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PREFACE

On-Farm Research Division (OFRD) of Bangladesh Agricultural Research Institute (BARI) 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 across the country. Major thrust during that period was given on the improvement of existing farming systems through introduction of improved varieties and management practices. Integrated farming and component technology studies were also conducted to improve the existing 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 this report will be useful to the researchers and extension workers in the field.

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Content

Socio-economics of Farming Systems

Yield and benefit gap of Mungbean under different management practices at Barisal area

The study was conducted at Babuganj Upazila of Barisal district during May-June 2001 to estimate the yield gap under different management packages and to identify the probable reasons for the gap. Two management practices i.e. recommended packages (Demonstration plot) and farmers practice (Farmers plot) were included in the study for data collection. A total of 25 farmers owing 25 plots and 5 demonstration plots were selected for collection of necessary primary information. The data collected from the sample farmers were edited, summarized and presented in tabular form. The study revealed that recommended package gave higher yield (982 kg/ha) than that of the farmers practice (388 kg/ha). The yield gap was 594 kg/ha (Table 1). Higher gross margin (Tk. 19025/ha) was also obtained from the recommended package and the gap in gross margin was Tk. 11238/ha (Table 2). This yield gap was due to non-use of fertilizer by the farmers and poor management practices to the farmer's plots.

Table 1. Production packages and yield of mungbean at Barisal during Khari-1, 2001

Item	Recommended packages	Farmers practice	Gap
Variety	BARI mungbean-2	BARI Mungbean-2	-
Planting time	February-12	February 15-22	-
Planting method	Line	Broadcast	-
Seed rate (kg/ha)	30	40	(-)10
Ploughing (no)	4	1	-
Weeding (no)	1	-	-
Insecticides use (no)	2	-	-
Yield (kg/ha)			
Main product	982	388	594
By-product	14840	90040	5800

Table 2. Input use, cost and returns of mungbean cultivation under different management packages at Barisal during Kharif-I, 2001

Item	Recommended packages	Farmers practice	Gap
Seed (kg/ha)	30	40	(-)10
Fertilizer (kg/ha)			
Urea	45	-	45
TSP	100	-	100
MP	58	-	58
Total variable cost (Tk/ha)	8035.00	4490.00	3545.00
Gross margin (Tk/ha)	19025.00	7787.00	11238.00
BCR	3.37	2.73	0.64

Labour utilization pattern and possibility of generating non-farm income at FSRD site, Goyeshpur, Pabna

The study was carried out at FSRD site, Goyeshpur, Pabna during October 2000 to March 2001 to find out family labour availability and utilization pattern and to find out the possibility of utilizing under utilized labour resource for income generating activities. The study was based on primary data collected by participatory approach and survey method from 60 sample farmers of marginal, small and medium farm categories by stratified random sampling technique. The collected data were then

edited, summarized and analyzed to achieve the objectives of the study. It was found that unemployed labour of all farm categories had decreased with the increase of farm size (Table 3). Regarding the skillness of family members it was found that sewing (31%) frying rice (20%) and embroidery (15%) could be the areas of work where the unemployed family members can work for generating income (Table 4).

Table 3. Unemployment level of family labour at FSRD site, Pabna during 2000-01

Family member		Effective member (no/family)	Available labour (m-d/ week/family	Labour utilized		Unemployment level (m-d/ week/family)
				Agril. activity	House hold & non-Agril.	
Marginal	Male	2.75	16.84	4.92	1.79	11.13
	Female	2.15	13.17	2.22	5.71	5.24
	Child	2.0	12.25	0.66	2.54	9.35
Small	Male	2.25	12.79	4.37	1.16	7.26
	Female	2.30	13.08	2.52	5.59	4.97
	Child	2.10	11.94	0.73	3.10	8.11
Medium	Male	2.0	9.62	2.37	1.28	5.97
	Female	2.38	11.45	1.66	4.98	4.81
	Child	2.0	9.63	0.28	1.94	7.41

m-d = man-day

Table 4. Area of generating employment of the family members at FSRD site, Pabna

Area	No. of family member	Percent
Sewing	18	31
Work with bamboo	8	13
Frying rice	12	20
Jute goods	7	12
Embroidery	9	15
Fruit processing	4	6
Weaving	2	3

Yield and benefit gap of aman rice under different management practices at Hathazari area of Chittagong

The study was carried out at FSR site, Hathazari to find out the yield gap in aman rice under two management conditions i.e. recommended packages (Farmers experimental plot) and farmers' practice during Kharif-II, 2000 season. A total of 34 farmers, 17 involved in farmer's experimental plots and 17 concerned in farmer's practice were interviewed by using a pre-designed schedule. The collected data were edited, summarized and analyzed in order to achieve the objectives of the study. Cobb-Douglas production function was selected to quantify the relative contribution of different production factors to the yield gap between recommended package and farmers practice. The study revealed that recommended packages

Table 5. Yield, input use and economics of T.Aman rice cultivation at FSRD site, Hathazari during Kharif II, 2000

Item	Recommended package	Farmers practice	Gap
Human labour (m-d/ha)	86	101	-15
Animal labour (P-d/ha)	35	27	8
Seed (kg/ha)	35	51	-16
Fertilizer (Kg/ha) :			
Urea	186	141	45
TSP	37	56	-19
MP	94	10	84
Gypsum	45	0	45
Cowdung	0	2193	-2193
Insecticides (Tk/ha)	1615	810	805
Production yield (kg/ha)	4321	3490	831
Total variable cost (Tk/ha)	17861	17541	320
Gross margin (Tk./ha)	15843	9681	6162
BCR	1.89	1.56	0.33

gave higher yield (4321 kg/ha) than that of the farmer's practice (3490 kg/ha). The yield gap was 831 kg/ha (Table 5). Higher gross margin (Tk. 15843/ha) was also obtained from recommended packages and the gap in gross margin was Tk. 6162/ha. The yield gap was due to reduced and imbalance amount of fertilizer used by the farmers.

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

The study was undertaken at FSRD site, Lebukhali during Kharif-I and II seasons of 1998 to 2000 for T.Aus and T.Aman and Rabi seasons of 1999-2000 and 2000-2001 for mustard to estimate the yield gap between recommended and farmers practice and to identify the factors responsible for the gap. Three crops i.e. T.Aus, T.Aman and mustard were selected for the study. A total of 20 farmers owing 20 plots for each of the crops were selected randomly for monitoring farmers' practices. Five plots measured 20 x 30 m was established with recommended packages to obtain necessary primary data. The collected information were edited, summarized and presented in tabular form. It was found that recommended packages gave higher yield than that of farmers' practices in all the three crops. The average yield with recommended management was 3980 kg/ha for T.Aus, 4677 kg/ha for T.Aman and 800 kg/ha for mustard. Whereas the corresponding yield for farmers practice was 2765 kg/ha, 3337 kg/ha and 570 kg/ha respectively (Table 6). Thus the yield gap per hectare was 1215 kg for T.Aus, 1340 kg for T.Aman and 230 kg for mustard. The gap in gross margin was Tk. 7055/ha for T.Aus, Tk. 4700/ha for T.Aman and Tk. 2227/ha for mustard respectively. The yield gap in T.Aus and T.Aman might be due to wider spacing, reduced and unbalanced fertilizer use. The yield gap in mustard was attributed to reduced and unbalanced fertilizer use.

Table 6. Production packages, yield and economics of T.Aus, T.Aman and Mustard at Lebukhali FSRD site, Patuakhali during 1998-2000

Item	T.Aus rice		T.Aman rice		Mustard	
	RP	FP	RP	FP	RP	FP
Variety	BR-2	BR-2	BR-23	BR-23	Daulat	Daulat
Planting/sowing time	May 4-11	May 7-26	Sept. 3-10	Aug.28 Sep.20	Dec.4-10 7.5	Nov.25-Dec.12
Seed rate (kg/ha)	25	35	30	45	-	10
Spacing (cm)	25x15	30x25	25x15	30x25	142	-
Plants/m2	24	12	24	15		131
Fertilizer use (kg/ha):					88	
Urea	77	51	77	81	66	81
TSP	28	-	28	-	28	-
MP	30	-	30	-	800	-
Yield (kg/ha)	3980	2765	4677	3337	11060	570
Total variable cost (Tk/ha)	13657	12205	1500	14200	5000	9227
Gross margin (Tk/ha)	14205	7150	175000	12800		2773
Gap in gross margin(Tk/ha)	7055		4700		2227	
Yield gap (kg/ha)	1215		1340		230	

RP= Recommended packages, FP = Farmers practices

Homestead fruits and vegetables production and utilization system at FSRD site, Jamalpur

The study was carried out at FSRD site, Narikeli, Jamalpur during January-February 2001 to know the existing homestead fruits and vegetables production and utilization system as well as problems faced in homestead gardening. A total of 150 farmers (45 marginal, 60 small, 25 medium and 20 large) were selected randomly for primary data collection. It was found that average homestead area was 37.08 decimals and average family size was 6.24 persons. It was revealed from the study that a good amount of fruits and vegetable were produced in the homestead of FSRD site Narikeli, Jamalpur. From the total production of fruits (1307 kg/farm/year), 56 percent was consumed by the family, 20 percent was sold and the rest was either distributed or rotten. Total leafy vegetable production was 248 kg/farm/year and 66 percent of the produce was consumed. Other than these leafy vegetables bottle gourd, Bean, Brinjal, Radish and Tomato were also produced at the homestead and the total amount was 1073 Kg/farm/year. Fifty two percent of these vegetables were consumed, 35 percent were sold, 12 percent were distributed and the rest (7%) were rotten (Table 7). The farmers of the area faced some problems to grow fruits and vegetables in the homestead. Insect pest infestation (72%), lack of quality seed (48%) and lack of technical know how (42%) were the main problems mentioned by the farmers (Table 8).

Table 7. Homestead fruits and vegetables production and utilization at FSRD site, Jamalpur during 2000

Kg/farm/year

Items	Production	Consumption	Distribution	Sold	Rotten
Fruits :					
Mango	353	210	40	98	5
Lemon	15	6	2	6	1
Jackfruit	730	356	94	264	16
Banana	25	115	14	116	2
Coconut	113	25	10	71	7
Blackberry	1.04	0.5	0.3	-	0.3
Guava	70	38	9	17	6
Total (Fruits)	1307 (100)	731(56)	169(13)	572(44)	37(3)
Total leafy vegetables	248(100)	164(66)	27(11)	50(20)	37(3)
Others vegetables :					
Bottle gourd	396	228	53	112	3
Bean	200	102	21	78	-
Brinjal	216	97	20	95	3
Radish	232	112	35	83	2
Tomato	29	15	5	9	-
Total (Other vegetables)	1073(100)	554(52)	134(12)	377(35)	8(7)

Table 8. Problems faced by the farmers for homestead gardening

Problem	Number	Percent
Natural calamity	49	33
High price of seed	54	36
Small homestead area	41	27
Lack of proper management	18	12
Lack of quality seed	72	48
Lack of technical know how	64	42
Insect pest infestation	108	72
Water logging	35	23
Shortage of fencing materials	17	11

Adoption status of improve technologies tested and recommended to FSRD site Palima, Tangail

The study was conducted at FSRD site, Palima, Tangail during May-June 2001 to assess the adoption status of the improved technologies tested and recommended to FSRD site, Palima, Tangail. A total of 60 farmers were selected randomly for primary data collection. A pre-designed survey schedule was used and direct interview method was followed. The survey revealed that a lot of technologies were adopted by the farmers of the FSRD site. The adoption rate varied for different technologies for obvious reasons. Technology like homestead vegetable garden was adopted by cent percent of the farmers. On the other hand, some pattern-based technologies were adopted by 2-10% of the farmers (Table 9). Besides this some technologies were not found to adopt at the farm level. These are BARI Chula, Cabbage variety Protiva, Batishak, Maize, Rice cum Fish, etc.

Table 9. Adoption status of improved technologies tested at FSRD site, Palima, Tangail in 2001

Name of the technology	Adoption status (% farmer)	Economic advantage
Broiler chick rearing	10	GM Tk. 2200/- from 100 broiler chick TVC=Tk. 7900.00
Beef fattening with UMS diet	20	GM TK. 3540 with 4 months TVC = Tk.9110/-
Vaccination to poultry	69	Reduced mortality
Vaccination to cattle	44	Reduced mortality
Deworming of cattle	15	Increased body weight
Mustard-Boro-T.Aman instead of Boro-T.Aman	90	GM=Tk. 40,000/ha/year TVC=Tk. 39000/ha/year
Wheat-Jute-T.Aman instead of Jute-T.Aman	40	GM = Tk. 16,000/ha/year TVC= Tk. 36500/ha/year
Wheat-Sesame-T.Aman instead of Wheat-Jute-T.Aman	5	GM = Tk. 35000/ha/year TVC=Tk. 37000/ha/year
Potato-Boro-T.Aman instead of Mustard-Boro-T.Aman	2	GM = Tk. 92000/ha/year TVC=Tk. 63000/ha/year
BRRI Dhan-29 as Boro rice variety instead of IR-8 & BR-14	80	GM = Tk. 16000/ha
BRRI Dhan-32 as T.Aman variety instead of BR-11	10	15 Days earlier than BR-11
Tomato variety Ratan	50	GM= Tk. 150000/ha TVC = 21000/ha
Seedless lemon	50	-
BARI Litchi-1	20	-
Hopper control in Mango	40	Yield increased significantly
BARI Dherosh-1	80	GM= Tk. 59000/ha, TVC= Tk. 27000/ha
BARI Lau-1	20	GM = Tk. 88/pit, TVC= Tk. 25/pit
Kazipayara	70	GM = Tk. 800/plant
Homestead vegetable garden	100	GM = Tk. 60000/ha/year
Jute variety 0-7897	50	GM =Tk. 23000/ha, TVC= Tk. 16000/ha
BARI Sarisha 8 & 9	5	GM = Tk. 140000/ha, TVC=Tk.8000/ha

GM= Gross margin, TVC= Total variable cost

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

The survey was conducted at three locations namely Goyeshpur FSRD site, Pabna, Narikeli FSRD site, Jamalpur and Palima FSRD site, Tangail. A total of 270 farmers (150 from Jamalpur and 60 each from Pabna and Tangail) were selected using stratified random sampling technique for primary data collection. The survey was conducted with the help of a pre-designed schedule by direct interviewing the selected farmers during December 2000 to March 2001. The collected information was edited, summarized and local units and measurements were converted into standard ones. The results were presented in tabular form.

Farm size, cattle and poultry population: The average farm size of the sample farmers was 1.42 ha, with the largest average size at Pabna (2.14 ha) followed by that in Tangail (1.20 ha) and the smallest in Jamalpur (0.92 ha). Highest number of cattle (6.2) and poultry (27) was found with the farmers at Jamalpur and Tangail respectively. The smallest number of cattle was found with Tangail (2.4) and that of poultry was reported in Pabna (8). It was revealed that cattle population was low in Tangail may be due to the mechanization (2.4) (Table 10).

Annual production of organic materials and their uses: Cowdung, cattle feed waste, kitchen waste, ash and poultry litter were the main organic materials available at the farm level. Availability of cowdung was the highest (3000 kg/farm/year) with the farmers of Jamalpur followed by those reported by the farmers of Pabna (2596 kg/farm/year) and Tangail (2174 kg/farm/year). On an average the amount of cattle feed waste, kitchen waste, ash and poultry litter available with the farmers was 1280 kg, 253 kg, 420 kg and 208 kg per farm per year respectively (Table 11). It was revealed that the highest amount of cowdung was used as farm yard manure (76%) followed by fuel (21%). A small portion of the cowdung was also used as directly to the vegetable garden. Major portion of the cattle waste feed was used as FYM (64%), a portion as domestic fuel (27%). Most of the kitchen waste (47%) was used as farm yard manure. A portion of the kitchen waste was used as cattle feed (25%) and the rest amount (28%) was dropped out without any meaningful use. In case of ash, the major amount (77%) was used in farm yard manure and a portion (10%) was used directly in the vegetable garden. The highest amount of poultry litter (49%) was dropped out and a significant portion was used as FYM (43%) (Table 12).

Annual production of crop residues and their uses: A number of crop residues were available at the farm level. The major crop residues were the straws of Aus, Aman, Boro rice and Wheat. Rice bran and Mustard/pulse stover were also available at farm level. Among the crop residues available, Aman rice straw was recorded to be the highest (3320 kg/farm/year) followed by that of Boro rice (2637 kg/farm/year) and Aus rice (497 kg/farm/year). The amount of wheat straw (660 kg/farm/year) was very small compared to other straw because cultivation of wheat was limited at Jamalpur and Tangail. The amount of Mustard/pulses stover (427 kg/farm/year) was also small for the same reason (Table 11). It was found that most of the straw of Aus (53%), Aman (74%) and Boro rice (68%) was used as cattle feed. Thirty eight percent of rice bran and 32% of Mustard/pulse stover was also used as cattle feed (Table 5). On the other hand, most of the wheat straw (58%), rice bran (53%) and Mustard/pulses stover (64%) were used as fuel. A portion of the Aus (33%) Aman (14%) and Boro rice straw (18%) was also burnt as domestic fuel (Table 12).

A good amount of organic materials and crop residues are produced at the farm level. The out tern is different at the different locations. The reasons may be varied for obvious reasons. However farmers used the household organic materials mostly in making farm year manure, rice straw as cattle feed and mingled the crop residue mostly in the soil. This indicated a favourable condition to the organic recycling. But a considerable portion of the household organic materials were not used for any productive purpose specially those of poultry litter and kitchen waste were dropped out. It is suggested that effective propaganda be at the offing to take care of the organic materials produced at

the household and to process for recycling. This organic manure would be valuable input to improve soil fertility. Therefore preservation of organic materials at the household level be encouraged for improvement of potential soil organic matter content of the soil.

Table 10. Farm size, cattle and poultry population at different location

Location	Farm size (ha)	Cattle (no.)	Poultry (no.)
Pabna	2.14	3.3	8
Jamalpur	0.92	6.2	14
Tangail	1.20	2.4	27
All	1.42	4.0	16

Table 11. Annual production of organic materials and crop residue at household level at different locations

Kg/farm/year

Items	Locations			
	Pabna	Jamalpur	Tangail	All
Organic materials:				
Cowdung	2596	3000	2174	2590
Cattle feed waste	1248	1498	1095	1280
Kitchen waste	157	244	357	253
Ash	333	411	516	420
Poultry litter	156	221	246	208
Crop residue:				
Rice bran	483	120	625	409
Mustard/pulse stover	379	400	502	427
Aus straw	290	1200	-	497
Aman straw	2101	4000	3860	3320
Boro straw	1904	2500	3508	2637
Wheat straw	1353	100	527	660

Table 12. Use of organic materials and crop residues available in households at different locations

Items	Locations			
	Pabna	Jamalpur	Tangail	All
Organic materials				
Cowdung (%):				
Farmyard manure	85	80	63	76
Fuel	12	15	36	21
Vegetable garden	-	5	2	2
Others	3	-	-	1
Cattle waste feed (%):				
Farmyard manure	85	73	35	64
Fuel	5	23	53	27
Vegetable garden	10	-	-	3
Others	-	4	12	5
Kitchen waste (%):				
Farmyard manure	55	36	49	47
Cattle feed	15	46	14	25
Drop out	30	18	37	28

Table 12. Contd.

Items	Locations			
	Pabna	Jamalpur	Tangail	All
Ash (%):				

Farmyard manure	95	74	61	77
Vegetable garden	2	20	7	10
Others	3	6	32	14
Poultry litter (%):				
Farmyard manure	76	40	13	43
Vegetable garden	4	10	10	8
Drop out	20	50	77	49
Crop residue				
Aus straw (%):				
Fuel	23	50	-	37
Cattle feed	66	40	-	53
Fencing	-	-	-	-
Others	11	10	-	10
Aman straw (%):				
Fuel	7	20	15	14
Cattle feed	85	56	80	74
Fencing	-	20	-	7
Others	8	4	5	5
Boro straw (%):				
Fuel	11	18	25	18
Cattle feed	69	62	72	68
Fencing	20	-	-	7
Others	-	20	3	8
Wheat straw (%):				
Fuel	70	80	25	58
Cattle feed	-	-	72	24
Fencing	25	20	-	15
Others	5	-	3	3
Mustard/pulse stover (%):				
Fuel	63	50	78	64
Cattle feed	30	50	16	32
Others	7	-	6	4
Rice bran (%):				
Fuel	56	60	42	53
Cattle feed	35	25	55	38
Others	9	15	3	9

Fertilizer management in major cropping patterns at different areas of Bangladesh

The survey was conducted at three locations namely Goyeshpur FSRD site, Pabna, Nerikeli FSRD site, Jamalpur and Palima FSRD site, Tangail. A total of 270 farmers (150 from Jamalpur and 60 each from Pabna and Tangail) were selected using stratified random sampling technique for primary data collection. The survey was conducted with the help of a pre-designed schedule by direct interviewing the selected farmers during December 2000 to March 2001. The collected information was edited, summarized and local units and measurements were converted into standard ones. The results were presented in tabular form.

Major cropping patterns: The major cropping patterns, which were identified by using adoption index revealed that two of the three major cropping patterns at all the three locations were sequenced with three crops and one cropping pattern in each location was sequenced with two crops. This signified a high cropping intensity of more than 250%. T.Aman rice was common in all the cropping patterns either it sequenced with two or three crops. At Jamalpur the major patterns were Boro-T.Aman,

Mustard-Boro-T.Aman and Wheat-Jute-T.Aman which adoption index was 4.36, 2.11 and 1.56 respectively. At Tangail major cropping patterns were Mustard-Boro-T.Aman, Wheat-Jute-T.Aman and Boro-T.Aman which adoption index were 3.61, 2.37 and 2.31 respectively. The major cropping patterns at Pabna were found Wheat based. The adoption indexes were 2.91, 2.30 and 2.27 for Wheat-T.Aman, Wheat-Jute-T.Aman and Wheat-Sesame-T.Aman respectively. Jute was found with one of the major cropping patterns at each of Pabna, Tangail and Jamalpur (Table 13).

Table 13. Major cropping pattern identified at Tangail, Jamalpur and Pabna during 2000- 2001

Location	Cropping pattern	Adoption index
Tangail	Mustard-Boro-T.Aman	3.61
	Wheat-Jute-T.Aman	2.37
	Boro-T.Aman	2.31
Jamalpur	Boro-T.Aman	4.36
	Mustard-Boro-T.Aman	2.11
	Wheat-Jute-T.Aman	1.56
Pabna	Wheat-T.Aman	2.91
	Wheat-Jute-T.Aman	2.30
	Wheat-Sesame-T.Aman	2.27

$$\text{Adoption index} = \frac{\text{\% farmer responded X \% area covered}}{100}$$

Fertilizer management and crop performance

Tangail: Organic manure like farm yard manure (FYM), poultry litter and ash was found to use in all major cropping patterns. FYM was applied in all the three first crops of the cropping patterns and the second crop of the pattern also receives FYM. T.Aman did not receive any kind of organic manure. Boro in both the cropping patterns received poultry litter and ash. On the other hand Jute received FYM @ 2958 kg/ha, poultry litter @131 kg/ha and ash @ 987 kg/ha in the Wheat-Jute-T.Aman cropping pattern. The inorganic (NPKSZn) dressing with mustard was 76-11-17-7-0.11 kg, that with Boro was 112-15-29-4-0.26 kg and T.Aman rice was 72-6-16-4-0.20 kg NPKSZn/ha respectively (Table 14). Farmers used higher amount of N and P but lower amount of other inorganic fertilizers. Farmers received satisfactory yield of all the three crops.

In the Wheat-Jute-T.Aman cropping pattern wheat received a small amount of FYM and poultry litter and Jute received FYM, poultry litter and Ash. Wheat and Jute received fertilization of NPKS @ 78-19-29-6 and 45-6-13-1 kg NPKS/ha, respectively. T.Aman in the pattern received NPKS @ 50-10-14-2 kg/ha. In wheat and T.Aman, farmers used higher amount of P but lower amount of NKSZn. But for Jute in the pattern, farmers' applied higher amount of N and lower amount of PKSZn than the recommended rate. The yield level of these three crops was lower than the expected yield level.

In Boro-T.Aman pattern Boro received NPKSZn @ 116-14-31-5-0.20 kg/ha and T.Aman received 51-10-24-2-0.15 NPKSZn kg/ha. In Boro, farmers applied higher amount of N and lower amount of other fertilizers. In T.Aman P was applied higher than recommended rate but other fertilizers were applied less than the recommended rate. The yield level was satisfactory for both the crops.

Jamalpur: All the crops of three cropping patterns received small to moderate amount of FYM and all the three first crops of the patterns received a good amount of Ash. T.Aman in Boro-T.Aman cropping pattern and wheat in Wheat-Jute-T.Aman cropping pattern also received a small amount of poultry

litter. Farmers used 4-5 kinds of inorganic fertilizer for Boro, T.Aman, Mustard, Wheat and Jute. The rate of inorganic fertilizers however varied with the variation of cropping patterns. Farmer applied more amounts of N and P but less amount of K, S and Zn for Boro in the first two cropping patterns. T.Aman on the other hand in all the three cropping patterns received more amounts of N and fewer amounts of P and other fertilizer except P in the cropping pattern Mustard-Boro-T.Aman. In this pattern T.Aman received more amount of P than that of the recommendation. In Wheat-Jute-T.Aman pattern wheat received more amount of N and less amount of other fertilizer than that of the recommendation. All the crops produced moderate to good yield with all the cropping patterns.

Pabna: All the three wheat based patterns of Pabna received a moderate amount of FYM and a small amount of Ash. Farmers did not apply any FYM to T.Aman but Wheat, Jute and Sesame received 3.7 – 5.4 t/ha FYM. Except sesame, all the crops in the three cropping patterns received higher amount of N than that of the recommendation. Farmers also applied less amount of P in all the crops except T.Aman in Wheat-Jute-T.Aman and Wheat-Sesame-T.Aman cropping pattern. Except nitrogen, the variation in use of P, K and S fertilizers in farmers practice and recommendation was narrow. But the yield differences in farmers practice and recommendation was not narrow. This may be due to unbalanced use of fertilizers.

Trend of crop yield: Decreasing trend of crop yield was reported by the farmers at Tangail and Pabna, for not using or using less amount of organic manure and sub optimal amount of chemical fertilizer. Crop production status considering last 5 years was reported to be increasing at Jamalpur. Balance use of chemical fertilizer, use of organic manure and cultivation with new varieties of crop was reported to be the causes of increasing trend of crop yield. But considering the opinion of the farmers of three locations increasing trend of crop production was observed (Table 15).

Determination of fertilizer rates: Farmers resort to five sources to determine fertilizer rates for their crops. These are i) Farmers indigenous/local knowledge, ii) Advice from the neighbour, iii) Block supervisor, iv) Printed materials like booklet or leaflet and v) Dealer. Most of the farmers (49%) are dependent on self-knowledge and a large portion of the farmers (25%) took advice from the neighbour. Block supervisors and printed materials also helped farmers to determine fertilizer rate (Table 16).

Farmers do not apply recommended dose of fertilizer to their crop field. There was found no general trend for using inorganic fertilizer to the crops. The amount of fertilizers varied among the locations and crops but the recommendation was not followed in most of the cases. The unbalanced use of all the nutrient may lead to nutrient imbalance in soil plant systems and yield goal could not be achieved in most cases. Except a few crops and locations use of organic manure is negligible which may lead to a degradation of soil nutrient status. Leguminous or fibre crop is also included rarely in the cropping pattern at different locations, which is also enhancing the degradation of soil nutrient status. Strong extension service and result demonstration with recommended fertilizer application may be suggested.

Table 14. Application of organic manure, nutrient and yield obtained in different cropping patterns at Tangail, Jamalpur and Pabna

kg/ha

Cropping pattern	FYM	Poultry litter	Ash	N	P	K	S	Zn	Yield
				Tangail					
Mustard	1191	15	301	76	11	17	7	0.11	1170
Boro	401	96	8	112	15	29	4	0.26	6010
T.Aman	-	-	-	72	6	16	4	0.20	3690
Wheat	1135	577	-	78	19	29	6	-	2380
Jute	2958	131	987	45	6	13	1	-	2320
T.Aman	-	-	-	50	10	14	2	-	3400
Boro	465	29	155	116	14	31	5	0.2	5910
T.Aman	-	-	-	51	10	24	2	0.15	3640
				Jamalpur					
Boro	5172	-	1358	112	19	32	5	0.4	4730
T.Aman	2565	166	881	84	6	12	2	0.3	3770
Mustard	4827	-	1965	39	12	16	3	-	910
Boro	1780	-	-	110	19	41	12	0.5	4610
T.Aman	1260	-	-	93	10	18	4	-	3290
Wheat	4904	270	1203	89	16	25	13	-	2370
Jute	3840	-	-	40	4	12	-	-	2370
T.Aman	1988	-	-	88	7	23	3	-	3450
				Pabna					
Wheat	4500	270	1965	114	17	30	9	4	2850
T.Aman	-	-	-	93	5	16	3	3	2940
Wheat	4850	-	1965	117	16	33	8	2	2270
Jute	5400	-	-	76	5	22	3	-	1860
T.Aman	-	-	-	108	9	19	3	3	3230
Wheat	6150	-	-	94	17	22	9	3	2100
Sesame	3675	-	225	38	14	-	-	-	1220
T.Aman	-	-	-	109	8	26	6	3	3220

FYM = Farm yard manure

Table 15. Trend of crop yield during last 5 years as reported by the farmers at different locations

Location	Yield status	Farmer responded (%)	Reasons
Tangail	Stable	21	Fertilizer use, regular intercultural operation
	Increasing	31	Fertilizer use, regular intercultural operation, use of organic manure, maintaining crop rotation, new variety
	Decreasing	48	No use of organic manure, insect pest infestation, lack of quality seed etc.
Jamalpur	Stable	18	Use of organic manure, irrigation etc.
	Increasing	70	Balance use of chemical fertilizer & use of organic manure and new variety
	Decreasing	12	Use reduced amount of chemical fertilizer
Pabna	Stable	16	Fertilizer use, regular intercultural operation
	Increasing	24	Fertilizer use, regular intercultural operation, use of organic manure, maintaining crop rotation
	Decreasing	60	No use of organic manure, insect pest infestation, lack of quality seed etc.

All locations : Stable 18 % Increasing 42% Decreasing 37%

Table 16. Amount and type of fertilizer determination for crops as reported by the farmers

Location	Self, considering the soil condition	Advice from other farmers	Block supervision	Booklet/ leaflet	Dealer
Tangail	50	27	17	6	-
Jamalpur	45	18	14	11	12
Pabna	52	30	7	10	3
All	49	25	13	9	5

Plant biodiversity in the homesteads of saline area at Noakhali

The study was conducted at FSRD site Noakhali, MLT sites Laxmipur and Feni of greater Noakhali district. Thirty selected homestead of each location were surveyed following two methods namely, formal survey and informal survey and focused group discussions. Data for plant biodiversity of the homesteads were collected using questionnaire. Each homestead was visited twice, in winter and in summer. Information was recorded through interviews of family members like head of the family, housewife and others. Data were collected mainly on name and number of the plant species and name and number of major morphotypes per species.

Almost all the homesteads had mixed vegetation with various annual and perennial trees and seasonal vegetables. The study revealed that a wide variety of plant species was found in the study areas. More than 62 useful species were identified in the homesteads of FSRD site, Atkapalia, MLT site Lakshipur and MLT site Feni. Among them 30.91% were fruit, (perennial and annual), 29.09% were timber, 34.54% were vegetables (summer and winter) and 5.45% were spices species (Table 17). The distribution pattern of the plant species was influenced by macro and micro environmental factors of the homesteads and needs of the family members.

Table 17. Species richness of different plant groups at greater Noakhali

Region	Fruits tree	Timber thee	Vegetables	Spices	Total
FSRD site, Atkapalia	18	17	18	5	58
MLT site Lakshmipur	17	7	18	2	44
MLT site Feni	21	17	20	4	62
Average	19.00	13.67	18.67	3.67	54.67
All	17	16	19	3	55
Percent	(30.9)	(29.09)	(34.54)	(5.45)	

Inter-species diversity

Species diversity index is a measure, which renders considerable ecological insight (Magurran, 1988). Simpson index (1949) of species diversity (D) varied among the different groups of plant species (Table 18). Diversity was found higher for vegetable species (0.879) in the homesteads of the study area (3 regions as a whole) followed by fruit (0.854), timber and spices.

Table 18. Inter species diversity of different plant groups at the homesteads in greater Noakhali

Region	Fruits tree	Timber thee	Vegetables	Spices	Total
FSRD site, Atkapalia	0.822	0.817	0.910	0.690	0.809
MLT site Lakshmipur	0.899	0.733	0.740	0.650	0.756
MLT site Feni	0.866	0.871	0.894	0.717	0.837
Average	0.862	0.807	0.846	0.686	0.812
All	0.854	0.853	0.879	0.705	0.823

Relative prevalence of species

Fruit: It is observed from Table 19 that coconut was found in 98.63% household at Noakhali. While mango, banana, betel nut and date palm, were found at more than 60% homesteads of Noakhali.

Timber: Mahogani, badhi and neem was found at 50% homesteads of the study area. (Table 20).

Vegetables: Country bean was found at 81.96% homesteads of Noakhali. Whereas sweet gourd, brinjal were found at more than 50% homesteads of the study area (Table 21).

Spices: Among the spices chili was found at more then 54% homestead of the study area (Table 22).

Relative prevalence value of common species considering 90 households as a whole none of the species was found in every homestead of all the regions. Species found at least one homestead in each region were screened out. Only 17 fruit, 13 timber, 17 vegetables and 2 spices species were found common at all regions.

Table 19. Distribution of fruit species in the homesteads of greater Noakhali

Sl. no.	Species	% homestead containing the species			
		FSRD site, Atkapalia	MLT site Lakshmipur	MLT site Feni	All
1.	Mango (*Mangifera indica*)	96.67	88.24	100	96.72
2.	Jujube (*Zizyphus jujuba*)	86.67	70.59	100	86.88
3.	Coconut (*Cocos nucifera*)	98.10	99.40	97.8	98.6
4.	Jackfruits (*Artocarpus heterophyllus*)	60.00	41.18	100	65.57
5.	Wood apple (*Aegle mermelos*)	20.00	17.65	13.33	18.03
6.	Star fruits (*Averrhoa carambola*)	43.33	35.29	86.67	52.46
7.	Litchi (*Litchi chinensis*)	16.67	23.53	20.0	19.67
8.	Velvet apple (*Diospyros discolor*)	0.00	0.00	66.67	16.39
9.	Bullocks heart (*Anona reticulata*)	60.00	41.18	0.00	40.98
10.	Palm (*Borassus flabellifer*)	63.33	52.94	100	70.49
11.	Date palm (*Phoenix sylvestris*)	90.00	41.18	100	80.32
12.	Banana (*Musa spp*.)	93.33	70.58	100	90.16
13.	Timber nut	50.00	5.88	0.00	26.22
14.	Amlaki (*Phyllanthus embelica*)	30.00	17.64	0.00	19.67
15.	Guava (*Psidium guajava*)	90.00	58.82	100	85.24
16.	Caranda (*Carissa carandus*)	0.00	0.00	46.67	11.47
17.	Pomelo (*Citrus grandis*)	43.33	0.00	86.67	42.62
18.	Papaya (*Carica papaya*)	50.00	64.71	100	67.21
19.	Black berry (*Eugenia jambolana*)	53.33	11.76	93.33	52.46
20.	Pineapple (*Anonus comosus*)	10.00	5.88	13.33	9.84
21.	Water melon	3.33	0.00	0.00	0.00
22.	Custard apple (*Anona squamosa*)	40.00	0.00	86.67	22.95
23.	Hog plum (*Spondias mangifera*)	16.67	5.88	20.00	26.23
24.	Pome granite (*Punica granatum*)	0.00	5.88	86.67	31.14
25.	Cashew nut (*Anacardium oxydentale*)	33.33	5.88	0.00	1.64
26.	Olive (*Elaeocarpus floribundus*)	3.33	5.88	0.00	18.03
27.	Wax apple (*Syzygium samarangense*)	10.00	5.88	20.00	1.64
28.	Rose apple (*Eugenia javanica*)	0.00	5.88	6.67	11.48
29.	Betelnut (*Areca catechu*)	45.00	82.36	100	93.44

Table 20. Distribution of timber species in the homesteads of greater Noakhali

Sl no	Species	% homestead containing the species			
		FSRD site, Atkapalia	MLT site Lakshmipur	MLT site Feni	All
1	Mahogani (*Swietenia macrophylla*)	63.33	47.05	98.00	68.85
2	Sissoo (*Dalbergia sissoo*)	23.30	0.00	6.67	13.11
3	Teak (*Tectona grandis*)	26.66	11.76	60.00	31.14
4	Akashmoni (*Acacia auriculiformis*)	16.60	0.00	20.00	13.12
5	Eucalyptus (*Eucalyptus camaldulensis*)	16.66	0.00	6.67	9.84
6	Minjiri (*Cassia samea*)	0.00	0.00	0.00	0.00
7	Chapalish (*Artocarpus chaplasha*)	6.66	0.00	40.00	13.11
8	Koroi (*Albizia procera*)	85.00	7.59	96.00	93.44
9	Neem (*Azadirachta indica*)	63.33	11.76	86.67	55.73
10	Tamarind (*Tamarindus indica*)	53.33	0.00	93.33	49.18
11	Garzan (*Diplorocarpus turbinatus*)	3.33	0.00	6.67	3.28
12	Shal (*Shorea robusta*)	3.33	0.00	0.00	1.64
13	Raintree (*Samanea saman*)	40.00	23.52	40.00	36.07
14	Ipil-Ipil (*Leucaena leucocephala*)	26.67	0.00	0.00	13.11
15	Krishnachura (*Delonix regia*)	13.33	11.76	93.33	32.79
16	Babla (*Acacia nilotica*)	26.67	0.00	53.33	26.23
17	Kadam (*Anthocephalus cadamba*)	16.67	52.94	100.00	47.54
18	Pithraj (*Amoora rohitoca*)	3.33	5.88	40.00	13.11
19	Silk cotton (*Bombax malabaricum*)	26.67	23.53	40.00	29.51
20	Palash (*Butea monosperma*)	0.00	5.88	6.67	3.28
21	Pain (*Toona ciliata*)	6.67	0.00	66.67	19.67
22	Sonalo	20.00	29.41	93.33	40.98
23	Mandar (*Erythrina indica*)	46.67	11.76	93.33	49.18
24	Domur (*Ficus racemosa*)	10.00	0.00	73.33	22.95
25	Badhi (*Lannea coromandelica*)	53.33	41.17	93.33	60.65
26	Jarul (*Lagerstroemiaflos reginae*)	3.33	0.00	20.00	6.56
27	Champa (*Michelia champaca*)	3.33	0.00	13.33	4.92
28	Debdaru (*Polyalthia longifolia*)	3.33	0.00	26.67	9.84
29	Gamar (*Gmelina arborea*)	10.00	6.00	26.67	11.47

Table 21. Distribution of vegetable species in the homesteads of greater Noakhali

Sl. no	Species	% homestead containing the species			
		FSRD site, Atkapalia	MLT site Lakshmipur	MLT site Feni	All
1	Indian Spinach	70.00	17.65	0	34.43
2	Spinach	60.00	0.00	6.67	19.67
3	Red amaranth	36.67	11.65	13.3	36.06
4	Stem amaranth	60.00	23.53	66.67	39.34
5	Kang Kong	33.33	0.00	0.0	14.75
6	China copi	30.00	0.00	13.33	6.56
7	Mustard	6.67	0.00	0	4.92
8	Cauliflower	10.00	5.88	60.0	19.67
9	Cabbage	6.67	0.00	60.0	18.03
10	Olcopi	0.00	0.00	0.0	0.0
11	Broccoli	0.00	0.00	0.0	0.0
12	Sweet gourd	80.00	70.59	100.0	83.61
13	Cucumber	30.00	35.29	40.0	34.43
14	Ribbed gourd	16.67	17.64	46.67	24.59
15	Sponge gourd	20.00	52.94	100.0	49.18

Table 21. Contd.

Sl. no	Species	% homestead containing the species			
		FSRD site, Atkapalia	MLT site Lakshmipur	MLT site Feni	All
16	Ash gourd	10.00	29.41	53.33	26.23
17	Bitter gourd	6.67	11.76	13.33	9.84
18	Kakrol	16.67	0.00	6.67	9.84
19	Snake gourd	23.33	17.64	46.66	27.87
20	Pointed gourd	0.00	0.00	6.67	1.64
21	Bottle gourd	60.00	82.35	93.33	75.41
22	Country bean	66.67	88.24	100.0	81.96
23	Yard long bean	26.67	11.76	13.33	19.67
24	Brinjal	50.00	41.17	100.0	60.65
25	Tomato	63.33	5.88	100.0	57.38
26	Okra	30.00	5.88	6.67	18.03
27	Potato	16.67	5.88	46.67	21.31
28	Sweet potato	46.67	0.00	33.32	31.15
29	Taro	0.00	5.88	86.67	22.95
30	Potato yam	6.67	41.18	93.33	37.70
31	Radish	33.33	5.88	86.67	39.34
32	Turnip	3.33	0.00	0.0	1.64
33	Carrot	3.33	0.00	0.0	26.23
34	Sugar bet	6.67	0.00	0.0	24.59

Table 22. Distribution of spices species in the homesteads of greater Noakhali

Sl. no	Species	% homestead containing the species			
		FSRD site, Atkapalia	MLT site Lakshmipur	MLT site Feni	All
1	Chilli	96.00	23.53	80.0	54.09
2	Onion	90.00	2.94	66.67	19.67
3	Garlic	20.00	5.88	13.33	36.06
4	Zinger	36.67	0.00	40.0	1.64
5	Turmeric	10.67	5.88	66.67	8.19
6	Coriander	16.67	0.00	6.67	6.56

The RP values of common fruit, timber, vegetables and spices

Fruit: Among 17 fruit species, common at all regions, coconut was found most prevalent in the study area. On the basis of mean dominance, coconut, mango ranked top followed by jackfruit, guava and jujube.

Timber: Among the 18 timber species, common at all regions, Kori was found most prevalent at FSRD site Atkapalia and cadamba was at MLT site Lakshmipur and Feni population level (Table 25).

Vegetables: Out of 21 vegetable species, common at all regions, Sweet gourd was found most prevalent at FSRD site Atkapalia and country bean was at both MLT site Lakshmipur and Feni (Table 26). On the basis of mean dominance rank, country bean occupied top position followed by taro, sweet gourd, Indian spinach and bottle gourd. The least ranked vegetable species was kangkong.

Spices:In case of spices chilli, garlic and turmeric were found common in all the regions

Based on the present study it may be concluded that wide range of plant biodiversity existed in the homestead of the greater Noakhali. Among the plant species, inter species diversity of vegetables

species was the highest followed by fruit in the homesteads. Coconut in fruits group and Country bean in vegetable was most prevalent species in the homestead. Therefore, intensive research should be undertaken to improve the most prevalent vegetables, spices, fruits and timber species.

Table 23. Relative prevalence of common fruit species found in the homestead of the greater Noakhali

Sl. no.	Species	FSRD site, Atkapalia	MLT site Lakshmipur	MLT site Feni	All
1	Mango	2133.11	849.26	5173.33	2524.27
2	Jujube	257.11	101.47	526.67	272.05
3	Coconut	3183.33	1900.00	1633.33	2496.72
4	Jackfruits	290.0	72.06	900.0	331.09
5	Wood apple	18.00	3.31	4.44	10.35
6	Star fruits	49.11	22.06	150.22	60.19
7	Litchi	4.44	16.18	6.67	7.74
8	Velvetapple	0	0	84.4	5.11
9	Bullocks heart	150.0	23.16	0.0	56.44
10	Plum	183.66	92.65	946.67	296.99
11	Date plum	1449.0	48.89	920.0	842.78
12	Banana	5721.33	472.06	3186.67	3582.91
13	Timber nut	743.33	0.73	0.0	192.64
14	Amlaki	14.0	5.51	0.0	6.12
15	Guava	600.0	84.56	753.33	469.55
16	Carandus	0.0	0.0	28.0	1.69
17	Pumelo	95.33	0.0	190.67	69.17
18	Papaya	86.66	109.19	580.0	182.90
19	Black berry	165.33	6.62	1319.11	270.03
20	Pineapple	3.0	3.67	26.67	7.90
21	Water melon	0	0	0.0	0.0
22	Custard apple	0.11	0	127.11	8.65
23	Hog plum	53.33		8.0	21.07
24	Pome granite	3.33	1.10	121.33	14.29
25	Cashew nut	0	0.36	0.0	0.11
26	Olive	13.33	1.47	0.0	4.43
27	Wax apple	0.33	1.10	10.67	1.08
28	Rose apple	1.66	0.73	1.33	2.82
29	Betel nut	6934.66	1750.0	1326.67	4240.15

Table 24. Relative prevalence of common timber species found in the homestead of the greater Noakhali

Sl. #	Species	FSRD site, Atkapalia	MLT site Lakshmipur	MLT site Feni	All
1	Mahogany	1851.44	435.29	1660.00	1438.0
2	Sissum	87.11	0	0.89	24.51
3	Segun	31.11	7.35	304.0	61.78
4	Akashmoni	20.0	0	12.00	9.67
5	Eucalyptus	7.77	2.20	2.22	3.06
6	Minjiri	0	0	0.0	0.0
7	Chapalish	0.66	0	69.33	6.23
8	Kori	6130.0	811.76	3306.0	3858.72
9	Neem	179.44	2.94	0.67	112.39
10	Tamarind	8177.0	0	196.44	85.46
11	Garzan	0.77	0	373.33	0.59
12	Shal	0.22	0	1.78	0.05

Table 24. Contd.

Sl. #	Species	FSRD site, Atkapalia	MLT site Lakshmipur	MLT site Feni	All
13	Rain tree	734.66	26.47	0.0	357.69
14	Ipil-Ipil	1496.00	0	96.0	361.84
15	Krishnachura	3.55	2.20	0.0	29.95
16	Babla	80.88	0	255.11	50.74
17	Cadamba	11.11	102.57	96.0	92.74
18	Pithraj	0.11	0.36	453.33	2.79
19	Silk cotton	35.55	5.88	29.33	26.12
20	Palash	0.00	1.47	26.67	0.26
21	Pain	4.0	0	0.44	18.06
22	Sonalo	18.0	12.87	168.89	102.12
23	Mandar	402.88	25.73	734.22	647.40
24	Domur	4.66	0	3167.11	43.27
25	Badhi	1245.77	82.35	493.78	1024.19
26	Jarul	0.44	0	1499.55	12.25
27	Champa	0.88	0	0.0	1.05
28	Debdaru	0.11	1.84	4.44	1.93
29	Gamar	17.66		10.67	12.42

Table 25. Relative prevalence of common vegetable species found in the homestead of the greater Noakhali

Sl. #	Species	FSRD site, Atkapalia	MLT site Lakshmipur	MLT site Feni	All
1	Indian Spinach	4606.00	18.75	0.0	1309.33
2	Spinach	1772.22	0	66.67	515.99
3	Red amaranth	11690	1102.94	453.33	4644.18
4	Stem amaranth	1404.44	4411.76	1871.11	3021.77
5	Kang Kong	1147.00	0	0.0	277.42
6	China copi	166.66	0	71.11	89.22
7	Mustard	233.33	0	0.0	56.44
8	Cauliflower	21.11	367.65	1800.0	498.25
9	Cabbage	27.77	0	1980.0	183.28
10	Olcopi	0	0	0.0	0.00
11	Broccoli	0	0	0.0	0.00
12	Sweet gourd	1341.33	202.94	2666.67	1300.69
13	Cucumber	67.00	24.26	144.0	74.49
14	Ribbed gourd	11.11	5.51	388.89	60.47
15	Sponge gourd	24.00	92.64	1153.33	191.07
16	Ash gourd	5.33	14.70	103.11	22.79
17	Bitter gourd	1.33	6.62	22.22	6.45
18	Kakrol	66.11	0	4.44	20.80
19	Snake gourd	67.66	9.96	379.55	99.59
20	Pointed gourd	0	0	2.67	0.16
21	Bottle gourd	154.00	185.29	64711	168.26
22	Country bean	3337.78	843.75	4213.33	3073.09
23	Yard long bean	246.22	3.67	18.67	97.71
24	Brinjal	2441.67	156.98	4566.667	2198.52
25	Tomato	5826.67	73.53	5233.36	3522.57
26	Okra	1092.00	91.91	66.67	441.06
27	Potato	638.89	77.20	5444.44	1086.54
28	Sweet potato	3688.22	0	1266.667	1501.72
29	Taro	0	18.38	14300.0	950.01

Table 25. Conted.

Sl. #	Species	FSRD site, Atkapalia	MLT site Lakshmipur	MLT site Feni	All
30	Potato yam	100.00	61.76	404.44	333.16
31	Radish	2750.00	110.29	10920.0	3008.87
32	Turnip	16.11	0	0.0	3.89
33	Carrot	13.33	0	0.0	141.47
34	Sugar bet	0	0	0.0	0.00

Table 26. Relative prevalence of common spices species found in the homestead of the greater Noakhali

Sl. #	Species	FSRD site, Atkapalia	MLT site Lakshmipur	MLT site Feni	All
1	Chilli	12684.0	451.47	21493.36	4376.65
2	Onion	793.33	0	9866.67	603.06
3	Garlic	1894.44	110.29	355.55	2453.64
4	Zinger	0	0	1813.33	4.03
5	Turmeric	468.89	0	10222.22	113.41
6	Coriander	186.67	0	66.67	45.15

Improvement of Crops and Cropping Systems

Growing potato yam, bottle gourd and snake gourd on the same trellis

The experiment was conducted at RARS, Jessore during 2000-01 to know the performance of Potato yam along with other vegetables on the same trellis with different plant population. The number of fruits and yield of all the vegetables studied increased gradually with the increase of population. The highest yield and gross returns from yard long bean and bottle gourd were obtained from 4 plants per trellis grown on 2 pits. While for snake gourd and potato yam the highest yield and gross return were obtained from 8 plants per trellis grown on 4 pits (Table 1).

Table 1. Performance of different vegetables on the same trellis at the RARS, Jessore during 2000-01

Treatment	Number/ Trellis		Yield (kg/trellis)			Gross return (Tk/trellis)	Planting Time	Harvesting time
					Yard long bean			
1 Pit 1 Plant	67		0.91			86.85		
1 Pit 2 Plants	86		1.09			118.37		27-4-2000
2 Pits 3 Plants	178		2.21			139.79	24-1-'00	to
2 Pits 4 Plants	197		2.38			191.53		29-6-2000
LSD (.05)	44		0.49					
					Snake gourd			
1 Pits 2 Plants	84		11.33			74.55		
2 Pits 4 Plants	137		18.88			124.23		4-5-2000
3 Pits 6 Plants	159		23.44			154.23	27-2-'00	to
4 Pits 8 Plants	163		25.62			168.58		14-8-2000
LSD (.05)	34		5.78					
					Potato Yam			
	B	R	B	R	Tot.			
1 Pits 2 Plants	52	1.8	7.6	0.39	8.0	64.00		
2 Pits 4 Plants	62	3.8	10.3	0.59	10.9	87.20	18-4-'00	22-2-2001
3 Pits 6 Plants	70	5.8	12.0	0.86	12.9	103.20		
4 Pits 8 Plants	93	7.8	16.2	1.42	17.6	140.80		
LSD (.05)	8	0.69	2.8	1.25	2.6			
					Bottle Gourd			
1 Pit 1 Plant	12		12.80			64.00		
1 Pit 2 Plants	18		18.63			93.15		19-10-2000
2 Pits 3 Plants	24		25.74			128.70	10-8-'00	to
2 Pits 4 Plants	30		32.04			160.20		24-1-2001
LSD (.05)	4.8		5.63					

B = Bulbil, R = Rhizome

Price of vegetables (Tk./kg): Yard long bean= 9.75, Snake gourd= 8.60, Potato yam= 8.00
Bottle gourd= 5.00

Improvement of productivity of yam though intensification of spacing

The experiment was carried out during 2000-01 at RARS, Jessore to find out the optimum spacing for growing potato yam. The highest total yield was obtained from 1 x1m spacing. Probably there is scope of yield elevation with further reduction of spacing (Table 2).

Table 2. Effect of spacing on the performance of yam grown on the ground at RARS, Jessore during 2000-01

Spacing (m)	Nodal rhizome		Main rhizome		Total yield (t/ha)
	Number (No./ha)	Yield (t/ha)	Number (No./ha)	Yield (t/ha)	
3.0 x 3.0	14167	0.64	1111	2.59	3.22
1.5 x 1.5	31944	1.42	4444	7.08	8.50
1.0 x 1.0	73889	4.20	10000	9.47	13.67
LSD (.05)	10220	2.87	-	2.63	5.26

Performance of alternate cropping patterns in old Brahmaputra floodplain soil under AEZ 9

To evaluate the productivity and profitability of four alternate cropping patterns the experiment was undertaken at FSRD site, Narikeli, Jamalpur, during 1999-2000. Potato-Sesame-T.Aman gave the highest gross margin and benefit cost ratio over three years mean (Table 3 & 4).

Table 3. Yield of different crops under different patterns at FSRD site, Narikeli, Jamalpur during 1999-2000

Crops	Grain/fibre yield (kg/ha)	Straw/stick yield (kg/ha)
Potato (Diamont)	24000	-
Mustard (Tori-7)	850	2450
Lentil (L-5)	810	1330
Sunflower (Kironi)	896	7060
Sesame (T-6)	991	2312
Jute (0-9897)	2706	4081
T. Aman (BRRI Dhan-32)	3760	6710

Table 4. Cost and return analysis of different cropping pattern at FSRD site, Narikeli, Jamalpur during 1999-2000

Cropping pattern	GR (Tk/ha)	TVC (Tk/ha)	GM (Tk/ha)	Benefit cost ratio			Mean
				1999-2000	1998-99	1997-98	
Potato-Sesame-T. Aman	132230	47907	84323	2.76	2.81	3.10	2.89
Mustard-Sesame-T. Aman	45580	31657	13923	1.43	1.60	2.89	1.96
Lentil-Sesame-T. Aman	52430	28711	23719	1.82	1.99	2.53	2.11
Sunflower-Jute-T. Aman	52192	38917	13275	1.32	1.72	2.64	1.89

Price of input and output (Tk./kg): Potato= 4.00; Mustard= 11.00; T. Aman= 7.00; Lentil = 20.00; Sunflower= 10.00; Sesame= 10.00; Jute= 6.25; Urea= 5.60; T.S.P.= 12.40; MP= 9.40; Gypsum= 4.00; Zinc sulphate=. 25.00.

Effect of cutting stage on the forage and grain yield of Barley

The study was conducted at RARS, Jamalpur during 2000-01 to find out the optimum cutting times for obtaining maximum forage besides grain yield. Four treatments viz. T_1=no cutting (control), T_2= cutting at 40 DAE and then grain production, T_3=cutting at 55 DAE and then grain production, T_4=cutting at 40 and 55 DAE and then grain production were studied on BARI barley –1. Results showed that at 40 DAE cutting, though yield was 27% lower than control but subsequent green fodder (9.29 t/ha) production was very substantial during the fodder scarcity period (Table 5).

Table 5. Fodder yield, dry matter and grain yield of barley as affected by different cutting stages

Treatment	Fodder yield (t/ha)			Dry matter (t/ha)			Grain yield of Barley (t/ha)
	40 DAE	55 DAE	Total	40 DAE	55 DAE	Total	
T_1	-	-	-	-	-	-	2.45a
T_2	9.29	-	9.29b	1.16	-	1.16b	1.77b
T_3	-	14.28	14.28a	-	2.38	2.38a	0.59c
T_4	8.58	1.62	10.20b	1.11	0.26	1.37b	0.63c
CV%	-	-	12.93	-	-	15.10	10.01

Performance of alternate cropping pattern T.Aus-T.Aman-Mustard against the farmers existing pattern T.Aus-T.Aman-Fallow

The experiment was carried out at FSRD site, Golapgonj, Sylhet during 1999-2000 and 2000-01. Results showed that alternate cropping pattern yielded on an average 4.72, 3.79 and 0.95 t/ha of T.aus, T.aman and mustard respectively against 2.27 t/ha of T.aus and 2.68 t/ha of T.aman in farmer's pattern. Alternate cropping pattern fetched more than double the gross margin over the existing pattern (Table 6) due to change of rice varieties and introduction of mustard.

Table 6. Yield and gross margin of the cropping pattern T.Aus-T.Aman-Mustard against the existing pattern T.Aus - T.Aman at FSRD site, Golapgonj, Sylhet

Cropping pattern	Grain yield (t/ha)	Gross margin (Tk/ha
Alternate cropping pattern		
T.Aus (BRRI Dhan-26)	4.72	49,341
T.Aman (BRRI Dhan-32)	3.79	-
Mustard (Tori-7)	0.95	-
Existing cropping pattern		
T.Aus (Purbachi)	2.27	20,196
T.Aman (Pajam)	2.68	-

Effect of late transplanting on the yield and yield components of photo period sensitive Aman rice varieties

The experiment was conducted at FSRD site, Golapgonj, Sylhet during 2001 to show the performance of photo period sensitive T.aman rice under late transplanting condition. There were three dates of planting such as, 20 and 30 September and 10 October and three varieties BR-22, Binashail and Moinasail were considered for the study. Seedling age was 30 days. Results revealed that none of the varieties produced any grain in October 10 transplanting. BR-22 gave the highest grain yield (1.48 t/ha) in September 30 planting but it was at par with Moinasail (Table 7).

Table 7. Effect of date of transplanting, variety and their interaction on yield and yield attributes of T. Aman at FSRD site, Golapgonj, Sylhet

Factor	Plant height (cm)	Fertile tillers/hill (no.)	Grain yield (t/ha)	Straw yield (t/ha)
Date of transplanting				
20 September	83.67 a	5.37 a	1.97 a	3.87 a
30 September	69.67 b	4.30 b	1.34 b	2.86 b
10 October	51.00 c	0 c	0 c	0.59 c

Table 7. Conted.

Factor	Plant height (cm)	Fertile tillers/hill (no.)	Grain yield (t/ha)	Straw yield (t/ha)
		Variety		
BR-22	64.67 b	3.45	1.22 a	2.32
BINA Sail	63.00 b	3.19	1.08 ab	2.37
Moina Sail	76.67 a	3.03	1.01 b	2.62
		Date of transplanting × Variety		
20 September				
BR-22	81 b	5.99 a	2.19 a	3.82 a
BINA Sail	80 b	5.49 b	1.98 b	3.73 a
Moina Sail	90 a	4.63 c	1.74 c	4.06 a
30 September				
BR-22	65 c	4.37 cd	1.48 d	2.65 c
BINA Sail	63 cd	4.08 d	1.25 e	2.81 bc
Moina Sail	81 b	4.45 cd	1.29 de	3.12 b
10 October				
BR-22	48 e	0 e	0 f	0.48 d
BINA Sail	46 e	0 e	0 f	0.58 d
Moina Sail	59 d	0 e	0 f	0.69 d

Performance of maize cultivation for fodder and grain purposes

The experiment was carried out at Sunamgonj MLT site during rabi seasons of 1999-2001 to know the potential of growing maize for grain and fodder purposes. The treatments were T_1=Maize as grain, T_2=Maize as fodder, T_3=Maize as grain + fodder (thinned as 2 plants/hill at 60 DAE), T_4=T_3 + removal of lower leaves benath the cob) at silking stage. From the results it was observed that thinning as 2 plants/hill at 60 days after emergence (T_3) produced reasonable fodder yield without sacrificing grain yield of maize (Table 8). The same treatment also gave the highest gross margin (Table 8).

Table 8. Grain and fodder yield of maize (cv. Barnali) cultivation for fodder and grain purposes during 1999-2000 to 2000-01

Treatment	Grain yield (t/ha)			Fodder yield (t/ha)		
	1999-2000	2000-01	Average	1999-2000	2000-01	Average
T_1	5.12	5.19	5.16	-	-	-
T_2	-	-	-	16.69	17.04	16.87
T_3	4.98	5.01	5.00	12.38	12.09	12.23
T_4	4.81	4.87	4.84	13.82	13.16	13.49
$LSD_{0.05}$	NS	0.20	-	0.74	0.73	-

Table 9. Cost and return analysis of maize (cv. Barnali) cultivation as fodder and grain purposes during 1999-2000 to 2000-01

Treatment	Gross return (Tk/ha)	Total variable cost (Tk/ha)	Gross margin (Tk./ha)	BCR
T_1	322119	9112	23106	3.54
T_2	9275	3478	5797	2.67
T_3	37948	10222	27725	3.71
T_4	37669	10755	26914	3.50

Average price (Tk/kg): Maize (grain) = 6.25, Fodder (green) = 0.55

Screening of winter vegetables under irrigated condition

The experiment was conducted at FSRD site, Golapgonj, Sylhet and MLT site Sunamgonj during rabi seasons of 1998-2001 to know the yield and profitability of winter vegetables. Results revealed that the highest yield and gross margin were obtained from tomato at Golapgonj, whereas at Sunamgonj the highest yield and gross margin was obtained from cabbage (Table 10).

Table 10. Yield of different winter vegetables at FSRD site Golapgonj, Sylhet and MLT site Sunamgonj during 1998-99 to 2000-01

Crop	FSRD Site, Golapgonj				MLT Site, Moulvibazar (t/ha)			
	1998-99	1999-2000	2000-01	Mean	1998-99	1999-2000	2000-01	Mean
Cabbage	25.10	27.43	26.76	26.43	88.90	82.45	87.54	86.30
Cauliflower	26.90	26.06	27.34	26.77	26.75	32.94	33.12	30.94
Tomato	24.05	48.62	50.16	40.94	27.50	35.43	38.76	33.90
Carrot	6.00	9.00	8.87	7.96	20.10	27.13	24.34	23.86
Lalsak	5.60	4.88	5.34	5.27	4.45	4.94	5.19	4.86
Spinach	5.15	4.31	6.23	5.23	5.40	5.75	5.57	5.57
Radish	34.65	27.22	36.42	32.76	57.55	38.96	56.42	50.98
LSD (0.05)	1.94	2.06	1.84	-	5.20	5.52	5.36	-

Performance of alternate cropping pattern Wheat-Sesame-T.Aman under rainfed condition in young Jamuna floodplain soil

The experiment was conducted at FSRD site, Palima, Tangail under rainfed condition during 1998-2000. The tested cropping pattern was superior over farmers existing pattern in respect of yield, gross margin and MBCR (Table 11).

Table 11. Yield and gross margin of alternate cropping pattern against the existing at FSRD site, Palima, Tangail during 1998-2000

Cropping pattern	Grain yield (t/ha)	Gross margin (Tk/ha)	MBCR
Alternate cropping pattern			
Wheat (Kanchan)	1.96	-	-
Sesame (T-6)	1.27	69712	1.96
T.Aman (BRRI Dhan-33)	3.67	-	-
Existing cropping pattern			
Wheat (Kanchan)	1.59	-	-
Jute (0-9897)	2.05	62653	1.39
T.Aman (BRRI Dhan-33)	3.28	-	-

Performance of alternate cropping pattern Potato-Boro-T.Aman under irrigated condition at Palima, Tangail

The experiment was conducted at FSRD site Palima, Tangail during 1998-2001 to know the performance of alternate cropping pattern Potato-Boro-T.aman against the existing pattern Mustard-Boro-T.aman. The tested cropping pattern was highly profitable over the existing pattern. The average gross margin obtained from the developed pattern was Tk.98950/ha, while gross margin of existing pattern was Tk. 50602 (Table 12).

Table 12. Yield and gross margin of the cropping pattern Potato-Boro-T.aman against the existing pattern Mustard-Boro-T.aman.

Cropping pattern	Grain yield (t/ha)	Gross margin (Tk/ha)	MBCR

	Alternate cropping pattern		
Potato (Diamont)	33.5	-	-
Boro (BR-29)	6.29	98,950.00	2.55
T.Aman (BRRI Dhan-32)	4.55	-	-
	Existing cropping pattern		
Mustard (Tori-7)	0.93	50,602	2.4
Boro (BR-29)	5.27	-	-
T.Aman (BRRI Dhan-32)	4.42	-	-

Yield performance of mustard varieties in Mustard-Boro-T.Aman cropping pattern under farmer's field condition at Palima, Tangail

The experiment was conducted at FSRD site, Palima during rabi seasons of 1998-2001 to assess the yield performance of different mustard varieties in mustard based cropping pattern. From the results it was observed that BARI Sharisha–8 gave the highest yield (1.34 t/ha) but its growth duration was 20 days longer than Tori-7 (Table 13). BARI Sharisha–8 could be fitted into the cropping pattern Mustard-Boro-T.aman provided short duration T.aman varieties like BRRI Dhan-32, BRRI Dhan-33 were grown.

Table 13. Grain yield and growth duration of mustard varieties at FSRD site, Palima, Tangail during1998-2001

Variety	Grain yield (t/ha)			Mean (t/ha)	Growth duration
	1st year	2nd year	3rd year		
Tori-7	0.76 d	0.75c	1.03b	0.85	72c
BARI-6	1.43a	1.02a	1.34a	1.26	94ab
BARI-7	1.32ab	1.01a	1.33a	1.23	94ab
BARI-8	1.47a	1.06a	1.47a	1.34	92b
Sampad	1.0	0.91b	1.53a	1.17	93b
SS-75	0.87cd	0.85b	1.07b	0.93	96a

Feasibility of growing different crops as intercrop with Pineapple

The experiment was conducted at Modhupur (AEZ-28), Tangail during 1998-2000 to select suitable crop for intercropping with pineapple. The treatments were T_1= Pineapple + Mukhikachu, T_2= Pineapple + Panchumukhi kachu, T_3= Pineapple + Zinger, T_4=Pineapple + Turmeric, T_5= Pineapple (Sole). Results revealed that the highest gross margin was obtained from pineapple + Zinger (T_3) followed by pineapple + Turmeric (T_4) (Table 14).

Table 14. Yield, cost and return analysis of intercrop with pineapple at MLT site, Modhupur Tangail during 1998-2000

Treatment	Yield of inter crop (t/ha)	Pineapple fruit (no.ha)	Gross return of inter crop (Tk./ha)	Gross return of pineapple (Tk./ha)	Total gross return (Tk./ha)	TVC (Tk./ha)	Gross margin (Tk./ha)	MBCR
T_1	4.67b	30662a	19720	100171	119891	10750	109141	2.54
T_2	5.48ab	29275ab	18188	95469	113656	13750	99906	1.53
T_3	3.16c	24850b	76578	82885	159463	23750	135713	2.82
T_4	5.70a	28250ab	56846	92031	148878	15000	133878	3.75
T_5	0.00	28500ab	0.00	92573	92573	0.000	92573	-

Effect of sowing time on the performance of bush bean at FSRD site, Palima, Tangail

The experiment was conducted at FSRD site, Palima during rabi season of 2000-01 to know the optimum time of sowing and planting distance. There were four sowing time such as: T_1 = November 10, T_2=November 20, T_3= November 30 and T_4=December 10 and 3 spacing such as : S_1 = 30 x 15 cm, S_2 = 20 x 15 cm and S_3=25 x 20 cm. Results showed that highest yield was obtained from November 10 sowing along with 25 x 25 cm spacing (Table 15).

Table 15. Interaction effect of sowing time and spacing on the performance of Bush bean at Tangail during 2000-01

Sowing time	Spacing	Plant height (cm)	No. of pod/plant	Vegetable yield (t/ha)	Gross return (Tk/ha)	TVC (Tk/ha)	Gross margin (Tk/ha)	BCR
T_1	S_1	47.33a	11.80b	1.701c	17010.00	6485.00	10525.00	2.62
	S_2	45.69ab	13.33a	2.457b	24566.67	6485.00	18081.67	3.79
	S_3	44.20bc	13.40a	2.875a	28746.67	6485.00	22261.67	4.43
T_2	S_1	39.33d	10.00cd	1.274ef	10189.33	6485.00	3704.33	1.57
	S_2	39.00d	10.67bc	1.654cd	13234.67	6485.00	6749.67	2.04
	S_3	37.80de	11.27bc	1.728c	13821.33	6485.00	7336.33	2.13
T_3	S_1	37.83de	9.133d	1.117f	7063.00	6485.00	578.00	1.09
	S_2	35.73ef	10.60bc	1.493cde	8960.00	6485.00	2475.00	1.38
	S_3	34.80f	11.33bc	1.721c	10324.00	6485.00	3839.00	1.59
T_4	S_1	42.67c	9.993cd	1.321ef	6606.67	6485.00	121.67	1.02
	S_2	39.93d	9.993cd	1.412def	7058.33	6485.00	573.33	1.09
	S_3	39.73d	11.00bc	1.705c	8525.00	6485.00	2040.00	1.32
LSD		2.018	1.331	0.2322				
CV (%)		2.89	6.97	7.78				

Screening of different rabi crops in saline area at Noakhali

The study was carried out in the saline area of Noakhali during 1997-2001 to find out saline tolerant crop varieties. Results revealed that among the vegetable crops tomato (Ratan) gave the highest yield while among the pulses, cowpea produced the highest yield. Among the cereal crops wheat (Kanchan) gave the highest yield (Table 16).

Table 16. Yield performance of different rabi crops in saline area at FSRD site, Atkapalia, Noakhali during 1997-2001

Crops	Yield (t/ha)					TVC (Tk/ha)	GR	BCR
	1997-98	1998-99	1999-00	2000-01	Average			
Vegetable								
Tomato (Ratan)	45.51	16.30	32.25	47.03	35.27	44120	158715	3.59
Radish (Tasaki)	15.59	22.13	26.22	27.33	22.82	29835	45634	1.52
Chilli (Local)	0.70	0.66	1.46	0.67	0.873	17609	43650	2.48
Pulses								
Grasspea (Local)	0.77	0.52	1.15	1.06	0.875	6570	10500	1.59
Lentil (BARI-2)	0.20	0.60	0.49	0.70	0.498	6300	9960	1.58
Chickpea (BARI-2)	0.23	0.35	0.46	0.64	0.421	9600	9262	0.96
Mungbean (BARI-2)	0.22	0.26	0.39	0.76	0.408	8750	12240	1.39
Cowpea (Local)	1.10	0.58	0.88	1.04	0.900	7300	16200	2.21
Cereals								
Wheat(Kanchan)	2.04	2.02	2.17	2.12	2.092	10100	16736	1.75
Maize (Barnali)	2.40	1.95	2.29	1.60	2.010	7730	16080	2.08
Triticalli	1.40	1.10	1.62	1.10	1.307	10100	10456	1.03
Barley (BARI-2)	1.42	0.83	1.13	1.17	1.137	7500	7959	1.06
Millet (Titus)	0.97	0.87	0.85	1.21	0.970	8150	14550	1.78
Oil seed								
Mustard (Tori 7)	1.20	0.95	0.56	1.04	0.938	7000	15946	2.28

TVC= Total variable cost, GR= Gross margin, BCR= Benefit cost ratio

Effect of mulching on Potato in the saline soil of Noakhali

The experiment was conducted at FSRD site, Atkapalia, Noakhali during 1999-2001 to find out the effect of mulching on soil moisture conservation and minimization of salinity for potato production. There were four treatments viz. T_1= control (no mulch), T_2=Wastage of rice straw, T_3= Rice straw and T_4= Water hyacinth all were at the rate of 4 t/ha. Results revealed that rice straw mulch produced the highest tuber yield but it was at par with water hyacinth mulch (Table 17). Control treatment gave the lowest yield. The potato tuber yield enhancement by mulching was due to conservation of soil moisture and minimization of soil salinity.

Table 17. Effect of different mulches on the yield and yield parameters of potato (cv. Diamont) at FSRD site, Atkapalia, Noakhali during the winter of 1999-2000

Treatment	Plant ht. (cm)	No. of tuber/hill	Tuber wt./hill (gm)	Tuber yield (t/ha)
T_1	41.62c	6.33c	392.7c	11.32c
T_2	45.37b	7.53b	420.7b	14.32b
T_3	59.80a	10.07a	454.3a	17.23a
T_4	59.02a	9.80a	448.8a	16.52a
CV%	5.76	11.06	2.34	7.57

Effect of mulching on tomato production in the saline soil at FSRD site, Atkapalia, Noakhali

The experiment was conducted at FSRD site, Atkapalia, Noakhali during 1999-2001 to show the effect of mulching on soil moisture conservation and minimization of soil salinity on tomato production. The treatments were T_1=control (no mulch), T_2=straw waste, T_3=Rice straw, T_4=Water hyacinth. Form the results it was observed that rice straw mulch gave the highest tomato fruit in both the years. However, rice straw waste and water hyacinth could also be used for better fruit yield of Tomato variety ratan (Table 18).

Table 18. Effect of mulching on tomato production at FSRD site, Atkapalia, Noakhali during 1999-01

Treatment	No. of fruits/plant	Wt. of fruit/plant (g)	Each fruit wt.(g)	Fruit yield (t/ha)	
				2000-01	1999-2000
T_1	28.68c	1158c	42.33c	50.21c	28.42c
T_2	38.53ab	1448b	44.83bc	60.97b	32.50b
T_3	38.60a	1823a	48.83a	73.57a	42.24ab
T_4	33.57b	1515b	46.50ab	66.08b	37.03ab
CV (%)	11.21	4.95	5.0	9.43	14.12

Effect of mulching on cabbage production in the saline soil of FSRD site, Atkapalia, Noakhali

The experiment was carried out at FSRD site, Atkapalia, Noakhali during 2000-01 to investigate the effect of mulching on soil moisture conservation and minimization of soil salinity for the production of cabbage. The treatments were T_1= Control, T_2= Rice straw waste, T_3= Rice straw and T_4= Water hyacinth. Results revealed that water hyacinth mulching produced the highest cabbage yield. However rice straw and wastage of rice straw mulch could also be used (Table 19).

Table 19. Effect of mulches on the yield and yield components of cabbage (cv. Atlas 70) in the FSRD site Atkapalia during 2000-01

Treatment	Plant ht. (cm)	Head dia (cm)	Head wt (gm)	Yield (t/ha)
Control	20.27b	16.10b	757.8c	23.63c

Wastage of rice straw	21.43a	17.67a	918.3b	38.57b
Rice Straw	22.00a	18.50a	954.3b	42.15b
Water hyacinth	23.33a	18.60a	1101.0a	47.22a
CV(%)	3.92	5.35	9.67	8.94

Mustard cultivation with minimum tilalge in different salinity levels at FSRD site, Atkapalia, Noakhali

The experiment was conducted at FSRD site, Atkapalia, Noakhali during 2000-01 to see the effect of different salinity levels on the performance of mustard. The mustard cultivar was Tori-7. Results showed that with the increase of salinity levels mustard yield reduced gradually (Figure1). However in high level of salinity (>10 ds/m) the yield of mustard (912 kg/ha) was above national average (Table 20). The results suggested that salinity might not be a problem for mustard cultivation, if it is timely sown.

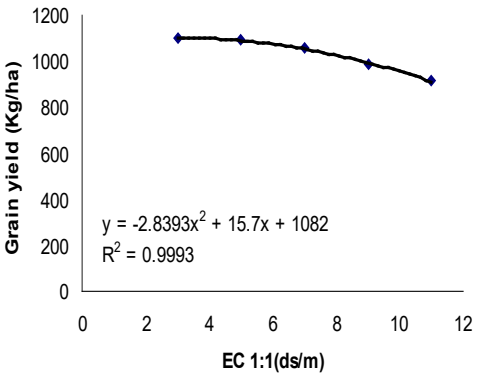


Figure 1. Yield of mustard in different salinity level

Table 20. Effect of different salinity level on the yield and yield contributing characters of mustard (cv. Tori-7) during rabi season of 2000-01

Salinity level	Plant height (cm)	Total branch/ plant (no)	Capsule/ plant (no.)	No of plant/ m^2	1000 seed wt. (gm)	Seed yield (kg/ha)	Straw yield (t/ha)
2-4 ds/m	88.50a	9.62a	146.0a	114.20b	2.68a	1103.0a	1.71a
4-6ds/m	71.50c	6.15bc	100.03bc	101.0a	2.66ab	1090.0ab	1.29bc
6-8ds/m	82.75ab	5.67c	99.25bc	109.5a	2.64ab	1055ab	1.38b
8-10ds/m	78.50bc	7.80ab	81.53c	110.3a	2.63ab	990.0bc	1.37b
>10 ds/m	84.25ab	7.80ab	124.0ab	113.0a	2.59b	912.5c	1.10c
CV (%)	6.97	18.13		8.44	9.96	6.89	

Effect of intercropping Maize with groundnut in saline soil under rainfed condition

The experiment was conducted at FSRD site, Atkapalia, Noakhali during 2000-01 to show the effect of intercropping of groundnut with maize in the saline soil under rainfed condition. There were five treatments namely, T_1= Sole groundnut (25 x 25 cm), T_2= Sole maize (75 x 25 cm), T_3= Groundnut (30 cm x 15 cm) + maize (100 x 25 cm), T_4 = Groundnut (30 x 15 cm) + maize (150 x 25 cm), T_5 = Groundnut (30 x 15 cm) + maize (200 x 25 cm). The highest groundnut equivalent yield (GEY) and MRR were obtained from treatment T_4 (Groundnut 30 x 15 cm) + maize (200 x 25 cm) (Table 21 and 22).

Table 21. Seed yield, Groundnut equivalent yield and LER of Groundnut (cv. Dhaka-1) -Maize (cv. Barnali) intercropping system

Treatment	Yield (kg/ha)		GEY (kg/ha)	LER
	Groundnut	Maize		
T_1	1956	-	1956	1

T_2	-	2640	1624.62	1
T_3	1145	1936	2336.36	1.31
T_4	1461	1664	2423.46	1.37
T_5	1596	1207	2440.77	1.30
LSD (0.05)	144.5	217.9		
CV (%)	7.31	13.18		

Table 22. Marginal analysis of undominated groundnut-maize intercropping system

Gross margin (Tk/ha)	Treatment	TVC (Tk/ha)	MGM (Tk/ha)	MVC (Tk/ha)	MRR (%)
T_2	9770	11350	-	-	-
T_1	13457	13927	4175	2107	198
T_5	18277	14493	8507	3143	271
T_4	19009	14757	9239	3407	271

Effect of intercropping Maize (Barnali) with soybean (Shohagh) in saline soil under rainfed condition

The study was conducted at FSRD sites, Atkapalia, Noakhali during rabi season of 2000-01 to find out the effect of maize and soybean intercropping on total productivity and income. There were five treatments namely, T_1 = Sole soybean (25 x 15 cm), T_2 = Sole maize (75 x 25 cm), T_3 = Soybean (25 x 15 cm) + maize (100 x 25 cm) T_4 = Soybean (25 x 15 cm) + maize (150 x 25 cm) and T_5= Soybean (25 x 15 cm) + maize (200 x 25 cm). The highest soybean equivalent yield (SEY) and MRR were obtained from T_5. The results indicate that comparatively lower population of maize increased the total productivity and income largely (Table 23 and 24).

Table 23. Seed yield, Soybean equivalent yield and LER of soybean-maize intercropping system

Treatment	Yield (kg/ha)		SEY (kg/ha)	LER
	Soybean	Maize		
T_1	1535	-	1535.00	1
T_2	-	2662	1419.73	1
T_3	869	1723	1787.93	1.21
T_4	1020	1442	1789.07	1.20
T_5	1365	1200	2005	1.34
LSD (0.05)	0.075	0.195		
CV (%)	4.770	8.0		

Table 24. Marginal analysis of undominated soybean-maize intercropping system

Gross margin (Tk/ha)	Treatment	TVC (Tk/ha)	MGM (Tk/ha)	MVC (Tk/ha)	MRR (%)
T_1	12690	10335	-	-	
T_5	19174	11050	6484	715	906.85
T_4	15671	11165	2981	830	359.16

Performance of Maize (Barnali) in different soil salinity levels at FSRD site, Atkapalia, Noakhali

The experiment was conducted at FSRD site, Atkapalia, Noakhali during rabi season of 2000-01 to know the effect of different levels of soil salinity on the performance of maize. Results revealed that with the increase of salinity levels maize yield gradually decreased. The highest yield was obtained from lowest salinity level (1.5 ds/m) (Table 25).

Table 25. Performance of maize (cv. Barnali) in different salinity level at FSRD site Atkapalia, Noakhali

Salinity (ds/m)	Plant height (cm)	No. of cob /plant	Cob length (cm)	Seed /cob	1000 grain weight (g)	Yield (t/ha)
1.5	160.0a	2.0a	22.27a	341.1d	298.3a	7.5a
3.1	154.8b	1.70b	13.30c	343.8c	255.3c	2.88b
3.9	152.0c	1.70b	15.60b	360.0b	252.3cd	2.76bc
4.5	125.1f	1.70b	15.60b	291.3e	259.0b	2.75bc
4.9	138.6e	1.70b	12.73c	228.3f	250.0d	2.54c
6.5	146.7d	1.66b	15.10b	472.3a	210.0e	1.94d
LSD(0.5)	1.894	0.2301	1.256	2.071	3.499	0.3355
CV (%)	5.71	7.18	4.37	4.33	3.76	5.43

Effect of soil salinity and phosphorus levels on the growth and yield of Wheat

The experiment was conducted at MLT site, Lakshmipur, Noakhali during 2000-01 to show the effect of phosphorus fertilizer on the yield of wheat under different soil salinity levels. The study revealed that 50 kg P/ha gave the highest grain yield while zero phosphorus produced the lowest amount of grain. On the other hand with the increased soil salinity level wheat yield decreased gradually (Table 26). Probably timely sowing can further reduce the effect of soil salinity on wheat yield.

Table 26. Effect of salinity and phosphorous fertilizer on the yield and yield attributes of wheat (Kanchan)

Treatments	Plant height (cm)	No. of tiller/hill	Non effective tiller /hill	Panicle length (cm)	No. of panicle /m2	1000 Grain weight (g)	Grain yield (t/ha)	Straw yield (t/ha)
				Salinity (ds/m)				
1.92	82.00	3.50	1.175	14.33	189.5a	40.37a	1.58a	1.63a
2.45	77.5	3.40	1.15	14.60	186.75ab	39.62b	1.55ab	1.60ab
3.53	73.5	3.20	1.25	13.37	181.50b	39.25b	1.50b	1.54b
4.03	74.00	3.33	1.50	13.87	179.75b	39.75ab	1.40b	1.48b
5.34	80.25	3.15	1.13	13.53	181.5b	38.25c	1.26c	1.40b
LSD (0.05)				0.6959	7.156	0.699	0.069	0.109
				P Level (Kg/ha)				
0	66.80c	3.22	1.24a	11.50d	169.8c	37.4d	0.73d	1.02c
40	75.00b	3.20	1.16ab	13.52c	183.2b	39.0c	1.52c	1.46c
50	82.10a	3.40	1.08b	15.98b	192.8a	41.2a	1.70a	1.60a
60	85.60a	3.44	1.05b	15.76a	189.4ab	41.2a	1.67b	1.50b
LSD (0.05)	3.27	ns	0.097	0.622	6.401	0.625	0.02	0.097
CV (%)	3.01	8.5	5.79	3.24	2.53	1.15	4.01	5.72

Sunflower cultivation in different levels of soil salinity at FSRD site, Atkapalia, Noakhali

The experiment was conducted at FSRD site, Atkapalia, Noakhali during the rabi season of 2000-01 to study the effect of various salinity levels on the performance of sunflower. The test variety was Kironi. Yield of sunflower decreased with the increase of soil salinity. The highest seed yield was found at the lowest salinity level (Table 27).

Table 1. Effect of saline soils on the yield and yield contributing characters of sunflower at FSRD site Atkapalia, Noakhali during rabi season of 2000-01

Treatments	Plant ht (cm)	Dia of head (cm)	No. of matured seed	1000 grain wt. (gm)	Seed yield (t/ha)
Ec 1:1(<4 ds/m)	137.6	15.0	488	60.6	2.15

Ec 1:1(4-8 ds/m)	130.8	14.8	412	58.0	1.57
Ec 1:1(>8ds/m)	117.4	12.3	365	54.0	1.22
CV (%)	6.78	12.06	3.45	6.79	8.06
LSD (0.05)	15.09	NS	24.87	6.76	0.23

Comparative performance of different vegetables as intercropped with Sugarcane

The experiment was conducted at FSRD site, Ishan Gopalpur, Faridpur during rabi seasons of 1998-2000 to study the performance of different vegetables as intercropped with sugarcane. The highest sugarcane equivalent yield, gross return, net return and benefit cost ratio were obtained from intercropping sugarcane with cabbage in two consecutive years (Table 28).

Table 28. Performance of different vegetables as intercropped with sugarcane (cv. ISD-21) at FSRD site, Ishan Gopalpur during 1999-2000

Treatment	Yield (t/ha)				Sugarcane equivalent yield(t/ha)	Gross return (Tk./ha)	Total variable cost (Tk./ha)	Net return (Tk./ha)	BCR
	Sugarcane		Intercrop						
	1998-99	1999-2000	1998-99	1999-2000					
Sugarcane sole	79.48a	95.65a	--	--	95.65e	103302	50100	53202	1.92
Sugarcane+Lalshak	82.43a	90.78b	6.75	6.70	128.00d	138240	52580	85660	2.50
Sugarcane+Tomato	82.08a	90.26b	14.69	15.28	196.03b	211712	72350	139362	2.78
Sugarcane+Spinach	81.58a	91.59b	8.60	7.98	143.31c	154774	53500	101274	2.69
Sugarcane+Cabbage	77.75a	87.57c	34.67	30.51	228.82a	247125	66570	180555	3.56
Sugarcane+Turnip	84.57a	89.01bc	7.11	6.91	140.17c	151383	65400	85983	2.25
Level of significance	NS	**			**				
CV (%)	5.41	2.40			1.40				

*Means significance at 1% level. Means followed by common letters are statistically similar

Price (Tk./ha): Sugarcane=1.08, Spinach= 7.00, Cabbage=5.00, Turnip= 8.00, Tomato=8.00, Lalshak= 6.00

Screening of different rabi crops in saline area

The experiment was conducted at Paikgacha MLT site, Khulna during rabi season of 2000-01 to find out the salt tolerant crops. Results showed that among the eleven crops Wheat, Barley, Tritically, Grass pea, Knolkhol, Sugarbit and Tomato survived and yielded. Chilli, Mungbean and Blackgram died within two months of emergence. Chickpea failed to germinate. Knolkhol and sugarbit produced higher edible yields in comparison to other crops (Table 29).

Table 29. Performance of different crops tested at saline area of Paikgacha, MLT site during 2000-01

Name of crops	Total emergence/transplanted Plot size (1m x 2m)	Seedlings mortality	Yield/plot (Kg)	Remarks
Wheat	410	--	0.30	
Barley	375	--	0.39	
Triticaly	280	--	0.26	
Chickpea	--	--	--	Not germinated
Grasspea	690	240	0.10	Poor growth

Table 29. Contd.

Name of crops	Total emergence/transplanted Plot size (1m x 2m)	Seedlings mortality	Yield/plot (Kg)	Remarks
Knolkhol	35	--	6.0	
Sugerbit	35	--	5.5	
Tomato	15	--	1.7	
Chili	30	30	--	Died
Mungbean	225	225	--	Died

Blackgram	508	508	--	Died

Intercropping Turmeric (Sinduri) with different vegetables

The experiment was conducted at Daulatpur, Khulna during 1999-2000 from April to February to study the compatibility of different quick growing vegetables as intercropped with turmeric. The highest turmeric equivalent yield and net benefit were obtained from turmeric + Gimakalmi. Gimakalmi also gave the highest vegetable production under intercropped condition (Table 30 and 31).

Table 30. Effect of intercropping with different vegetables

Treatments	Yield of turmeric t/ha		Yield of vegetables t/ha	
	2000	1999	2000	1999
Turmeric sole (Sinduri)	28.35	30.37	--	--
Turmeric + Lalshak (L)	26.08	28.12	5.33	4.81
Turmeric + Danta (L)	25.99	26.95	6.80	6.35
Turmeric + Gheekanchan (L)	25.42	27.78	3.25	4.99
Turmeric + Gimakalmi (L)	24.75	26.75	9.70	9.00

Table 31. Turmeric equivalent yield, cost and return of intercropping turmeric with vegetables

Treatments	Turmeric equivalent yield (t/ha)	Gross benefit (Tk/ha)	Total variable cost (Tk/ha)	Net benefit (Tk/ha)	BCR	
					2000	1999
Turmeric sole	28.35	141750	27000	114750	5.25	5.70
Turmeric + Lalshak	31.41	157050	27400	129650	5.73	6.07
Turmeric + Danta	31.43	157150	27400	129750	5.73	5.90
Turmeric+ Gheekanchan	29.32	146600	27400	119220	5.35	5.23
Turmeric + Gimakalmi	34.54	172250	27700	145250	6.25	6.52

Price (Tk./ha): Turmeric (Fresh)=5, Lalshak= 5, Danta= 4, Gheekanchan= 6, Gimakalmi= 5

Comparative performance of different flowers as a commercial crop

The experiment was conducted at Agricultural Research Station, Pabna during rabi season of 2000-01 to test the feasibility of growing flowers as commercial crops and to select the suitable species and cultivar. Among the tested flowers and cultivar local variety of marigold gave the highest gross margin and benefit cost ratio (Table 1).

Table 32. Performance of flower species as commercial crop at ARS, Pabna during 2000-01

Species &varieties	Flower harvested (#/ha)	Gross return (Tk./ha)	Cost of cultivation (Tk./ha)	Gross margin (Tk/ha)	BCR (Tk./ Tk)	Remarks
Marigold						
i) Local	11,50,000	3,45,000	35,087	3,09,913	9.83	High return, casual sale, but high demand in all season, especially winter season. Sale rate Tk 0.30/piece, Local variety Tk. 0.50/ seedling
ii) Hybrid	4,50,000	1,35,000	1,25,000	10,000	1.08	
Gladiolus						
i) Red	2,30,000	2,30,000	30,528	1,99,472	7.53	Seed cost not included, as cost of corm is equal to return from corm. First year seed cost about Tk 20,000/ ha. Sale rate Tk 1.00/ piece. Hybrid variety Tk.5.00/ seedling
ii) Pink						
Tube rose						Harvesting going on
i) Single						

Species &varieties	Flower harvested (#/ha)	Gross return (Tk./ha)	Cost of cultivation (Tk./ha)	Gross margin (Tk/ha)	BCR (Tk./ Tk)	Remarks
ii) Double Rose						Stem in ready for grafting
i) Hybrid Red						
ii) Hybrid pink						

Effect of irrigation on the growth and yield performance of different Chickpea varieties in the High Barind Tract

The field experiment was carried out at FSRD site, Chabbishnagar, Barind during 1998-2001 to know the effect of irrigation on the growth and yield of chickpea. Four irrigation treatments were included in the study viz. T_1=No irrigation, T_2= Irrigation at 20 days after germination, T_3= Irrigation at 40 days after germination, T_4= Irrigation at 20 and 40 days after germination. Results revealed that BARI Chola-5 along with one irrigation at 20 days after germination gave the highest yield (Table 33).

Table 33. Combined effects of varieties and Irrigation on the yield and yield attributes of Chickpea at FSRD site, Chabbishnagar during 2000-01 and yield of 1999-2000

Treatment		Population/m^2	100 grain wt.(g)	Seed/ pod	Pod/ plant	Grain yield (kg/ha) 2000-01	Straw yield (kg/ha) 2000-01	Grain yield (t/ha) 1999-2000
	I_0	27.35	14.30	1.4	12.96	758	1083	1.44 abc
	I_1	29.16	15.36	1.7	13.98	938	1416	1.64 ab
V_1	I_2	29.02	15.16	1.56	14.90	849	1510	1.44 abc
	I_3	28.10	15.40	1.73	18.20	866	1483	1.32 bc
	I_0	30.96	11.96	1.53	14.20	877	1027	1.36 bc
	I_1	39.30	12.63	1.7	16.46	944	1333	1.74 a
V_2	I_2	37.91	12.40	1.6	15.26	933	1411	1.49 abc
	I_3	38.35	13.50	1.7	16.67	940	1355	1.19 c
CV (%)		15.22	9.21	6.01	12.56	11.22	6.17	13.75
LSD (.05)		10.51	7.82	0.31	6.56	10.35	5.24	2.28

V_1= BARI Chola-3, V_2= BARI Chola-5

Evaluation of chickpea variety for intercropping with Mustard (Tori-7)

The experiment was conducted at FSRD site, Chabbisnagar, Barind during 2000-01 to find out the suitable intercropping combination of chickpea and mustard (cv. Tori-7). There were seven treatments namely, T_1=2 rows of chickpea (cv. BARI Chola-2) alternate with 2 rows of mustard (50cm), T_2=4 rows of chickpea cv. BARI chola 2) alternate with 2 rows of mustard (67c: 33m) T_3= 2rows of chickpea (cv. BARI chola-5) alternate with 2 rows of mustard (50c: 50m), T_4= 4 rows of chickpea (cv. BARI chola 5) alternate with 2 rows of mustard (67c:33m) T_5=Sole mustard (cv. Tori-7), T_6=Sole chickpea (cv. BARI chola-2), T_7=Sole chickpea (cv. BARI chola-5). Results showed that highest chickpea equivalent yield was obtained from treatment T_3, (2 rows of BARI chola 5 alternate with 2 rows of mustard) same treatment also gave the maximum gross return (Table 34).

Table 34. Equivalent yields, LER values and cost and return analysis of chickpea and mustard intercropping

Treatments	Yield (t/ha)		Chickpea equivalent yield (t/ha)	LER	Gross returns (Tk/ha)	TVC (Tk/ha)	NR (Tk/ha)	BCR
	Chickpea	Mustard						
T_1	0.94	0.15	1.07	1.00	21400	6110	15290	3.50

T_2	1.06	0.14	1.18	1.07	23600	6270	17230	3.76
T_3	1.30	0.19	1.46	1.31	29200	6110	23090	4.77
T_4	1.27	0.160	1.40	1.20	28000	6270	21730	4.47
T_5	-	0.47	0.40	1.0	7990	5680	2310	1.40
T_6	1.38	-	1.38	1.0	27600	6550	21050	4.21
T_7	1.43	-	1.43	1.0	28600	6550	22050	4.37

Price: Mustard Tk. 17/kg, Chickpea Tk. 20/kg

Root traits potentiality of different crops under rainfed conditions in the High Barind Tract

The experiment was conducted at FSRD site, Chabbishnagar, Barind during rabi season of 2000-01 to quantify the root traits of different crops and thereby to select suitable alternative crops of chickpea for the High Barind Tract. Six crops were included in the study namely, Chickpea (cv. BARI chola-2), Wheat (cv. Kanchan), Brassica (cv. Dhali), Barely (cv. Local), Linseed (cv. Lina) and Lentil (cv. L-5). Results revealed that roots were found down to 90-105 cm depth for barley, Barssica and chickpea. Barely possessed the highest root length density (RLD) followed by chickpea and Brassica (Figure 2). Barley plants had the smallest root diameter while Brassica had the thickest coarse root. Barley and Brassica could be the possible alternatives of chickpea in terms of root systems and yield (Table 35).

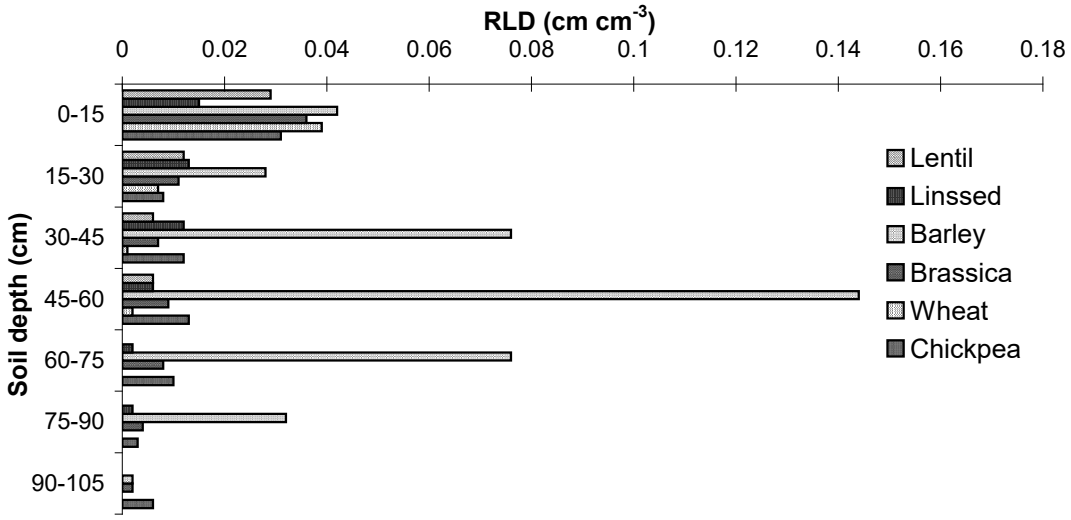


Figure 2. Root length density (RLD) of different crops in the High Barind Tract, 2001

Table 35. Grain and hay yields of different crops in the High Barind Tract during 2000-01

Crops	Grain yield (kg/ha)	Hay yield (kg/ha)
Chickpea (Barichola 2)	1367	2133
Wheat (Kanchan)	850	1900
Brassica (Dhali)	934	3433
Barley (Local)	2000	3834
Linseed (Nila)	567	1800
Lentil* (L-5)	0	0

* All the lentil plants died at flowering to pod-setting stage

Influence of rhizobium inoculation, soil moisture and applied phosphorus on biological nitrogen fixation and grain yield of Chickpea

The experiment was carried out at FSRD site, Chabbishnagar, Barind during 2000-01 to investigate the effect of inoculation, soil moisture and phosphorus fertilizer on the yield of chickpea. There were five treatments such as : T_1= R1 (Rhiziboum inoculation)+Io(No irrigation) + Po (Phosphorus zero), T_2=RI+I1 (30-45 DAS)+Po, T_3 = R1+I1(30-45 DAT)+P20, T_4 = R1+Io+P20, T_5 = R1 (No inoculation)+ I1 (30-45 DAS)+P20. Chickpea cultivar was BARI Chola-2 and rhizobium source was BINA. Results showed that Rhizobium inoculation along with phosphorus fertilizer application at the rate of 20 kg P/ha and one irrigation at vegetative stage of the crop apparently gave the highest grain yield (Table 36).

Table 36. Yield and yield attributes of chickpea as affected by different combinations of inoculant, phosphorus fertilizer and irrigation at High Barind Tract

Treatment	Plant height (cm)	Pods/plant (no.)	Seeds/plant (no.)	100-seed wt. (g)	Grain yield (kg/ha)	Hay yield (kg/ha)
$RI+I_0+P_0$	26.93	19.46	1.40c	10.93	583	916
$RI+I_1+P_0$	27.00	24.06	1.60b	11.43	889	1361
$RI+I_1+P_{20}$	28.13	25.13	1.93a	10.63	972	1278
$RI+I_0+P_{20}$	24.00	19.8	1.73b	10.26	694	944
$RI_0+I_1+P_{20}$	26.46	20.53	1.70b	10.86	680	958
CV (%)	13.8	26.6	5.7	6.0	38.1	33.5

Means followed by a common letter or no letter in a column are not significantly different at the 5 % level by DMRT.

Effect of time of sowing and harvesting on the yield and marketing of Radish (Tasakisan) at Narsinghdi

The experiment was conducted at MLT site, Shibpur, Narshingdhi during rabi seasons at 1999-2001 to find out appropriate time of sowing and harvest to obtain the highest market price. After two years of experimentation it was observed that sowing at October 30 and harvest at 50-60 days after sowing contributed to the highest economic return (Table 37 and 38).

Table 37. Effect of sowing dates on the yield and yield attributes of radish at MLT site, Narsinghdi during rabi 1999-2000 and rabi 2000-01

Sowing date	Individual root weight (g)			Root yield (t/ha)		
	1999-00	2000-01	Mean	1999-00	2000-01	Mean
30 October	396.6	275.0	335.8	54.76	41.24	48.0
10 November	341.7	238.0	289.9	46.90	36.04	41.47
20 November	236.1	154.9	195.5	34.97	23.18	33.58

LSD (.05)	38.1	36.5		6.16	6.75
CV (%)	6.6	6.6		7.6	8.1

Table 38. Effect of time of harvest on the yield and yield attributes of radish at MLT site, Narsinghdi during rabi 1999-2000 and rabi 2000-01

Time of harvest	Individual root weight (g)			Root yield (t/ha)		
	1999-00	2000-01	Mean	1999-00	2000-01	Mean
40 DAS	146.9	124.4	135.7	20.19	18.92	19.56
50 DAS	368.2	173.8	271.0	51.86	25.99	38.93
60 DAS	459.2	369.7	414.5	64.58	55.54	60.06
LSD (.05)	38.1	36.5		6.16	6.75	
CV (%)	6.6	6.6		7.6	8.1	

DAS = Days after sowing

Effects of spacing and time of twig planting on seed yield of Kangkong

The experiment was conducted at ARS, Rangpur during 1999-2001 to determine the optimum spacing and time of twig transplantation for maximum seed yield of Kangkong. Results showed that the highest seed yield was obtained from September 01 planting along with 30x20cm planting spacing in 2000-01, but in previous year highest yield was found in August 16 planting (Table 39 and 40).

Table 39. Seed yield and yield attributes of Kangkong (cv. Gimakalmi) as influenced by spacing and time of twig plantation at ARS, Rangpur during 1999-2001

Planting date/ planting spacing	Days of 50% flowering	No. of primary branch/ plant	Length of primary branch (cm)	No. of pods/ plant	No. of seeds/ pod	1000 seed wt. (g)	Yield (t/ha)		
							Seed		Bio mass
							1999-00	2000-01	
Planting Date									
July 16	74	7.8	61.1	72	3.7	39.0	1.61	0.94	3.77
August 01	64	6.2	48.1	68	3.8	39.0	1.58	1.12	3.02
August 16	55	5.0	54.5	74	3.9	39.6	2.00	1.20	1.94
Sept. 01	46	4.3	61.2	83	3.7	38.4	1.62	1.46	1.59
Sept. 16	36	4.4	43.5	58	3.7	35.5	1.15	0.53	0.99
LSD (0.05)	0.92	0.32	2.55	1.86	ns	1.07	-	0.04	0.37
CV (%)	2.4	8.5	6.9	4.6	6.4	4.1	9.6	6.4	23.7
Planting spacing									
30x15 cm	54.8	5.5	56.3	74	3.7	38.4	1.50	1.12	2.33
30x20 cm	55.6	5.8	53.6	83	3.7	38.7	1.40	1.12	2.05
30x10 cm	55.3	5.2	53.0	62	3.8	38.9	1.49	0.92	2.32
25x15 cm	55.3	5.4	50.3	62	3.8	38.1	1.45	0.96	2.41
35x15 cm	54.9	5.7	55.2	74	3.7	37.6	1.47	1.13	2.19
LSD	ns	0.45	1.80	1.73	ns	ns	-	0.05	0.21
CV (%)	1.9	12.8	5.3	4.6	6.2	4.5	13.9	9.9	14.7

Table 40. Interaction effects of spacing and planting dates on the seed yield (t/ha) of Kangkong (cv. Gimakalmi)

Spacing	Planting dates				
	Jul 16	Aug 01	Aug 16	Sep 01	Sep 16
30x15 cm	1.00	1.15	1.20	1.60	0.62
30x20 cm	0.95	1.16	1.27	1.67	0.53
30x10 cm	0.82	1.03	1.09	1.31	0.40
25x15 cm	0.84	1.00	1.09	1.30	0.55
35x15 cm	1.09	1.21	1.34	1.48	0.52

CV (%) = 9.9
LSD (0.05): 2 means of planting date (P) at each Spacing (S) = 0.12, 2-S mean a each P=0.12, P x S= 0.423

Effect of sowing time on leaf miner infestation in String bean

The experiment was carried out at ARS, Rangpur for consecutive two years (1999 and 2000) to show the effects of sowing time on the leaf miner infestation in Stringbean. Leaf miner infestation (%) increased with the increase in plant age irrespective of sowing time. Highest pod yield was obtained from February 01 planting in both the years (Table 41).

Table 41. Yield and yield attributes of stringbean as influenced by leaf miner infestation under different sowing times at ARS, Rangpur during 1999-2001

Sowing date	Plant pop./ m^2	Pods/ plant	Pod length (cm)	Pod yield (t/ha)	
				2000-01	1999-2000
Feb 01	5.4 b	39.5 a	54.8 c	36.74 a	16.01 a
Feb 16	2.1 h	24.0 c	59.3 a	6.49 e	13.32 ab
March 01	4.3 cd	31.3 b	60.0 a	12.16 c	15.72 a
March 16	5.2 b	31.0 b	59.3 a	19.88 b	9.34 cde
April 01	4.6 c	16.0 d	58.5 ab	11.34 c	11.88 bc
April 16	3.9 de	11.5 ef	55.8 bc	10.54 d	-
May 01	5.7 a	11.3 ef	52.8 cd	6.34 e	10.96 bcd
May 16	1.1 i	4.8 h	49.8 d	2.88 f	3.33 g
June 01	3.6 ef	15.0 d	45.5 e	7.52 e	6.45 efg
July 01	2.9 g	13.3 de	38.8 f	7.27 e	5.65 fg
August 01	3.2 fg	13.5 de	35.8 f	8.05 de	-
August 16	3.7 ef	8.8 fg	28.3 g	3.48 f	-
Sept. 01	3.4 f	6.0 gh	24.0 h	1.77 f	-
Sept. 16	4.4 c	3.5 h	23.3 h	0.89 f	-
CV (%)	8.5	13.5	4.6	18.8	23.4
LSD	**	**	**	**	**

Performance of summer vegetables on the trellis followed by bottle gourd

The experiment was conducted at FSRD site, Syedpur and MLT site, Polashbari, Lalmonirhat and Nilphamari during 1999-2000 to know the economic use of BARI Lau-1 trailee by growing different summer vegetables in the same trailee. Results revealed that BARI Lau-1 produced 75 and 94 number of fruits per decimal at the FSRD site and MLT site respectively. Among the summer vegetables ash gourd gave the highest yield of 117 kg and 174 kg per decimal respectively at FSRD site and MLT sites. The vegetable sequence of BARI Lau-1 and ash gourd gave highest gross return and benefit cost ratio (Table 42). The production system ensured continuous vegetable supply to farm families for certain period of time.

Table 42. Cost and return analysis of vegetable production from BARI Lau-1 and different summer vegetables on the same trellis during 1999-2000

Vegetable sequence		Gross return (Tk/dec.)	TVC (Tk/dec.)	Gross margin (Tk/dec.)	BCR
Winter	Summer				
Bottle gourd	Bitter gourd(L)	967	207	760	4.67
Bottle gourd	Snake gourd(L)	957	206	751	4.64
Bottle gourd	Ribbed gourd(L)	991	203	788	4.88
Bottle gourd	Ash gourd (L)	1332	204	1128	6.53

Effect of planting time on the performance of Bushbean at level Barind soil (AEZ 25)

The experiment was conducted at ARS, Bogra during 2000-01 to find out the optimum planting time for BARI Bushbean-1. The highest marketable (vegetable) pod yield was obtained from Nov. 16 sowing (Table 43). Yield of Bushbean reduced drastically from December 8 sowing.

Table 43. Performance of Bushbean cv. BARI Jharseem-1 at different sowing dates at level Barind soil of ARS, BARI, Bogra during rabi 2000-01

Treatments Sowing dates	Plant height at last harvest (cm)	No. of pods/plant (no.)	Wt. of pods/plant (gm)	Pod size length (cm)	Marketable yield (fresh): (t/ha)
D_1=Nov.16,2000	41.7a	28.0a	0.26a	16.0a	20.12a
D_2=Nov.22,2000	42.3a	27.0a	0.20b	14.3ab	17.11b
D_3=Dec.1,2000	35.0ab	25.6a	0.19b	14.3ab	16.90b
D_4=Dec.8,2000	30.3a	16.0b	0.11cd	12.6bc	8.63c
D_5=Dec,15,2000	31.7b	16.6b	0.13c	13.3bc	9.17c
D_6=Dec,22,2000	32.3b	16.0b	0.12c	13.0bc	8.78c
D_7=Jan.1,2001	31.7b	14.3b	0.06d	12.6bc	5.74d
D_8=Jan.8,2001	32.0b	14.6b	0.06d	12.3c	5.54d
F-test	**	**	**	**	**
CV (%)	8.84	10.64	13.93	13.58	7.79

Similar letter in a column do not differ significantly

Seed priming of BARI Mung-5

The study was conducted at FSRD site Lebukhali, Patuakhali during 1998 to 2001 to overcome the low seed germination of BARI Mung-5. Five seed priming treatments were included in the study namely T_1= Pre-sowing water soaking for 2 hours, T_2= Presowing water soaking for 4 hours, T_3= Pre-sowing water soaking for 6 hours, T_4=Presowing water soaking for 8 hours, T_5=No seed soaking. Results revealed that seed priming for 2-8 hours incresed seed germination significantly in comparison to nonprimed seed. Seed priming for 4 hours gave the highest seed yield but it was at par with 2 and 6 hours seed priming, while nonprimed treatment gave the lowest yield (Table 44)

Table 44. Yield and yield attributes of BARI Mung–5 as affected by seed priming

Treatment	Plant pop. /m^2	Plant height (cm)	Pod/ plant	Seed/pod	1000 seed wt. (g)	Seed yield (kg/ha)
T_1	36.50	39.50	14.2	8.50	37.75	1657c
T_2	37.70	40.00	14.75	8.77	38.50	1787a
T_3	36.50	39.50	14.47	8.60	38.00	1720b
T_4	37.62	39.50	13.25	8.67	37.20	1600c
T_5	33.03	40.25	11.1	8.47	37.50	1140d
LSD (0.05)	1.75	-	1.16	-	-	59.75
CV (%)	3.2	3.9	5.5	4.1	1.4	2.5

Screening of different rabi crops in saline area

The experiment was conducted at MLT site Kalapara, Patuakhali during 1999-2001 to find out the suitable saline tolerant crops. The salinity range of the area was 6-14 ds/m during the dry period. Nine crops were tested viz. Chilli, Cowpea, Mungbean, sesame, sunflower, linseed Field pea, safflower, Bushbean. Among the tested crops first five crops were possible to grew. The highest yield was given by cowpea but from economic point of view chilli, mungbean and sun flower were found viable (Table 45 and 46).

Table 45. Yield and yield contributing characters of different rabi crops at Kalapara during rabi 2000-01

Crops	Variety	Plant pop./m^2 (final)	Plant herght (cm)	Capsule/pod/ plant (diameter of head)	Seed/ pod wt. of head	1000 seed wt. (g)	Yield (kg/ha)
Chilli	Local	20	46	12		230	620
Cowpea	Local	21	53	8	13	131	1232
Mungbean	Kanti	31	38	5	8	35	442
Sesame	T-6	30	85	38	50	2	1070
Sunflower	Kironi	6.33	111	9	30	56	1023
Linseed	Nila	124.4	37	11	8	4.25	741

Table 46. Cost and return of different rabi crops at Kalapara during Rabi 1999-01

Crops	Yield (kg/ha)	Gross return (Tk./ha)	Variable cost (Tk./ha)	Gross margin (Tk./ha)	BCR
Cowpea	1232	16016	10467	5555	1.53
Chilli	620	39000	23150	1650	1.68
Mungbean	442	24800	8629	1537	1.17
Sesame	1070	20460	12820	1400	1.10
Sunflower	1023	20460	17550	2910	1.16

Profitable rabi crops screening for fallow land after T.Aman rice harvest

The experiment was conducted at FSRD site, Lebukhali, Patuakhali during rabi season of 2000-01 to identify crops which could be grown profitably after T.aman harvest. All the crops were sown/planted between January 11 to 25. From the results it was found that potato, onion, chickpea and sweet potato were suitable for catena-I (Medium high land). While for catena-II (medium low land) onion, mungbean, chilli, and ground nut were suitable (Table 47 and 48).

Table 47. Yield and economic performance of different crops grown under medium high land (catena-1)

Crops	Yield (kg/ha)	Gross return	Variable cost	Gross margin	BCR
Potato (Diamont)	20000	100000	42800	66200	2.5
Sweet potato (Diamont)	28000	84000	29000	55000	2.89
Chickpea (L)	1340	29480	5950	27550	4.95
Onion (L)	8710	87100	17600	69500	4.94
G.nut (GR-2)	1920	28800	23425	5375	1.22
Sunflower(Kironi)	3087	61740	18550	43190	3.3
Chilli (L)	924	36960	17500	12260	1.5
Mungbean (Kanti)	1422	35550	15225	20325	2.33

Table 48. Yield and economic performance of different crops grown under medium high land (catena-2)

Crops	Yield kg/ha	Gross return	Variable cost	Gross margin	BCR
Chickpea	860	19780	5950	13830	3.32
Onion	8388	83880	17600	66280	3.76
G.nut	1400	21000	23425	-	
Sunflower	2300	46000	18550	27450	2.5
Chilli	960	38400	24700	13700	1.55

Mungbean	1260	31500	15225	16275	2.06
Cowpea	630	12600	20950	-	

Output (Tk./kg): Mungbean= 25.00, Potato= 5.00, Chickpea= 23.00, Onion= 10.00, G.nut = 15.00, Sunflower= 20.00, Cowpea= 20.00, Sweet potato= 3.00, Chilli= 40.00

Integrated Farming

Unlike western farmers, a typical small and marginal farmer of Bangladesh obtains his livelihood by applying available technologies and inputs on his farm resources. He has a parcel of land to grow crops and vegetables, a homestead to reside and to use as the center of many activities, a pond/ditch for pisiculture and domestic uses, a variety of different farm implements and livestock to use in farm operations. The farmers manage all his available resources and integrate these in such a way that he can derive the best benefit out of this. But natural risk and hazard as well as other socio-economic factors also influence his production systems. Under such situation if the farmer is efficient to integrate his resources he can enjoy a progressive development.

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 all are not used by the farmers for varied reasons. 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.

Broad objective

- Improvement of productivity and profitability of farm resources sustainably by generating and applying effective technologies in an environment friendly approach.

Specific objective

- To identify resources base of a farm
- To identify specific technologies that can maximize farm productivity and profitability
- To intervene the resources base of the farmer with the technologies
- To generate resources within the household production system
- To compare sectoral contribution to the farm productivity and profitability
- To identify scope of further improvement in the production system and household management

As stated earlier that a well contented and widely conceived work produce is lacking for such a study. The present procedure as used by the FSRD group in BARI is also a methodological research. It will offer scope for improvement and envisaged developing some modules for Integrated Approach to Farming System Research and Development at the end. However, the present procedure as laid down is as follows :

Step I- Accounting of pre-intervention status: Case studies were conducted on the selected farmers to assess their resources, assets and liabilities, potential for improvement, technology practiced, level of input use and output obtained, income and expenditure status, labour availability of the farm, etc.

Step II- Selection of technologies for intervention: The scope for improvement identified in the case studies were discussed with the individual cooperator farmer. On the basis of the discussion the site team considered several alternatives of technologies to each of the resources available to the farm for intervention.

Step III- Motivation and final selection of technologies: In this step some motivational tools were used (like demonstration of results of candidate technologies) so that farmers could evaluate the costs, benefits, marketing and risk of the technologies. Finally numbers of options for technological interventions were formulated in participation with the farmers.

Step IV- Implementation of intervention: Before implementation of the intervention the cooperator farmers were trained on the production packages of the technologies. The technologies were then applied on the farm resources. Performances of the technologies were continuously monitored, relevant data and farmer reactions were recorded.

Step V- Data analysis and reporting: Data collected were edited, summarized and presented in tabular form for reporting.

Name of FSRD site **:** Ishan Gopalpur, Faridpur
Number of farmer **:** 2 (two)
Farm category **:** Small1, Marginal 1.

At the FSRD site, Ishan Gopalpur, Faridpur two farmers, one small and one marginal were included in the study. The small farmer used 13 technologies before the intervention. In this study his resource base was intervened with 34 technologies in 1999-2000 and 37 technologies in 2000-01. Similarly the marginal farmer uses 8 technologies on his farm. His resource base was applied 24 technologies in 1999-2000 and 31 technologies in 2000-01 (Table 1). Before the intervention the farmer obtained a gross margin of Tk. 29224/-. The gross margin increased up to Tk. 56714/- after intervention with the technologies. For this benefit he had to increase his total variable cost from Tk. 29360/- to 41929/-. Similarly the marginal farmer was using 8 technologies on his farm. In the intervention process he used 31 technologies in 2000-01. Use of these technologies could improve the gross margin from Tk. 11693/- to Tk. 28872/-. For this purpose he had to increase his total variable cost from Tk. 6695/- to Tk. 21370/- (Table 2).

The relative sectoral contribution in terms of gross margin for the farmers production system in descending order was crop>livestock>homestead>fisheries. Marginal benefit cost ratio (MBCR) for both the farmers was the highest for homestead system. The individual contribution of technologies applied on resources of farmer-1 and 2 is shown in Table 3. The summary of income and expenditure statement of both the farmers are shown in Table 4. The impact of technologies also showed in Table 5.

Table 1. Number of technologies used at Ishan Gopalpur, Faridpur during 1998-1999, 1999-2000 and 2000-01

Sector	Farmer1			Farmer 2		
	Before intervention (1998-1999)	After intervention		Before intervention (1998-1999)	After intervention	
		1999-00	2000-01		1999-00	2000-01
Crop	7	10	10	4	5	
Homestead	5	20	22	17	21	3
Livestock	--	3	4	2	4	5
Fisheries	1	1	1	1	1	-
Total	13	34	37	24	31	8

Table 2. Cost and benefit of integrated farmers at FSRD site, Ishan Gopalpur, Faridpur during 1998-1999, 1999-2000 and 2000-2001

Sector	Before intervention (98-99)		After intervention					
	TVC (Tk.)	GM (Tk.)	TVC (Tk.)		GM (Tk.)		MBCR	
			1999-00	2000-01	1999-00	2000-01	1999-00	2000-01
Farmer-1								
Crop	22311	16789	35138	34445	35442	36842	2.45	2.65
Homestead	239	2421	869	934	6180	6602	6.96	7.02
Livestock	6200	9400	5480	5500	10650	10895	--	--
Fisheries	610	615	970	1050	1660	2375	3.90	5.00
Total	29360	29225	42457	41929	53932	56714	2.86	3.19
Farmer 2								
Crop	6505	8258	10480	11055	11530	14540	1.82	2.38
Homestead	190	1845	695	735	5632	6092	8.49	8.79
Livestock	--	1590	3200	9230	3700	7590	1.66	1.65
Fisheries	--	--	480	350	970	650	3.02	2.86
Total	6695	11693	14855	21370	21832	28872	2.18	2.17

Table 3. Technologies used and return obtained from different sub system of integrated farmer at FSRD site, Ishan Gopalpur during 1998-99, 1999-2000 and 2000-01

Farmer-1

A. Crop land

Resource	***Area***	*Before intervention (1998-1999)*				*After intervention (2000-2001)*				*MBCR*	
		Pattern used	*Yield (kg)*	*GM (Tk.)*	*TVC (Tk.)*	*Pattern used*	*Yield (kg)*	*GM (Tk.)*	*TVC (Tk.)*	*99-00*	*00-01*
MHL-1	30 d	B. Aus (L) - Lentil (L)	200 105	2700	1400	Jute (0-9897) - Chickpea-5	230 180	3955	2455	3.00	2.19
MHL-2	30 d	T. Aman (BR-11) - Sweet gourd (L)	360 750	1765	3710	Jute (0-9897) - T. Aman (BR-32) - Wheat RF	250 470 350	4560	4940	4.44	1.78
MHL-3	60d*	Jute (L) - T. Aman (BR-11) - Wheat FP	320 680 700	4615	9335	Jute (0-9897) - T. Aman (BR-32) - Wheat RF	480 870 700	8320	10300	4.58	4.84
MHL-4	30 d	Jute (L) -- Wheat (Kanchan)	180 -- 320	1990	2675	Dherosh (BARI-1) - T.Aman (BR-32) - Mustard (BARI- 8)	1000 460 170	4950	4900	2.57	2.33
MHL-5	20 d	B. Aus (L) -- Wheat FP	140 -- 240	1065	1675	Jute (0-9897) - T. Aman (BR-32) - Radish (BARI-1)	160 310 4100	5990	4250	1.85	2.91
MHL-6	30 d	Jute (L) -- Lentil (L)	170 -- 80	2570	1530	Jute (0-9897) - Lentil 20 d - Tomato (BARI-1) 10 d	255 100 400	4640	2700	1.31	2.77
MHL-7	35 d	B. Aus (L) + B. Aman (L) - Kheshari (L)	220 + 150 225	2084	1986	B. Aus B. Aman - Boro (Brridhan-29)	220 200 865	4427	4900	1.86	1.80
Total	**235d**	**--**	**--**	**16789**	**22311**	**--**	**--**	**36842**	**34445**	**2.45**	**2.65**

*Rented in GM = Gross Margin, TVC = Total Variable Cost, L = Local, d= decimal, FP= Farmers practice, RF = Recommended fertilizer), MBCR = Marginal benefit cost ratio

B. Homestead

Resource	No.	Before intervention (1998-1999)				After intervention (2000-2001)				MBCR	
		Practice used	Yield (kg)	GM (Tk.)	TVC (Tk.)	Practice used	Yield (kg)	GM (Tk.)	TVC (Tk.)	99-00	00-01
House + threshing floor	16 d	No cultivation	--	--	--	--	--	--	--	--	--
Roof	2 d	White gourd	16 N	60	20	Sweet gourd + White gourd	15 N 25 N	340	60	7.14	8.00
Traili	1 d	Bottle gourd - Sweet gourd	15 N 10 N	101	219	Snake gourd - Jhinga - Shasha - Korola - Indian spinach	15 18 17 N 10 20	229	170	4.00	1.60
Open field	5 d	No cultivation	--	--	--	Homestead model	80	350	100	3.12	4.50
Partial shade	2 d	No cultivation	--	--	--	Turmeric (T-063) - Zinger - Mankachu - Moulovikachu - Elephant foot	15 1 8 N 3 12	318	74	5.12	5.30
Waste land	1 d	No cultivation	--	--	--	Panikachu - (Latiraj)	20	80	20	4.50	5.00
Pond Bank trail	1 d	No cultivation	--	--	--	White gourd - Bottle gourd	20 N 45 N	255	90	3.35	3.83
On support	1 d	Not used	--	--	--	BARI Shim-1 - Potato yam	30 10	195	40	18.00	5.88
Sub Total	29 d	--	--	161	239	--	--	1767	554	4.55	6.10

N = Number of fruit, d = decimal

C. Homestead trees

Resource	Number of plant	Before intervention (1998-1999)				After intervention (1999-2000)				MBCR	
		Practice used	Yield (kg)	GM (Tk.)	TVC (Tk.)	Practice used	Yield (kg)	GM (Tk.)	TVC (Tk.)	99-00	00-01
Coconut	6	Traditional	200 N	800	--	Fertilizer + Water management	310 N	1320	130	5.00	5.00
Jujube	1	No Budding	--	--	--	Budding	10	75	--	--	--
c. Mango	1	No control of hopper	28	100	--	Hopper Control + Fertilizer management	200	2000	200	13.00	10.50
Jackfruit	3	Traditional	18 N	360	--	Fertilizer management	22 N	390	50	6.00	1.60
Bamboo orchard	1 Orchard	Traditional	20 N	1000	--	Traditional	20 N	1000	--	--	--
--	--	--	--	--	--	New plantation lemon	30 N	50	--	--	--
		--	--	--	--	Guava	2	50	--	--	--
Sub total		--	--	2260	--	--	--	4835	380	9.79	7.78
Total (B+C)				2421	239	--	--	6602	934	6.96	7.02

N = Number of fruit,

D. Livestock

Resource	No.	Before intervention (1998-1999)				After intervention (2000-01)				MBCR	
		Practice used	Yield (kg)	GM (Tk.)	TVC (Tk.)	Practice used	Yield (kg)	GM (Tk.)	TVC (Tk.)	99-00	00-01
Duck	8	No vaccination	Egg-300 N	900	--	Vaccination + Feed	Egg-600N Meat-2	1620	300	1.76	3.40
Hen	15	No vaccination	Egg-500 N	1500	--	Vaccination + Feed	Egg-700N Meat-7.5	2325	300	1.76	3.75
Milch cow	2	No vaccination No UMS diet	Milk-400	5600	--	Deworming + Vaccination + UMS diet	Milk-700	6000	4000	1.25	1.10
Bullock	2	No vaccination No UMS diet	Meat-100	1400	6200	Deworming + Vaccination + UMS diet	Meat-20 increase	950	900	1.00	1.08
Total	--	--	--	9400	6200	--	--	10895	5500	--	--
Pond	6 d	Seasonal traditional culture	31	615	610	Mixed fish culture	80	2375	1050	3.90	5.0
Off farm	1 N	--	--	1500	500	--	--	1500	500	--	--

N = Number of egg, N = Number of fruit, d = decimal

Farmer-2

A. Crop

Resource	Area	Before intervention (1998-1999)				After intervention (2000-01)				MBCR	
		Pattern used	Yield (Kg)	GM (Tk.)	TVC (Tk.)	Pattern used	Yield (Kg)	GM (Tk.)	TVC (Tk.)	99-00	00-01
MHL-1	30 d	Jute (L) -- lentil (L)	190 -- 110	3703	1520	Jute (0-9897) - T. Aman (BR-32) - Wheat RF	220 480 325	4150	4850	1.11	1.13
MHL-2	20 d	Jute (L) -- Radish (L)	100 -- 1500	2260	2040	Jute (0-9897) - T. Aman (BR-32) - Radish (BARI-1)	160 300 4250	6190	4230	6.11	2.79
MHL-3	30 d	B. Aus +B. Aman - Wheat (K)	240 +150 350	2295	2945	B. Aus +B. Aman - Lentil (BARI-4)	220 +135 145	4200	1975	--	--
Total	80 d	--	--	8258	6505	--	--	14540	11055	1.82	2.38

d= decimal

B. Homestead

Resource	Area	Before intervention (1998-1999)				After intervention (2000-01)				MBCR	
		Practice used	Yield (kg)	GM (Tk.)	TVC (Tk.)	Practice used	Yield (kg)	GM (Tk.)	TVC (Tk.)	99-00	00-01
House + threshing floor	8 d	No cultivation -	--	--	--	--	--	--	--	--	--
Roof	2 d	Shim	15 N	88	2	Sweet gourd + White gourd	20 N 28 N	424	16	16.08	25
Traili	1 d	Bottle gourd. - Sweet gourd	20 N 14 N	107	188	Snake gourd - Jhinga - Shasha - Korola - Indian spinach	20 16 20 N 20 30	396	150	-10.15	- 6.6
Open field	4 d	No cultivation	--	--	--	Homestead model	120	560	130	3.57	5.31

Resource	Area	Before intervention (1998-1999)				After intervention (2000-01)				MBCR	
		Practice used	Yield (kg)	GM (Tk.)	TVC (Tk.)	Practice used	Yield (kg)	GM (Tk.)	TVC (Tk.)	99-00	00-01
Partial shade	1 d	No cultivation	--	--	--	Turmeric(T-063)- Zinger - Mankachu - Moulovikachu - Elephant foot	27 1 8 N 3 12	411	79	5.76	6.20
Waste land	1 d	No cultivation	--	--	--	Panikachu (Latiraj)	30	130	20	6.00	7.50
Pond Bank trail	1 d	No cultivation	--	--	--	White gourd - Bottle gourd	25 N 48 N	275	100	3.25	3.75
On support	2 d	Not used	--	--	--	BARI Shim-1 - Potato yam	35 16	246	40	24.81	7.15
Sub total	20 d	--	--	195	190	--	--	2442	535	7.05	7.51

N = Number of fruit, d = decimal

C. Homestead trees

Resource	Number of plant	Before intervention (1998-1999)				After intervention (1999-2000)				MBCR	
		Practice used	Yield (kg)	GM (Tk.)	TVC (Tk.)	Practice used	Yield (kg)	GM (Tk.)	TVC (Tk.)	99-00	00-01
Coconut	3	Traditional	30 N	150	--	Fertilizer + Water management	58 N	250	40	2.50	3.50
Mango	5	No control of hopper	40	400	--	Hopper Control + Fertilizer + Water management	90	800	100	5.00	5.00
Jackfruit	4	Traditional	20 N	400	--	Water + Fertilizer management	41 N	740	60	3.33	6.67
Bamboo orchard	1 Orchard	Traditional	14 N	700	--	Traditional	30 N	1800	--	--	--
--	--	--	--	--	--	New plantation (Lemon)	40 N	60	--	--	--
Sub total		--	--	1650	--	--	--	3650	200	11.11	11.00
Total (B+C)				1845	190	--	--	6092	735	8.49	8.79

N = Number of fruit,

D. Livestock

Resource	No.	Before intervention (1998-1999)				After intervention (2000-01)				MBCR	
		Practice used	Yield (kg)	GM (Tk.)	TVC (Tk.)	Practice used	Yield (kg)	GM (Tk.)	TVC (Tk.)	99-00	00-01
Duck	5	No vaccination	Egg-250 N	840	--	Vaccination + Feed	Egg-400N Meat-3	1180	230	3.00	2.48
Hen	7	No vaccination	Egg-250 N	750	--	Vaccination + Feed	Egg-500N Meat-4	1580	200	1.94	5.15
Cattle	1	No vaccination - No UMS diet	--	--	--	Deworming + Vaccination + UMS diet	Meat increase 70	2330	2800	1.62	1.83
Milch cow	1					Deworming + Vaccination + UMS diet	Milk 300	2500	6000		1.42
Total	--	--	--	1590	--	--	--	7590	9230	1.66	1.65
Pond	5 d	No cultivation	--	--	--	Rajputi	25	650	350	3.02	2.86
Off farm	--	Day labour	--	11300	--	Day labour	--	11000	--	--	--

N = Number of egg, N = Number of fruit,

Table 4. Income and expenditure statement of Farmer-1 and Farmer-2 under integrated Farming System during 1998-99, to 2000-01 at FSRD site, Ishan Gopalpur, Faridpur

Source	Farmer-1						Farmer-2					
	Before intervention 1998-1999		After intervention 1999-2000		After intervention 2000-2001		Before intervention 1998-1999		After intervention 1999-2000		After intervention 2000-01	
	Income (Tk.)	Expen. (Tk.)	Income (Tk.)	Expen. (Tk.)	Income (Tk.)	Expen. (Tk.)	Income (Tk.)	Expen. (Tk.)	Income (Tk.)	Expen. (Tk.)	Income (Tk.)	Expen. (Tk.)
Crop sub sector	39100/-	22311/-	70580/-	35138/-	71287/-	34445/-	14763/-	6505/-	22010/-	10480/-	25595/-	11055/-
Homestead sub sector	2660/-	239/-	7049/-	869/-	7536/-	934/-	2035/-	190/-	6327/-	695/-	6827/-	735/-
Livestock sub sector	15600/-	6200/-	16130/-	5480/-	16395/-	5500/-	1590/-	--	6900/-	3200/-	16820/-	9230/-
Fisheries sub sector	1225/-	610/-	2630/-	970/-	3425/-	1050/-	--	--	1450/-	480/-	1000/-	350/-
Off farm sub sector	2000/-	500/-	2000/-	500/-	2000/-	500/-	11300/-	--	11000/-	--	11000/-	--
Loan taken	--	--	--	--	10000/-	--	382/-	--	--	--	--	--
Kacha Bazar	--	9125/-	--	10950/-	--	10000/-	--	5475/-	--	6200/-	--	5500/-
Foods	--	2800/-	--	2200/-	--	2200/-	--	11000/-	--	11000/-	--	11500/-
Cloths	--	2500/-	--	3000/-	--	3500/-	--	2000/-	--	2000/-	--	2000/-
Education	--	1000/-	--	1500/-	--	2000/-	--	400/-	--	800/-	--	1000/-
Medical	--	2500/-	--	2000/-	--	2000/-	--	1200/-	--	800/-	--	700/-
Repairing	--	2400/-	--	2500/-	--	1500/-	--	500/-	--	3600/-	--	--
Investment	--	--	--	3500/-	--	27000/-	--	--	--	2000/-	--	5000/-
Others	--	6400/-	--	6970/-	--	8000/-	--	2000/-	--	2000/-	--	2000/-
Housing	--	--	--	2000/-	--	500/-	--	--	--	200/-	--	4500/-
Refreshment	--	1200/-	--	1500/-	--	2000/-	--	500/-	--	500/-	--	500/-
Distribution	--	500/-	--	800/-	--	1000/-	--	300/-	--	500/-	--	500/-
Balance	--	2300/-	--	20312/-	--	8514/-	--	--	--	3232/-	--	6672/-
Total	60585	60585	98389	98389	110643	110643	30070	30070	47687	47687	61242	61242

Name of the FSRD site : Golapgonj, Sylhet
Number of Farmers : 3 (Three)
Farm category : Marginal 2, Landless 1

It was revealed that the cooperator farmers of Golapgonj, Sylhet used 5-7 technologies before intervention but during intervention, the number of technologies used increases up to 13-19 (Table 5). The gross margin of farmer 1 increased from Tk 16702 to Tk. 73434, that of the farmer 2 from Tk. 1488 to Tk. 12830 and farmer 3 from Tk. 13030 to Tk. 37850. The corresponding total variable cost (TVC) of farmer 1 was Tk. 6673 and Tk. 10195 that of farmer 2 was Tk. 690 and Tk. 3820 and farmer 3 Tk. 3210 and Tk. 7915. On an average the highest gross margin was obtained from homestead and as such the corresponding marginal benefit cost ratio (MBCR) was also highest in the same sector (Table 6).

Table 5. Number of technologies used at FSRD site, Golapgonj, Sylhet

Sector	Before intervention (1997-98)	After intervention (2000-01)
Farmer –1		
Crop	2	7
Homestead	2	9
Livestock	1	1
Fisheries	1	2
Total	6	19
Farmer-2		
Crop	2	7
Homestead	1	4
Livestock	1	1
Fisheries	1	1
Total	5	13
Farmer-3		
Crop	4	5
Homestead	1	4
Livestock	1	3
Fisheries	1	1
Total	7	13

Table 6. Cost and benefit of integrated farmers at FSRD site, Golapgonj, Sylhet

Sector	Before intervention (1997-98)		After intervention (2000-01)		
	TVC (Tk)	G.M.(Tk)	TVC (Tk)	GM (Tk)	MBCR
			Farmer-1		
Crop	1735	3500	1163	31200	3.80
Homestead	4358	11402	5772	30534	14.50
Livestock	250	600	1020	4000	5.40
Fisheries	350	1200	2240	7700	4.44
Total	6673	16702	10195	73434	5.06
			Farmer-2		
Crop	190	800	1700	6030	4.46
Homestead	200	400	500	2000	6.33
Livestock	180	(-)62	720	1200	3.88
Fisheries	120	350	900	3600	5.17
Total	690	1488	3820	12830	4.62
			Farmer-3		
Crop	2850	12120	6285	32050	6.80
Homestead	30	200	500	2200	5.26
Livestock	130	10	430	600	2.97
Fisheries	200	700	700	3000	5.60
Total	3210	13030	7715	37850	6.27

Name of the FSRD site **:** Chabbishnagar, Barind, Rajshahi
Number of farmer **:** 3 (Three)
Farm category **:** Small –2, Marginal-1

It was observed that the cooperator farmers of Barind, Rajshahi used 10 to 15 technologies before intervention but the number of technologies used increases upto 34-36 during intervention (Table 7). The gross margin of farmer 1 increased from Tk 26855 to Tk 91880, that of farmer-2 from Tk 15885 to Tk 64482 and farmer 3 from Tk 6490 to Tk 54285. The corresponding TVC of farmer-1 was Tk 25298 and Tk 39250, that of farmer 2 was Tk 15320 and Tk 60810 and farmer 3 Tk 8605 and Tk 28440. On the average marginal cost benefit ratio (MBCR) from fisheries was found highest (Table 8).

Table 7. Number of technologies used at FSRD site, Chabbishnagar, Barind, Rajshahi

Sector	Before intervention (1997-98)	After intervention (2000-01)
	Farmer –1	
Crop	3	5
Homestead	4	22
Livestock	2	8
Fisheries	1	1
Total	10	36
	Farmer-2	
Crop	3	5
Homestead	5	24
Livestock	2	6
Fisheries	1	1
Total	11	36
	Farmer-3	
Crop	3	4
Homestead	9	24
Livestock	2	5
Fisheries	1	1
Total	15	34

Name of the FSRD site : Palima, Tangail
Number of farmers : 2 (Two)
Farm category : Small 2

The integrated approach of technology intervention resulted in the remarkable growth of farm income. The results indicated that the incomes from different sectors were increased with different rate. On two farms average it was found that the highest gross margin recorded at Livestock sector followed by crop sector. On the contrary it was found that the highest MBCR recorded at fisheries followed by homestead sector. Farmers used 11-15 technologies before intervention but during

intervention it was increased upto 36-38 technologies (Table 9). The gross margin of farmer 1 increased from Tk 17794 to Tk 66344 and that of the farmer 2 from Tk. 22940 to Tk. 75300. The corresponding TVC of farmer 1 was Tk. 8145 and Tk. 23770 and that of farmer 2 was Tk. 9863 and Tk. 31400 (Table 10).

Table 9. Number of technologies used at FSRD site, Palima, Tangail

Sector	Farmer-1		Farmer-2	
	Before intervention (1998-99)	After intervention (2000-01)	Before intervention (1998-99)	After intervention (2000-01)
Crop	5	5	3	5
Homestead	9	24	6	24
Livestock	-	7	1	5
Fisheries	1	2	1	2
Total	15	38	11	36

Table 10. Cost and benefit of integrated farmers at FSRD site, Palima, Tangail

Sector	Before intervention (1998-99)		After intervention (2000-01)		MBCR
	TVC (Tk.)	GM (Tk.)	TVC (Tk.)	GM (Tk.)	
			Farmer-1		
Crop	7120	12276	6000	21550	7.28
Homestead	275	2410	470	4279	10.58
Livestock	100	2558	15300	27100	2.60
Fisheries	650	1550	2000	13415	9.79
Total	8145	17794	23770	66344	4.11
			Farmer-2		
Crop	8320	13000	12000	16200	1.87
Homestead	523	1285	2000	13200	9.07
Livestock	420	7455	16000	39000	3.02
Fisheries	600	1200	1400	6900	10.83
Total	9863	22940	31400	75300	5.65

Name of the FSRD site : Goyeshpur, Pabna
Number of farmers : 15 (Fifteen)
Farm category : Marginal 5, Small 5 and Medium 5.

Marginal farmers (5) used 20 technologies before intervention but it was increased up to 97 technologies during intervention, that of small farmers (5) used 52 and 152 technologies and medium farmers (5) used 55 and 129 technologies before and after intervention, respectively (Table 11). From the record it was found that the highest number of technologies intervened at homestead followed by crop sector. Before the intervention the farmers obtained a gross margin of Tk. 13220 to Tk 101685. After intervention of technologies the gross margin increased from Tk. 17032 to Tk. 164716. For this purpose they had to increase their total variable cost from Tk. 11955 to Tk. 104571.

The relative sectoral contribution to build up gross margin in descending order was crop>livestock>fisheries>off farm>homestead. Marginal benefit cost ratio (MBCR) of the tested farmers was the highest for crop sector (Table 12).

Table: 11 Number of technologies used at FSRD site, Goyeshpur, Pabna during 2000-2001

Farmer	Crop		Homestead		Livestock		Fisheries		Total	
	Intervention		Intervention		Intervention		Intervention		Intervention	
	Before	After	Before	After	Before	After	Before	After	Before	After
1.	-	-	4	24	-	1	-	1	4	26
2.	2	3	5	20	-	3	-	2	7	28
3.	3	4	3	17	-	2	-	1	6	24
4.	4	4	4	18	-	2	-	2	8	26
5.	-	-	3	17	-	2	-	-	3	19
6.	12	11	3	10	-	2	-	1	15	24
7.	9	6	1	14	-	2	-	2	10	24
8.	2	2		-	-	-	-	-	-	-
9.	5	5	-	17	-	2	-	1	5	25
10.	6	5	1	20	-	2	-	1	7	28
11.	8	10	9	19	-	2	-	1	17	30
12.	3	7	1	22	-	2	-	1	4	32
13.	11	8	4	12	-	2	-	-	15	22
14.	1	1	4	22	1	1	-	-	6	24
15.	14	18	6	25	-	2	-	1	20	46

Table 12. Cost and benefit of integrated farmers at FSRD site Goyeshpur, Pabna

Farmers no	Sector	Before intervention		After intervention		
		TVC (Tk)	GM (Tk)	TVC (Tk)	GM (Tk)	MBCR
1	Crop	-	-	-	-	-
	Homestead	250	2356	935	6343	7.19
	Live stock	-	-	61484	43686	1.71
	Fisheries	-	-	540	335	1.62
	Off farm	45575	26000	16925	19075	-0.35
	Total	**45675**	**26225**	**79284**	**66809**	**0.63**
2	Crop	12105	9263	12001	12427	-29.42
	Homestead	1370	14524	1515	24016	66.46
	Live stock	1975	545	22790	16050	1.74
	Fisheries	3635	4965	2165	7275	-0.57
	Off farm	82600	5180	66100	3350	1.11
	Total	**101685**	**34477**	**104571**	**63118**	**10.92**
3	Crop	7986	18324	4315	12195	2.69
	Homestead	220	2520	715	3976	3.94
	Live stock	2550	4200	136760	17452	1.10
	Fisheries	800	3115	2300	6290	3.12
		20600	6500	415150	24550	18.05
	Total	**32156**	**34659**	**559240**	**64463**	**1.06**
4	Crop	26498	26844	26711	46467	93.13
	Homestead	141	3376	1204	5433	2.94
	Live stock	800	1010	16741	4807	1.24
	Fisheries	140	2000	1125	3965	2.99
	Total	**27579**	**33230**	**45779**	**60672**	**2.51**
5	Crop	-	-	-	-	-
	Homestead	270	1579	716	2014	4.93
	Live stock	-	-	12000	10500	1.88
	Fisheries	-	-	-	-	-
	Off farm	12950	24000	17800	26000	1.41
	Total	**13220**	**25579**	**30516**	**38514**	**1.75**

Farmers no	Sector	Before intervention		After intervention		
		TVC (Tk)	GM (Tk)	TVC (Tk)	GM (Tk)	MBCR
6	Crop	48861	39589	50299	50231	8.40
	Homestead	320	2405	707	3472	3.76
	Live stock	1540	3155	6150	7090	1.85
	Fisheries	1530	2200	1000	3000	-0.53
	Total	**52251**	**47349**	**58129**	**39939**	**-0.26**
7	Crop	18480	48670	24757	35188	-1.14
	Homestead	50	4920	2307	12559	6.44
	Live stock	-	2170	24345	9879	1.32
	Fisheries	-	4000	3210	12270	4.82
	Off farm	15300	21600	-	-	-
	Total	**33830**	**81360**	**54619**	**69896**	0.45
8	Crop	3750	8720	4250	10145	3.85
	Homestead	203	1656	819	5302	6.92
	Live stock	-	-	-	-	-
	Fisheries	-	370	1300	4640	4.28
	Off farm	21820	16775	28625	22500	1.84
	Total	**25773**	**27521**	**34994**	**42587**	**2.63**
9	Crop	34905	24256	26244	45639	-1.47
	Homestead	195	1935	2543	11217	4.91
	Live stock	1180	15000	16000	35360	2.4
	Fisheries	-	-	12000	72500	7.04
	Total	**36280**	**41191**	**56793**	**164716**	**7.02**
10	Crop	16388	6702	16419	8672	64.53
	Homestead	190	1560	501	4406	10.15
	Live stock	1020	1234	735	1854	-1.18
	Fisheries	800	400	1500	2100	3.43
	Total	**18398**	**9896**	**11955**	**17032**	**10.43**
11	Crop	21480	46470	30310	79190	4.71
	Homestead	265	3996	653	5575	5.07
	Live stock	30	520	12620	17420	2.34
	Fisheries	140	1450	280	9530	58.71
	Total	**21915**	**52436**	**43863**	**111715**	**3.70**
12	Crop	1180	4897	12604	5517	1.44
	Homestead	120	10045	1553	9617	0.70
	Live stock	1385	1930	17601	11689	16.21
	Fisheries	1225	1775	675	12857	9.98
	Off farm	69021	65695	67851	65009	1.58
	Total	**72931**	**84342**	**100284**	**104689**	**1.74**
13	Crop	42400	65288	48990	64880	0.94
	Homestead	174	2891	615	5223	6.29
	Live stock	2515	8185	2890	12870	13.49
	Fisheries	-	-	-	-	-
	Total	**45089**	**76364**	**52495**	**82973**	**1.89**
14	Crop	9730	1500	10460	8520	10.61
	Homestead	80	1170	503	4751	9.46
	Live stock	-	-	10060	5940	1.59
	Fisheries	-	-	-	-	-
	Total	**9810**	**2670**	**21023**	**19211**	**2.48**

Farmers no	Sector	Before intervention		After intervention		
		TVC (Tk)	GM (Tk)	TVC (Tk)	GM (Tk)	MBCR
15	Crop	17295	68300	32038	107171	3.64
	Homestead	895	5315	870	8343	0.008
	Live stock	-	-	11500	11120	1.97
	Fisheries	-	-	600	1553	3.59
	Off farm	-	6800	-	4000	-

Name of the FSRD site : Atkapalia, Noakhali
Number of farmer : 2 (two)
Farm category : Medium 2

It was recorded that the cooperator farmers of Atkapalia, Noakhali used 7 technologies of different sectors before intervention. But during intervention, the number of technologies used increases upto 15-27 (Table 13). The gross margin of farmer 1 increased from Tk. 12755 to Tk. 66018 and that of the farmer 2 from Tk. 3482 to Tk. 11470. The corresponding TVC of farmer 1 was Tk. 8200 and Tk. 12184 and that of farmer 2 was Tk. 8345 and Tk. 12184 (Table 14). Among the two farmers, the highest gross margin was recorded at livestock sector (Tk. 50200).

Table 13. Number of technologies used at Atkapalia FSRD site, Noakhali

Sector	Before intervention (1998-99)	After intervention (2000-01)
	Farmer-1	
Crop	3	4
Homestead	1	6
Livestock	2	4
Fisheries	1	1
Total	7	15
	Farmer-2	
Crop	5	18
Homestead	2	9
Total	7	27

Table 14. Cost and benefit of integrated farmers at FSRD site, Atkapalia, Noakhali during 1998-99 and 2000-01

Sector	Before intervention (1998-99)		After intervention (2000-01)		MBCR
	TVC (Tk)	GM (Tk)	TVC (Tk)	GM (Tk)	
		Farmer-1			
Crop	4200	3175	3798	7568	9.93
Homestead	1600	800	1800	1650	4.25
Livestock	2000	4280	349800*	50200	1.13
Fisheries	400	4500	600	6600	11.5
Total	8200	12755	355998	66018	1.15
		Farmer-2			
Crop	7745	2050	11334	7700	2.57
Homestead	600	1432	850	3770	10.35
Total	8345	3482	12184	11470	3.11

* For broiler house making initial cost as well as TVC largely increased.

Name of the FSRD site : Narikeli, Jamalpur
Number of farmers : 10 (ten)
Farm category : Landless 4, Marginal 2 and Small 4.

It was recorded that the cooperator farmers of Narikeli, Jamalpur used 6-11 technologies before intervention. But the number of technologies used increases up to 22-34 during intervention (Table 15). The gross margin of intervened farmers increased from Tk 700 to Tk. 38000. The corresponding

total variable cost (TVC) ranged from Tk. 1100 to Tk. 39000 and that of marginal benefit cost ratio (MBCR) ranged from 1.35 to 11.0 (Table 16). On the average the highest gross margin was obtained from crop sector (Tk. 7020) followed by livestock (Tk. 3570) and lowest in fish sector (Tk. 870).

Table 15. Number of technologies used at FSRD site, Narikeli, Jamalpur 1999-2001

Farmer	Sector	Before intervention (1999-2000)	After intervention (2000-01)
Farmer-1	Crop	6	10
	Homestead	4	15
	Livestock	-	3
	Fisheries	1	2
	Total	11	30
Farmer-2	Crop	7	11
	Homestead	2	15
	Livestock	-	3
	Fisheries	1	4
	Total	10	33
Farmer-3	Crop	6	12
	Homestead	4	15
	Livestock	-	3
	Fisheries	1	4
	Total	11	31
Farmer-4	Crop	6	11
	Homestead	3	14
	Livestock	-	4
	Fisheries	-	2
	Total	9	34
Farmer-5	Crop	4	11
	Homestead	2	14
	Livestock	-	4
	Fisheries	-	2
	Total	6	25
Farmer-6	Crop	4	10
	Homestead	5	10
	Livestock	-	3
	Fisheries	-	2
	Total	9	25
Farmer-7	Crop	5	10
	Homestead	4	13
	Livestock	-	3
	Fisheries	-	4
	Total	9	30
Farmer-8	Crop	6	11
	Homestead	4	10
	Livestock	-	2
	Fisheries	-	2
	Total	10	25
Farmer-9	Crop	4	7
	Homestead	4	10
	Livestock	-	2
	Fisheries	-	3

Farmer	Sector	Before intervention (1999-2000)	After intervention (2000-01)
	Total	8	22
Farmer-10	Crop	5	11
	Homestead	4	13
	Livestock	-	3
	Fisheries	-	5
	Total	9	32

Table 16. Cost and benefit of integrated farmers at FSRD site, Narikeli, Jamalpur during 1999-2001

Cooperator	Resource	Before intervention (1999-2000)		After intervention (2000-01)		MBCR
		GM(Tk)	TVC(Tk)	GM(Tk)	TVC(Tk)	
Farmer-1	Crop	4000	9000	6000	10000	2.00
	Homestead	2200	800	4500	1000	12.50
	Livestock	700	300	1500	500	5.00
	Fisheries	700	300	1000	500	2.50
	Total	7600	9400	13000	12000	3.07
Farmer-2	Crop	20600	3400	21500	3500	10.00
	Homestead	300	400	2000	1000	3.83
	Livestock	300	700	700	1000	2.33
	Fisheries	4500	500	4400	600	-
	Total	25700	5000	28600	6100	3.63
Farmer-3	Crop	8000	8000	8000	10000	1.00
	Homestead	100	200	200	300	2.00
	Livestock	3000	5000	4000	6000	2.00
	Total	11100	13200	12200	16300	1.35
Farmer-4	Crop	1000	7000	2000	7000	-
	Homestead	500	200	700	300	3.00
	Livestock	1500-	500-	3300-	700-	10.00-
	Total	3000	7700	6000	8000	11.00
Farmer-5	Crop	1000	3000	1500	3500	2.00
	Homestead	3750	250	4700	300	20.00
	Livestock	6000-	2000	9000	3000	4.00
	Total	10750	5250	15200	6800	3.80
Farmer-6	Crop	20000	25000	20000	30000	1.00
	Homestead	4500	1500	6000	2000	4.00
	Livestock	6000	4000	9000	6000	2.25
	Fisheries	2000	1000	3000	1000	-
	Total	32500	31500	38000	39000	1.75
Farmer-7	Crop	-	-	-	-	-
	Homestead	200	300	300	500	1.50
	Livestock	300	400	400	600	1.50
	Total	500	700	700	1100	1.50
Farmer-8	Crop	7000	8000	10000	10000	2.50
	Homestead	400	100	6000	1000	7.22
	Livestock	1000	1000	4000	2000	4.00
	Fisheries	200	200	300	400	1.50
	Total	8600	9300	20300	13400	3.85
Farmer-9	Crop	900	1100	1200	1200	4.00
	Homestead	700	800	2000	1000	7.50
	Livestock	3000	1000	3800	1200	5.00
	Fisheries	-	-	-	-	-
	Total	4600	2900	7000	3400	5.80
Farmer-10	Crop	-	-	-	-	-
	Homestead	-	-	400	200	3.00
	Livestock	-	-	--	--	--
	Total	-	-	400	200	3.00

Name of the FSR site : Syedpur, Rangpur
Number of farmers **:** 3 (three)
Farmer category : Small 3

It was observed that three cooperator farmers of Syedpur, FSRD site, Rangpur used 9-15 technologies before intervention but the number of technologies used increases upto 22-36 during intervention (Table 17). The gross margin of farmer-1 increased from Tk. 36721 to Tk. 64720, that of farmer-2 from Tk. 67566 to Tk. 103328 and farmer – 3 Tk. 27481 to Tk 48697. The corresponding total variable cost

(TVC) of farmer – 1 was Tk. 28692 and Tk. 40618, that of farmer-2 was Tk. 38275 and Tk. 57940 and farmer-3 was Tk. 13513 and Tk. 22948. On an average the marginal benefit cost ratio (MBCR) from homestead was found highest (Table 18).

Table 17. Number of technologies used in three farms at FSRD site Syedpur, Rangpur

Sector	Farmer 1: Mr. Md. Mohshin Ali (Small Farmer)	
	Before intervention (1998-99)	After intervention (2000-01)
Crop	10	
Homestead	5	
Livestocks	-	
Fisheries	-	
Total	15	
Farmer 2: Mr. Md. Shamsul Haque (Small Farmer)		
Crop	2	4
Homestead	5	10
Livestocks	-	5
Fisheries	2	5
Total	9	24
Farmer 3: Sree Moti Shudha Rani (Small Farmer)		
Crop	5	7
Homestead	7	12
Livestocks	-	3
Fisheries	-	-
Total	12	22

Table 18. Cost and benefit of integrated technologies at FSRD site, Syedpur, Rangpur during 1998-99 and 2000-01

Sector	Before intervention (1998-99)		After intervention(2000-01)		
	TVC (Tk)	GM (Tk)	TVC (Tk)	GM(Tk)	MBCR
			Farmer-1		
Crop	21278	24304	26314	43227	4.76
Homestead	484	9997	2130	16747	5.10
Livestocks	6930	2420	12174	40808	1.46
Total	**28692**	**36721**	**40618**	**64782**	**3.35**
			Farmer –2		
Crop	33670	51154	45739	63143	1.99
Homestead	480	5022	1517	12094	7.81
Livestock	1780	5500	8764	12231	1.96
Fisheries	2345	5890	1920	15860	-
Total	**38275**	**67566**	**57940**	**103328**	**2.82**
			Farmer – 3		
Crop	10999	12824	15639	21898	2.95
Homestead	634	6712	2074	10944	3.93
Livestock	1880	7945	5835	15855	3.00
Total	**13513**	**27481**	**22948**	**48697**	**3.20**

Table 19. Impact of integrated farming in FSRD sites

Sl.No.	Area	Impact
01	Family income	Net income increased Used modern varieties Used more area for cultivation/production
02	Nutrition	Consumption of vegetables, fruits and fish increased Changed consumption habit Reduced disease infestation
03	Resource use	Intensive cropping Introduced new fruit trees like mango, Jujubee, etc Homestead area utilized properly
04	Education and knowledge	Increased knowledge of family member Children's are educated by private tutor Male member involved in distributing knowledge among the neighbouring farmers.
05	Refreshment	Cost of refreshment increased in case of farmers 1 Purchase of new cloth increased in case of farmer 1
06	Social status	Improved mental strength Increased acceptability to people
07	Environment	Household waste used for composting New plantation improve environment Irrigation to crop and trees improve environment
08	Others	More utilization of family labour Improve the cattle health

Conclusion and Recommendation

The integration of technology brought out slow and steady growth of the farm family as a whole. The gross margin from crop sector, homestead, livestock, fisheries were higher than the previous year. The family nutrition, resource use, knowledge, social status and microenvironment were improved considerably due to intervention. Though contribution from the homestead system was the highest but there is also enough scope for further improvement such as establishment of broiler farm, local and exotic poultry breeds under traditional rearing, improved breed of duck, pigeon rearing, introducing quick growing multipurpose tree species in homestead, commercial plant nursery etc. If the farmer accept these technologies as an enterprise, then it will provide maximum benefit and technology will be sustainable.

Location: Narikeli, Jamalpur
Cropping pattern: Mustard-Boro-T.Aman Year of establishment: 1999-2000

In mustard, significantly higher and identical yield was recorded from ED_2, INM and FRG'97. In Boro and T.Aman rice similar trend was found. The control plot produced the lowest yield and the farmers' dose produced the intermediate yield. The highest gross margin was calculated from ED2 followed by FRG'97 and INM. Regarding the MBCR the highest value was found in FRG'97 followed by ED2. In INM treatment cost of mustard oil cake increase the fertilization cost and thereby reduced the gross margin and MBCR.

Table 3. Effect of different fertilizers on the agro-economics performance of Mustard-Boro-T.Aman rice cropping pattern at Narikeli during 1999-2000

Treatment	Grain yield (t/ha)			VC (Tk/ha)	GM (Tk/ha)	MBCR
	Mustard	Boro	T.Aman			
T_1 (ED2)	1.0ab	5.8a	4.05a	11504	79706	3.64
T_2 (INM)	1.1a	5.4a	3.90a	15560	74235	2.34
T_3 (FRG'97)	1.0ab	5.4a	3.78a	9476	76511	4.08
T_4 (FP)	0.8b	3.8b	2.32b	7581	55049	2.27
T_5 (Control)	0.5c	2.3c	1.76c	0	37845	-

Table 3.1. Fertilizer doses

Treatment	Fertilizer doses (NPKS kg/ha & MOC 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: Narikeli, Jamalpur
Cropping pattern: Wheat-Jute-T.Aman Year of establishment: 1999-2000

No significant difference was observed among the different fertilizer doses in grain yield of wheat except with control. In case of Jute and T.Aman almost similar trend was observed. The yields were identical and differed only with FP and control treatment. However the soil of the experimental field was deficient with NPK but it was not reflected well in the yield of crops at all. From cost benefit analysis, it was found that the higher gross margin and MBCR were obtained from ED2 followed by present BARC fertilizer recommendation.

Table 4. Effect of different fertilizers on agro-economic performance of Wheat-Jute-T.Aman cropping pattern at Narikeli during 1999-00

Treatment	Grain yield (t/ha)			VC (Tk/ha)	GM (Tk/ha)	MBCR
	Wheat	Jute	T.Aman			
ED2	2.81a	2.4 a	4.74 a	8410	69075	3.98
INM	2.73a	2.3 a	4.37 a	13578	59875	1.79
FRG'97	2.73a	2.0 a	3.85 a	7663	60069	3.20
FP	2.62a	1.4 bc	3.59 b	6863	45892	1.50

Control	1.51b	1.0 c	1.82 c	0	35577	-

Table 4.1. Fertilizer doses

Treatment	Fertilizer doses (NPKS kg/ha & MOC 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: Hathazari
Cropping pattern: Boro-T.Aman **Year of establishment: 1999-2000**

Significantly higher grain yield was obtained from ED_2 and INM in Boro rice followed by FRG'97 and ED1. In T.Aman rice, grain yield did not vary significantly among the different treatment combinations except with FP and control. 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.

Table 5. Effect of different fertilizers on agro-economics performance of Boro-T.Aman cropping pattern at Hathazari during 1999-2000

Treatment	Grain yield (t/ha)		Straw/stover yield (t/ha)		TVC (Tk/ha)	GM (Tk/ha)	MBCR
	Boro	T.Aman	Boro	T.Aman			
ED1	4.97bc	4.03ab	5.84	4.62a	26003	47053	3.71
ED2	5.86a	4.33a	6.36	4.78a	28509	57842	3.88
INM	5.83a	4.38a	6.31	4.90a	33253	53474	2.37
FRG'97	5.10b	4.03ab	5.09	4.53a	24632	47139	4.77
FP	4.53c	3.67b	4.76	4.76a	26284	40199	2.50
Control	3.16	2.62c	3.63	3.30b	19750	23832	-

Table 5.1. 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 : Satkanya, Chittagong
Cropping pattern : Boro-T.Aman
Year of establishment : 1999-2000

Significantly higher grain yield was obtained from ED_2 and INM in Boro rice followed by FRG'97 and ED1. In T.Aman rice, almost similar trend was observed. 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 FP and ED1. Additional cost for cowdung (10 t/ha) in integrated nutrient management practice reduced the MBCR value.

Table 6. Effect of different fertilizers on agro-economics performance of Boro-T.Aman cropping pattern at Hathazari during 1999-2000

Treatment	Grain yield (t/ha)		Straw/stover yield (t/ha)		TVC (Tk/ha)	GM (Tk/ha)	MBCR
	Boro	T.Aman	Boro	T.Aman			
ED1	5.29b	4.15bc	5.49b	4.76b	26758	52535	3.72
ED2	5.60a	4.91a	6.20a	5.34a	29600	58127	3.22
INM	5.74a	4.72a	6.20a	5.28ab	33314	53958	2.03
FRG'97	5.08b	4.33b	5.28b	5.22ab	25029	53770	5.18
FP	4.91b	4.03c	5.57ab	4.96ab	25209	50514	4.41
Control	2.94c	2.39d	3.42c	3.56c	19750	26431	-

Table 6.1. 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 Year of establishment: 1999-2000

Different doses of fertilizers failed to produce any significant difference in seed/fiber/grain yield of mustard, jute and T.Aman rice. 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 was calculated from ED2 followed by INM and FP. But regarding MBCR, the highest value was obtained from ED1 followed by ED2.

Table 7. Effect of different fertilizers on agro-economic performance of Mustard-Jute-T.Aman cropping pattern at Palima, Tangail during 1999-2000

Treatment	Grain yield (t/ha)			Straw/stover yield (t/ha)			TVC (Tk/ha)	GM (Tk/ha)	MBCR
	Mustard	Jute	T.Aman	Mustard	Jute	T.Aman			
ED1	046a	3.53a	3.75 a	0.83a	7.50a	4.33ab	43095	39937	3.09
ED2	048a	3.17a	4.25a	0.78ab	6.83ab	4.75a	45742	45310	2.80
INM	0.45a	3.25a	4.17a	0.76ab	6.50ab	4.33ab	47358	42976	2.19
FRG'97	0.45a	3.00a	3.58a	0.74b	6.17ab	4.42ab	45245	36584	1.99
FP	0.50a	2.93a	4.08a	0.82a	6.17ab	4.58a	45083	40844	2.50
Control	0.19b	2.00b	2.50b	0.55c	4.25b	3.67b	36155	18486	-

Table 7.1. 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: Palima, Tangail
Cropping pattern: Boro-T.Aman Year of establishment: 1999-2000

In Boro rice, grain yield did not differ due to different fertilizer doses. Even the FP also produced identical yield. There was no response of NPK was found however the soil was very deficient with these elements. Again, in T.Aman rice the responses of the nutrients were evident and the highest grain yield was obtained from INM and ED_2. Other fertilizer packages produced identical yield. But when cost benefit analysis was done the scenario was different. Highest gross margin and MBCR values were calculated from ED_2 followed by FRG'97.

Table 8. Effect of different fertilizers on Agroeconomic performance of Boro-T.Aman cropping pattern at Palima during 1999-2000

Treatment	Grain yield (t/ha)		Straw/stover yield (t/ha)		TVC (Tk/ha)	GM (Tk/ha)	MBCR
	Boro	T.Aman	Boro	T.Aman			
ED1	5.00a	3.08b	6.99a	4.32b	39510	29470	1.42
ED2	5.45a	3.80a	7.66a	5.02a	41950	39370	2.07
INM	5.29a	3.72a	7.91a	4.50ab	43120	33230	1.19
FRG'97	5.35a	3.30b	7.49a	4.38b	39910	34490	1.99
FP	5.10a	2.95b	7.14a	4.08b	37970	26520	1.27

Control	2.71b	2.01c	3.80b	3.42c	32230	19220	-

Table 8.1. 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: Lebukhali, Patuakhali
Cropping pattern: Mungbean-T.Aus-T.Aman **Year of establishment: 1999-2000**

In Mungbean, ED2 and INM produced significantly higher grain yield followed by ED1 and FRG'97. But in T.Aus, different fertilizer packages produced identical yield except with FP and control. In T.Aman rice significantly higher yield was recorded from INM, ED2 and FRG'97. The highest gross margin was calculated from INM followed by ED2 and FRG'97. Similarly the MBCR was also higher in the same treatments.

Table 9. Effect of different fertilizers on agro-economic performance of Mungbean- T.Aus-T.Aman cropping pattern at Lebukhali during 1999-2000

Treatment	Grain yield (t/ha)			Straw/stover yield (t/ha)			TVC (Tk/ha)	GM (Tk/ha)	MBCR
	Mungbean	T.Aus	T.Aman	Mungbean	T.Aus	T.Aman			
ED1	800b	4.12ab	3.74b	1850	4.04	3.64	45780	43240	1.88
ED2	820ab	4.32a	4.28a	1800	4.30	4.12	47189	47111	2.00
INM	850a	4.68a	4.48a	1900	4.18	3.95	49184	50856	1.98
FRG'97	800b	4.30a	4.04ab	2000	4.52	4.43	45424	46556	2.36
FP	780bc	3.43b	3.20c	1840	3.38	3.15	44000	35610	1.25
Control	750c	2.38c	2.88d	1870	3.32	2.98	37200	27120	-

Table 9.1. Fertilizer doses

Treatment	Fertilizer doses (NPKS kg/ha & cowdung t/ha)		
	Mungbean	T.Aus	T.Aman
ED1	12-14-20	55-10-20	55-10-20
ED2	12-14-20	75-15-20	75-15-20
INM	10-13-20	50-8-20	50-8-20
FRG'97	20-21-20	35-8-20	35-8-20
FP	0-0-0	60-0-0	50-0-0
Control	0-0-0-0	0-0-0	0-0-0

Location: Kendua, Kishoregonj
Cropping pattern: Boro-T.Aman **Year of establishment: 1999-2000**

In Boro rice, gain yield did not vary significantly among the different treatments except with FP and control treatment. But in T.Aman rice significantly higher grain yield was recorded from INM and ED2. However, the identical yield was obtained from ED1, FRG'97 and FP. The highest gross margin was calculated from ED2 which was closely followed by INM, FRG'97 and ED1. But the highest MBCR was found in FRG'97 which was followed by FP and ED1.

Table 10. Effect of different fertilizers on agro-economic performance of Boro-T.Aman cropping pattern at Kendua during 1999-2000

Treatment	Grain yield (t/ha)		Straw yield (t/ha)		VC (Tk/ha)	GM (Tk/ha)	MBCR
	Boro	T.Aman	Boro	T.Aman			
ED1	5.06ab	3.78b	5.50a	4.51a	6652	57078	2.52
ED2	5.41a	4.16a	5.67a	4.81a	9177	59695	2.11
INM	5.54a	4.34a	5.79a	4.45a	11421	57879	1.53
FRG'97	4.99ab	3.77b	5.25a	4.65a	5361	58119	3.31
FP	4.79b	3.74b	4.00ab	4.82a	6142	55990	2.55
Control	3.12c	2.18c	3.31b	3.91b	0	40345	-

Table 10.1. 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

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.

Location: Rangpur
Cropping pattern: Boro-T.Aman **Year of establishment: 1999-2000**

The trial was conducted at Syedpur FSRD site, Nilphamari MLT site and Polashbari MLT site of Rangpur. The result showed that INM and ED_2 produced the significantly higher yield of 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 low due to imbalance use of chemical fertilizers. Similarly highest gross margin was also obtained from the same treatments. But the highest MBCR value was calculated from ED_1 followed by ED_2. Application of cowdung along with chemical fertilizers in INM and FP leads to increase the additional cost for fertilizer and thus reduced the respective MBCR.

Table 11. Effect of different fertilizers on agro-economic performance of Boro-T.Aman cropping pattern at different locations of Rangpur during 1999-2000

Treatment	Grain yield (t/ha)		Straw yield (t/ha)		VC (Tk/ha)	GM (Tk/ha)
	Boro	T.Aman	Boro	T.Aman		
Syedpur FSRD site						
ED1	5.19b	4.44c	6.82b	5.59c	24897	68348
ED2	6.23a	4.96ab	7.93a	6.21ab	26474	70116
INM	6.31a	5.24a	7.92a	6.69a	28312	71393
FRG'97	5.36b	4.62bc	6.75b	5.74bc	25266	60819
FP	5.45b	4.70bc	8.09a	6.02bc	27837	62018

Treatment	Grain yield (t/ha)		Straw yield (t/ha)		VC (Tk/ha)	GM (Tk/ha)
	Boro	T.Aman	Boro	T.Aman		
Control	2.04c	1.72d	3.11c	2.72d	19628	13367

Treatment	Grain yield (t/ha)		Straw yield (t/ha)		VC (Tk/ha)	GM (Tk/ha)
	Boro	T.Aman	Boro	T.Aman		
Nilphamari MLT site						
ED1	5.38bc	4.50b	6.58b	5.71bc	25029	60156
ED2	6.35ab	5.08a	7.36a	6.63a	26758	71677
INM	6.74a	5.28a	7.61a	6.73a	28596	74734
FRG'97	5.19c	4.48b	6.57b	5.62c	25003	58452
FP	5.85bc	4.56b	7.61a	6.28ab	27517	62708
Control	1.94d	1.79c	3.15c	2.79d	19417	13393
Polashbari MLT site						
ED1	6.05bc	4.66b	6.68b	5.57bc	26104	65701
ED2	6.89a	5.44a	7.69a	7.02a	28176	77819
INM	6.92a	5.50a	7.89a	7.02a	30014	76801
FRG'97	5.81c	4.59b	6.54b	5.49c	25144	64071
FP	6.47ab	4.94b	7.98a	6.13b	28249	70086
Control	2.35d	1.47c	3.13c	2.26d	19558	16252

Table 11.1. 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 + CD 10 t/ha	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 Year of establishment: 1999-2000

In wheat, significantly higher grain yield was recorded from INM and ED2 followed by ED1 and FRG'97. However, ED1 and FRG'97 produced identical yield which was statistically higher than FP. But in T.Aman rice different treatments produced identical yield only differ with FP and control treatment. In both the cases control treatment gave the lowest yield. Regarding cost and return analysis the highest gross margin was calculated from INM followed by ED2 but the MBCR was highest in ED1 followed by ED2 and FRG'97. Inclusion of cost of cowdung the fertilization cost increased in INM and therefore the MBCR decreased.

Table 12. Effect of different fertilizers on agro-economic performance of Wheat-T.Aman cropping pattern at Paba during 1999-2000

Treatment	Grain yield (t/ha)		Straw/stover yield (t/ha)		TVC (Tk/ha)	GM (Tk/ha)	MBCR
	Wheat	T.Aman	Wheat	T.Aman			
ED1	2.61b	3.95ab	3.25	5.51	6366	61051	4.43
ED2	3.12a	4.35a	2.93	5.92	8767	62856	3.42

INM	3.57a	4.70a	3.92	6.11	10547	66853	3.22
FRG'97	2.94b	4.19a	3.20	4.48	7168	57470	3.43
FP	2.71c	3.72b	3.85	5.20	5470	49215	2.99
Control	0.89d	1.92c	1.17	3.71	0	32870	-

Table 12.1. 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 Year of establishment: 1999-2000

In wheat, the yield did not differ significantly among the treatments except with FP and control. In T.Aman rice, the significantly higher yield was recorded from ED2 and INM followed by ED1 and FRG'97. The gross margin was higher in INM followed by ED2 and ED1. But the MBCR was the highest in ED1 followed by ED2. In INM, due to the inclusion of cost for cowdung reduced the incremental BCR.

Table 13. Effect of different fertilizers on agro-economic performance of Wheat-T.Aman cropping pattern at Barind during 1999-2000

Treatment	Grain yield (t/ha)		Straw yield (t/ha)		VC (Tk/ha)	GM (Tk/ha)	MBCR
	Wheat	T.Aman	Wheat	T.Aman			
ED1	2.93a	3.84b	3.23	5.54	6412	60553	4.32
ED2	3.10a	4.38a	2.95	5.94	8769	62881	3.42
INM	3.22a	4.73a	3.91	6.17	10555	64855	3.03
FRG'97	2.97a	4.15b	3.19	4.50	7173	57467	3.43
FP	2.09b	3.67c	2.83	5.27	5470	49210	2.98
Control	0.79c	1.88d	1.13	3.68	0	32870	-

Table 13.1. 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

Location: Atkapalia FSRD site, Noakhali
Cropping pattern: Fallow-Fallow-T.Aman Year of establishment: 2000

The trial was initiated with single crop based pattern and the crop was T.Aman. Most of the area of Noakhali is covered by only one crop T.Aman. In Atkapalia FSRD site the yield of rice was did not

differed significantly among the different levels of nutrients except farmers' dose (FP) and control. Regarding economics, the highest gross margin was calculated from ED2 and FRG'97. Similarly, the MBCR was also higher in FRG'97 followed by ED1.

Table 14. Effect of different fertilizers on grain yield and straw yield of Fallow-Fallow-T.Aman cropping pattern at Atkapalia FSR site during 2000

Treatment (NPKS kg/ha & CD t/ha)	Yield of T.Aman (t/ha)		TVC (Tk/ha)	GM (Tk/ha)	MBCR
	Grain	Straw			
103-21-13-0-1 (ED1)	4.05a	4.88c	15643	21877	2.40
140-25-17-0-2 (ED2)	4.40a	5.42b	16743	23947	2.28
130-19-5-0-2 + 10 t/ha CD (INM)	4.46a	5.97a	20275	21877	1.01
65-20-40-10-1 (FRG'97)	4.30a	4.82c	15566	23420	2.66
38-16-0-0 (FP)	3.51b	4.14d	15292	17010	1.02
0-0-0-0 (Control)	2.71c	3.62c	12000	13300	-

Location: Munshiganj
Cropping pattern: Potato-Jute **Year of establishment: 1999-00**

Highest tuber yield was recorded from integrated nutrient management practice that was also identical to farmers' dose followed by ED2. ED1 and FRG'97 also produced identical yield. In Jute the higher and identical fiber yield was obtained from INM, ED2 and FP followed by ED1 and FRG'97. The highest gross margin was found in INM followed by ED2. The highest MBCR was calculated from ED2 followed by INM and ED1. Due to higher fertilization cost in FP as the farmers traditionally applied an extremely high fertilizer in potato, the gross margin and MBCR was least in FP.

Table 15. Effect of different fertilizers on agro-economic performance of Potato-Jute cropping pattern at Munshiganj during 1999-2000

Treatment	Tuber/ Fiber yield (t/ha)		Stick yield (t/ha)	TVC (Tk/ha)	GM (Tk/ha)	MBCR
	Potato	Jute				
ED1	26.9c	1.50b	2.67b	54086	104085	8.53
ED2	33.5b	1.84ab	2.95ab	55806	138028	12.0
INM	34.5a	2.02a	3.58a	58362	142066	9.22
FRG'97	27.5c	1.52b	2.70b	55832	105154	6.46
FP	33.8ab	1.97a	3.53a	68360	128143	3.98
Control	20.8d	1.05c	1.82c	50000	73309	-

Table 15.1. Fertilizer doses

Treatment	Fertilizer doses (NPKS kg/ha & cowdung t/ha)	
	Potato	Jute
ED1	90-8-35-10	35-0-10-0
ED2	128-11-50-15	50-0-15-0
INM	118-6-40-15 + CD 10 t/ha	50-0-15-0
FRG'97	95-25-60-20	35-4-20-3
FP	400-150-400-0	60-0-0-0
Control	0-0-0-0	0-0-0-0

Location: Goyeshpur FSRD site, Pabna
Cropping pattern: Wheat-Jute-T.Aman **Year of establishment: 1999-00**

No significant difference in grain yield of wheat was observed among the different treatments even

with farmers' dose. Similar trend was also observed in Jute. But in T.Aman rice the higher and identical yield was obtained from ED_2, INM and FP. FRG'97 and ED_1 produced similar yield. The highest gross margin was calculated from INM followed by ED_2 and ED_1. Regarding the MBCR the highest value was recorded from ED_1which was closely followed by other treatment except Farmers' practice.

Table 16. Effect of different fertilizers on the grain yield of crops in Wheat-Jute-T.Aman cropping pattern at Goyeshpur during 1999-00

Treatment	Grain/Fiber yield			TVC (Tk/ha)	GM (Tk/ha)	MBCR
	Wheat	Jute	T.Aman			
ED_1	3.18a	1.51ab	3.50b	45646	58214	2.42
ED_2	3.29a	1.62ab	4.34a	47810	59605	2.14
INM	3.21a	1.66a	4.53a	49405	65440	2.28
FRG'97	3.10a	1.50ab	3.54b	45455	57193	2.36
FP	2.89a	1.27ab	4.24a	45866	51522	1.83
Control	1.61b	0.99b	1.93c	33295	28520	-

Table 16.1. The treatment combinations were as follows:

Treatment	Wheat	Jute	T. Aman
	NPKS kg/ha	NPKS kg/ha	NPKS kg/ha
T_1=ED_1	75-26-17-20-2.5-0.3	67-8-13-8	59-13-12-5
T_2=ED_2	107-35-24-29-3.5-0.5	94-11-18-12	81-15-16-7
T_3=IFM	97-26-19-29-3.5-0.5	94-11-18-12	81-15-16-7
T_4=FRG'97	90-20-35-10-2-0.5	65-7-20-4	70-6-20-4
T_5=FP	64-26-17-0-0-0	35-11-25-1.5	75-16-29-4
T_0=Control	(0-0-0-0)	(0-0-0-0)	(0-0-0-0)

Location: Chatmohor, Pabna
Cropping pattern: Wheat-T.Aman Year of establishment: 1999-2000

The highest grain yield of Wheat (2.91 t/ha) and T.Aman (4.8t/ha) was recorded from INM where cowdung @ 3t/ha was applied along with recommended fertilizer dose for HYG. However it was also identical to other treatments except with Farmers' practice ant control treatment. Similarly the gross margin was almost same in all the treatments except with Farmers' practice and Control. But the MBCR for fertilizer cost was highest (4.28) in FRG'97 followed by ED_1. In INM the additional cost for cowdung increased the fertilization cost which decrease the MBCR.

Table 17. Effect of different fertilizers on agro-economic performance of Wheat-T.Aman cropping pattern at Chatmohor during 1999-2000

Treatment	Grain yield (t/ha)		Straw/stover yield (t/ha)		TVC (Tk/ha)	GM (Tk/ha)	MBCR
	Wheat	T.Aman	Wheat	T.Aman			
ED1	2.81ab	4.47ab	3.97ab	5.72abc	29954	28960	3.53
ED2	2.90a	4.68a	4.10a	5.97ab	31970	29052	2.70
INM	2.91a	4.80a	3.76bc	6.32a	34341	28034	2.04
FRG'97	2.78ab	4.32ab	3.87ab	5.35bc	28635	28438	4.28
FP	2.52c	4.15b	3.51c	5.07c	29742	23776	2.82
Control	1.36d	2.20c	2.36d	2.88d	23295	5600	-

Table 17.1. Fertilizer doses

Treatment	Fertilizer doses (NPKSZn kg/ha & cowdung t/ha)	
	Wheat	T.Aman
ED1	89-30-49-15-0.6	72-11-32-4
ED2	126-41-70-27-0.75	97-13-42-5.5

INM	116-13-34-14-0.7+ CD 5t/ha	97-13-42-5.5
FRG'97	90-20-35-10-2	70-6-20-4
FP	86-26-27	72-14-21-13
Control	0-0-0-0	0-0-0-0

Location: Chandina, Comilla
Cropping pattern: Potato-T.Aus-T.Aman Year of establishment : 1999-00

Significantly higher tuber yield was obtained from INM, FP and ED2 followed by ED1 and FRG'97. In T.Aus and T.Aman almost similar trend was found. Farmers traditionally applied a very high dose of fertilizer in potato. The highest gross margin was calculated from INM followed by ED_2. Regarding the MBCR the highest value was recorded from ED_1which was closely followed by ED2 and FRG'97. However, the total yield was higher in FP but due to the excess fertilization cost the MBCR was the least.

Table 18. Effect of different fertilizers on the grain yield of crops in Potato-T.Aus-T.Aman cropping pattern at Chandina during 1999-00

Treatment	Grain/Fiber yield			VC (Tk/ha)	GM (Tk/ha)	MBCR
	Potato	T.Aus	T.Aman			
ED_1	15.9b	3.4b	4.5b	11229	117381	5.79
ED_2	17.9ab	3.8ab	5.15ab	13813	126867	5.58
INM	18.5a	3.9a	5.57a	15232	127508	4.20
FRG'97	16.2b	3.5b	4.88ab	12216	118604	5.50
FP	18.8a	4.0a	5.45a	27699	121871	3.10
Control	6.1c	1.9c	3.5c	0	63570	-

Table 18.1. The treatment combinations were as follows:

Treatment	Potato	T.Aus	T. Aman
	NPKS kg/ha	NPKS kg/ha	NPKS kg/ha
T_1=ED_1	80-11-50-13-4	51-10-55-8	51-10-55-8
T_2=ED_2	113-20-101-15-5	72-12-60-12	72-12-60-12
T_3=IFM	103-14-90-15-5+CD 10 t/ha	72-12-60-12	72-12-60-12
T_4=FRG'97	95-20-56-8-3	64-14-40-8	64-14-40-8
T_5=FP	225-117-225	90-59-100	90-59-100
T_0=Control	(0-0-0-0)	(0-0-0-0)	(0-0-0-0)

Location: Laksam, Comilla
Cropping pattern: Boro-T.Aman Year of establishment : 1999-2000

In Boro rice, significantly higher grain yield was recorded from ED2, INM and FP followed by ED1 and FRG'97. Similar trend was found in T.Aman rice also. Highest gross margin was calculated from INM followed by ED2. But the highest gross margin was found in FRG'97 followed by ED2.

Table 19. Effect of different fertilizers on Agroeconomic performance of Boro-T.Aman cropping pattern at Laksam during 1999-2000

Treatment	Grain yield (t/ha)		Straw/stover yield (t/ha)		VC (Tk/ha)	GM (Tk/ha)	MBCR
	Boro	T.Aman	Boro	T.Aman			
ED1	5.56b	4.68b	6.9	5.14	6312	73908	5.45
ED2	6.28ab	5.30a	7.6	6.48	7884	87256	6.05
INM	6.36a	5.40a	7.8	6.81	9795	89135	5.00
FRG'97	5.88b	4.73b	6.6	5.67	5747	80793	7.18

FP	6.33a	4.93ab	7.8	5.9	10554	81966	4.02
Control	3.56c	2.09c	4.2	2.73	0	39480	-

Table 19.1. Fertilizer doses

Treatment	Fertilizer doses (NPKS kg/ha & cowdung t/ha)	
	Boro	T.Aman
ED1	96-18-25-14	52-12-58-8
ED2	135-22-37-22	74-15-62-13
INM	125-17-27-22+CD 10 t/ha	74-15-62-13
FRG'97	95-17-14	45-7-25-4
FP	145-25-60	95-45-52
Control	0-0-0-0	0-0-0-0

Location: Shibpur, Norshingdi
Cropping pattern: Boro-T.Aman Year of establishment: 1999-2000

In Boro rice, significantly higher grain yield was recorded from INM and ED2 followed by other treatments. Identical yield was obtained from ED1, FRG'97 and FP. Similar trend was also found in T.Aman rice also.Highest gross margin was calculated from INM followed by ED2. Similarly the highest MBCR was found in INM followed by FRG'97.

Table 20. Effect of different fertilizers on agro-economic performance of Boro-T.Aman cropping pattern at Shibpur during 1999-2000

Treatment	Grain yield (t/ha)		Straw/stover yield (t/ha)		TVC (Tk/ha)	GM (Tk/ha)	MBCR
	Boro	T.Aman	Boro	T.Aman			
ED1	5.21b	3.62c	6.74b	3.95c	29606	31546	1.67
ED2	5.71ab	4.40ab	6.96b	4.41b	31736	35220	1.68
INM	6.46a	4.86a	8.02b	5.21a	34455	43909	2.00
FRG'97	5.56b	3.70c	7.04b	4.03b	30644	34472	1.80
FP	5.25b	3.51c	6.69b	3.83c	32388	29098	1.03
Control	2.25c	2.13d	4.08c	2.96d	21375	17767	-

Table 20.1. Fertilizer doses

Treatment	Fertilizer doses (NPKS kg/ha & cowdung t/ha)	
	Boro	T.Aman
ED1	83-21-40-3	57-9-25-2
ED2	116-30-55-5	78-12-32-3
INM	106-25-45 5 + CD 5 t/ha	78-12-32-3
FRG'97	100-15-40-10	60-8-30-4
FP	100-30-60-4	80-16-20-2
Control	0-0-0-0	0-0-0-0

Location: Kushtia
Cropping pattern: Onion-T.Aus -T.Aman Year of establishment : 1999-00

Significantly higher bulb yield was obtained from INM and ED_2 followed by other treatments. In T.Aus the trend was almost similar. But in T.Aman rice there was no significant difference among the treatments except with control.

The highest gross margin was calculated from INM followed by ED_2. Regarding MBCR the highest value was recorded from ED_2, which was closely followed by INM.

Table 21. Effect of different fertilizers on the grain yield of crops in Onion-T.Aus -T.Aman cropping pattern at Kushtia during 1999-2000

Treatment	Grain/Fiber yield			VC (Tk/ha)	GM (Tk/ha)	MBCR
	Onion	T.Aus	T.Aman			
ED_1	8.87b	3.16b	4.45a	10253	152767	6.14
ED_2	11.2a	3.85a	4.60a	11870	181100	7.61
INM	11.1a	6.92a	4.80a	13039	185356	7.25
FRG'97	9.52b	3.20b	4.35a	10372	161538	6.82
FP	9.87b	3.25b	4.66a	11942	165433	6.25
Control	5.03c	2.06c	2.25b	0	90750	-

Table 21.1. The treatment combinations were as follows:

Treatment	Onion (NPKS kg/ha)	T.Aus (NPKS kg/ha)	T. Aman (NPKS kg/ha)
T_1=ED_1	80-26-20-0-2	55-15-7-3	55-15-7-3
T_2=ED_2	110-35-20-5	75-18-10-5	75-18-10-5
T_3=IFM	100-30-20-5+CD 10 t/ha	75-18-10-5	75-18-10-5
T_4=FRG'97	100-40-60-25-2	70-6-15-4	70-6-15-4
T_5=FP	109-22-74-17-	52-25-31-4	52-25-31-4
T_0=Control	(0-0-0-0)	(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./100g 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	5.6	1.30	0.75 (L)	0.65 (O)	7.5 (L)	8.0 (L)	4.0 (M)	0.17 (L)
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	5.6	1.20	0.07 (VL)	0.62 (O)	8.0 (L)	7.8 (L)	4.0 (M)	0.17 (L)
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	8.5	1.52	0.07 (VL)	0.16 (L)	5.16 (L)	19.5 (M)	0.65 (L)	0.29 (L)
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	-
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)
Kushtia	MHL	I	8.1	2.54	0.15 (L)	0.69 (VH)	3.98 (VL)	30.0 (O)	0.82 (L)	0.36 (M)
Shibpur	MHL	I	5.62	1.70	0.13 (L)	0.17 (M)	6.1 (L)	30.8 (O)	1.17 (M)	0.22 (L)
Bagherpara	MHL	I	-	-	0.11 (L)	0.39 (H)	17.9 (M)	7.34 (VL)	3.29 (VH)	0.4 (M)
Norail	MHL	I	-	-	0.11 (L)	0.27 (M)	1.88 (VL)	36.0 (H)	2.57 VH)	0.82 (O)
Goyeshpur	MHL	I	7.7	2.06	0.12 (L)	0.23 (M)	6.5 (VL)	5.36 (M)	0.45 (M)	0.33 (O)

Chatmohor	MHL	I	7.4	1.61	0.08 (VL)	0.13 (O)	2.5 (VL)	17.67 (M)	0.81 (M)	0.20 (O)

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	BR 28	40	2nd week of Feb	3rd week of May
	T.Aman	BRRI Dhan 33	40	4th week of July	1st week of Nov
Bagherpara	Mustard	Tori-7	08	3rd week of Nov	2nd week of Feb
	Boro	BR 28	40	3rd week of Feb	Last week of May
	T.Aman	BR 11	40	Last week of July	4th week of Nov
Narikeli	Mustard	Tori-7	08	3rd week of Nov	Last week of Jan
	Boro	BRRI Dhan 29	50	1st week of Feb	Last week of May
	T.Aman	BRRI Dhan 32	50	3rd week of July	1st week of Nov
Palima	Mustard	Tori-7	10	3rd week of Nov	3rd week of Jan
	Jute	O-9897	12	3rd week of April	2nd week of Aug
	T.Aman	BRRI Dhan 33	40	2nd week of Aug	2nd week of Nov
Narikeli	Wheat	Kanchan	100	4th week of Nov	4th week of March
	Jute	O-9897	10	1st week of April	1st week of Aug
	T.Aman	BRRI Dhan 32	50	1st week of Aug	2nd week of Nov
Kishoregonj	Wheat	Kanchan	120	1st week of Dec.	3rd week of March
	Jute	Falgunitosa	08	1st week of April	1st week of Aug
	T.Aman	BR 11	50	2nd week of Aug	4th week of Nov
Lebukhali	Mungbean	Kanti	40	2nd week of Feb	4th week of April
	T.Aus	BR 2	40	1st week of May	3rd week of Aug.
	T.Aman	BR 23	40	Last week of Aug	Last week of Dec
Palima	Boro	BR 29	40	1st week of Feb	4th week of May
	T.Aman	BRRI Dhan 33	40	3rd week of July	1st week of Nov
Kendua	Boro	BR 3	40	1st week of Feb.	3rd week of May
	T.Aman	BRRI Dhan 32	40	Last week of July	3rd 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
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	O-9897	10	2nd week of April	2nd week of July
Atkapalia	T.Aman	BRRI Dhan 32	40	Last week of July	Last week of Nov
Goyeshpur	Wheat	Kanchan	120	1st week of Dec.	3rd week of March
	Jute	O-9897	08	3rd week of April	3rd week of July
	T.Aman	BR 11	50	Last week of July	3rd week of Nov
Chatmohor	Wheat	Kanchan	120	1st week of Dec.	3rd week of March
	T.Aman	BR 11	40	Last week of July	3rd week of Nov
Chandina	Potato	Diamont	1500	1st week of Dec..	2nd week of Feb.
	T.Aus	BRRI Dhan 32	40	Last week of April	3rd week of July
	T.Aman	BR 11	40	1st week of Aug.	3rd week of Nov.
Laksam	Boro	BRRI Dhan 29	40	Last week of Jan.	2nd week of May
	T.Aman	BRRI Dhan 32	40	1st week of Aug.	1st week of Dec.
Shibpur	Boro	BRRI Dhan 29	40	Last week of Jan.	3rd week of May
	T.Aman	BRRI Dhan 32	40	1st week of Aug.	1st week of Dec.
Kushtia	Onion	Taherpuri	-	1st week of Jan.	1st week of April.
	T.Aus	IR 50	40	4th week of May	1st week of Aug.
	T.Aman	BR 22	40	3rd week of Aug.	2nd week of Dec.

Integrated nutrient management for Potato-T.Aus-T.Aman rice cropping pattern

The experiment was initiated from rabi, 1996-97 at Chandina, Comilla with Potato-T.aus- T.aman cropping pattern in medium highland area under irrigated condition to develop a cropping pattern based fertilizer recommendation considering carryover effect of nutrient in Potato-T.aus-T.aman cropping pattern. But the experiment was could not be completed as the crops were damaged due to flood during 1997-98 and 1998-99 and in 1999-00 the experiment was started again. The experiment was laid out in RCB design with five dispersed replications. Different fertilizer combinations were tested in 8mx5m unit plot area. Treatments are shown below-

Potato	T.Aus	T.Aman
T_1= Absolute control	T1= Absolute control	T_1= Absolute control
T_2= RF for MYG (120-70-120-20-4kg/ha of N, P, K, S and Zn)	T_2= RF for MYG	T_2= RF for MYG
T_3= Soil test based fertilizer rate for MYG (150-40-150-10 kg/ha of N,P,K and S)	$T_{3.1}$= 100% nutrient rate $T_{3.2}$= 100% N+66% others $T_{3.3}$= 100% N+33% others $T_{3.4}$= 100% N+0	$T_{3.1}$= 100% nutrient rate $T_{3.2}$= 100% N+66% others $T_{3.3}$= 100% N+33% others $T_{3.4}$= 100% N+0
T_4= T3+CD 10t/ha	$T_{4.1}$= 100%+66% others $T_{4.2}$= 100%+33% others	$T_{4.1}$= 100%+66% others $T_{4.2}$= 100%+33% others
T_5= Farmers' dose (225-270-225 kg/ha of NPK)	T_5= Farmers' dose	T_5= Farmers' dose

Potato variety Diamont was planted in last week of November and harvested in 3rd week of February. T.Aus (BR-22) was transplanted in last week of April and harvested in 3rd week of July. Similarly T.Aman rice (BRRI Dhan-32) was transplanted in 1st week of August and harvested in 2nd week of November.

In potato superior tuber yield (19.2 t/ha) was recorded from soil test base recommended fertilizer dose for HYG along with 10 t/ha cowdung which was also identical to farmers' dose and STB for MYG (without cowdung). Application of cowdung increases the yield about 30%. In farmers dose they applied a extremely high fertilizer in potato.

In T.Aus and T.Aman 66% recommended dose of PK along with full dose of N produced identical yield with full recommended dose of NPK. Therefore it was found that at least 33% PK could be reduced in T.Aus and T.Aman if the potato grown with full recommended dose of NPK. But when potato grown with recommended fertilizer for HYG along with cowdung the succeeding crops T.Aus and T.Aman produced identical yield with full dose of recommended fertilizer when grown with even 33% PK+full N.

From cost and return analysis it was found that the highest gross margin (112625Tk/ha) was calculated from ($T_{4.1}$) soil test based fertilizer dose for HYG along with cowdung in potato and 66% of recommended PK with full dose of N in T.Aus and T.Aman followed by 33% recommended dose with full N. But the highest MBCR was obtained from $T_{3.3}$ where potato grown with STB fertilizer dose for HYG and succeeding crops grown with 33% PK+full N followed by $T_{4.1}$.

Table 1. Agro-economic performance of Potato-T.Aus - T.Aman cropping pattern at Chandina, Comilla during 1999-2000

Treat	Fertilizer dose (NPKSZn kg/ha)			Tuber/grain yield (t/ha)			VC (Tk/ha)	GM (Tk/ha)	MBCR
	Potato	T.Aus	T.Aman	Potato	T.Aus	T.Aman			
T_1	0-0-0-0	0-0-0-0	0-0-0-0	6.89c	1.98c	2.12d	0	36014	
T_2	120-30-100-8-2	70-12-25	70-12-25	15.2b	3.44ab	4.78b	13350	89790	4.03
T3.1	150-18-125-10	90-12-33-10	90-12-33-10	17.8ab	3.74ab	5.09ab	17937	97273	3.41
T3.2		90-8-23-7	90-8-23-7		3.62ab	4.98b	14285	99315	4.43
T3.3		90-4-11-3	90-4-11-3		3.0b	3.89bc	10559	91071	5.21
T3.4		90-0-0-0	90-0-0-0		2.72bc	3.35c	6843	89047	7.75
$T_{4.1}$	150-18-125-10+CD 10t/ha	90-8-23-7	90-8-23-7	19.2a	4.39a	5.69a	15535	112625	4.93
T4.2		90-4-11-3	90-4-11-3		3.53ab	5.14ab	11647	106643	6.06
T_5	225-100-180	90-30-50	90-30-50	17.5ab	4.31a	5.65a	24141	98079	2.57

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

The experiment was conducted at 4 different locations during 1998-99 to 1999-2000 with 8 treatments and 6 (six) dispersed replications to see the effect of Boro rice straw incorporation on the yield of succeeding T.Aman rice. Boro rice was grown with recommended fertilizer and the succeeding T.Aman rice was grown as per treatment mentioned below-

1. T.Aman grown with RF_2
2. ⅓ Boro rice straw ($^2/_3$ should be harvested from top) incorporation then T.Aman with RF_2
3. $^2/_3$ Boro rice straw (⅓ 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).

Location: Mymensingh Year of conduction:1998-99 to 1999-2000

Boro rice' 98-99: About 4 t/ha and 4.5 t/ha of grain and straw yield, respectively, were recorded from recommended dose of fertilizers. Boro rice was harvested at different height as per treatment. The highest amount of Boro rice straw (3.73 t/ha) was added when 2/3 rd of straw was incorporated into the soil. About 2.7 t/ha and 2.0 t/ha of rice straw were added in the soil from 1/3 rd and farmers' practice, respectively.

Performance T. Aman rice: Two years of data showed that grain yield did not vary significantly with different treatments. The effect of Boro rice straw on the yield of T.Aman rice was not evident. However, the highest grain yield was recorded from T_3 where 2/3rd Boro rice straw was incorporated along with recommended fertilizer for MYG was applied. Similarly, the highest gross margin (19765 Tk/ha) and BCR (2.65) was also calculated from the same treatment.

Performance of Boro rice: In Boro rice of the second and 3rd cycle, no significant differences in the yield were observed due to the addition of different amount of rice straw in 1998-99. In this experiment it was found that the incorporation of Boro rice straw could not influence significantly on the yield of succeeding T.Aman rice. Similar result was found in two years of experimentation. The study should be continued for another crop cycles to assess the accumulation of organic matter, improved soil fertility and thereby increase soil health and production of Boro-T. Aman rice cropping system.

Table 1. Performance of Boro rice under Boro-Fallow-T.Aman cropping pattern at Netrokona MLT site during rabi- 98-99

Grain yield (t/ha)	Straw yield (t/ha)
4.06	4.49

Table 2. Rice straw in corporated in to the soil after Boro harvest during 98-99 and 1999-2000

Treatment	Rice straw incorporated (t/ha)	
	1998-99	1999-2000
T_1 = (RF_2-30 Kg N/ha)	1.94	2.12
T_2 = (1/3 Straw+RF_2)	2.65	2.86
T_3 = (2/3 Straw +RF_2)	3.74	3.59
T_4 = ((1/3 Straw+65-22-5-20-5 Kg NPKSZn/ha)	2.62	2.70
T_5 = (2/3 Straw+50-18-16-20-5Kg NPKSZn/ha)	3.68	3.92
T_6 = (HYG- RF_1 76-16-46-11-1.5Kg NPKSZn/ha)	2.01	2.15
T_7 = (MYG- RF_2 60-8-30-4-0 Kg NPKSZn/ha)	1.95	2.12
T_8 = (Farmers practice)	1.97	2.09

Table 3. Effect of rice straw on agro-economic performance of T.Aman rice at Netrakona during 1999

Treatment	Grain yield (t/ha)		Straw yield (t/ha)		TVC (Tk/ha)	GM (Tk/ha)	B CR
	1999	2000	1999	2000			
T_1 = (RF_2-30 Kg N/ha)	3.80	4.00	4.30	4.89	11599	17151	2.40
T_2 = (1/3 Straw+RF_2)	3.93	4.34	4.68	4.95	11990	14080	2.17
T_3 = (2/3 Straw +RF_2)	4.19	4.90	4.85	5.46	11990	19765	2.65
T_4 = (1/3 Straw+65-22-25-20-5 Kg NPKSZn/ha)	4.06	4.66	4.73	5.28	13852	16933	2.22
T_5 = (2/3 Straw+50-18-16-20-5Kg NPKSZn/ha)	3.96	4.68	4.76	5.16	13596	16504	2.21
T_6 = (HYG- RF_1 76-16-46-11-1.5Kg NPKSZn/ha)	4.26	4.74	4.96	5.32	13661	18494	2.35
T_7 = (MYG- RF_2 60-8-30-4-0 Kg NPKSZn/ha)	4.00	4.56	4.65	5.27	11990	18290	2.53
T_8 = (Farmers practice-105-23-30-21 NPKS Kg./ha)	3.89	4.28	4.56	5.03	14174	15381	2.09
Level of significance	NS	NS	NS	NS			

Table 4. Performance of Boro rice under Boro-Fallow-T.Aman cropping pattern at Netrokona MLT site during rabi- 99-2000

Treatment	Grain yield (t/ha)		Straw yield (t/ha)	
	1999-2000	2000-01	1999-2000	2000-01
T_1	4.38	4.85	5.33	5.62
T_2	4.16	5.04	4.87	5.68
T_3	4.24	5.25	5.00	6.09
T_4	3.95	5.05	4.64	5.83
T_5	4.23	5.08	5.02	5.88
T_6	4.28	4.96	4.96	5.81
T_7	4.31	4.87	5.03	5.79
T_8	4.03	4.89	4.72	5.64

Location: Rangpur **Year of conduction: 1999-2000**

Performance of T.Aman rice: Significantly higher grain yield was obtained from T5, T4 and T2. It indicates that incorporation of 2/3rd Boro rice straw along with recommended fertilizer for MYG or a reduced rate of MYG produced identical yield. Therefore a substantial amount of NPK could be reduced in T.Aman rice if 2/3rd Boro rice straw incorporated in the soil.

Table 5. Effect of rice straw on agro-economic performance of T.Aman rice at Rangpur during 1999-2000

Treatment	Grain yield (t/ha)	Straw yield (t/ha)	TVC (Tk/ha)	GM (Tk/ha)	BCR
T_2 = (1/3 Straw+RF_2)	4.55bc	5.46bc	26461	59799	3.26
T_3 = (2/3 Straw +RF_2)	5.00ab	6.08b	27436	63134	3.30
T_4 = (1/3 Straw+65-22-25-20-5 Kg NPKSZn/ha)	4.86b	5.83b	28245	61080	3.16
T_5 = (2/3 Straw+50-18-16-20-5Kg NPKSZn/ha)	5.21ab	6.19ab	28638	63667	3.22
T_6 = (HYG- RF_1 76-16-46-11-1.5Kg NPKSZn/ha)	5.46a	6.66a	25852	68688	3.66
T_7 = (MYG- RF_2 60-8-30-4-0 Kg NPKSZn/ha)	4.24c	5.23c	25211	58854	3.33
T_8 = (Farmers practice-105-23-30-21 Kg NPKS/ha)	4.78b	6.03b	26104	62681	3.40

Location: Pabna **Year of conduction: 1999-2000**

Performance of Boro rice: About 4.89 t/ha and 7.88 t/ha of grain and straw yield, respectively, were recorded from recommended fertilizer.

Table 6. Performance of Boro rice under Boro-Fallow-T.Aman cropping pattern at Pabna MLT site during rabi- 98-99

Grain yield (t/ha)	Straw yield (t/ha)
4.89	7.88

Performance of T.Aman rice: No significant difference was observed in the yield of T.Aman rice. However the highest yield was obtained from T4, which was identical to other treatments. Therefore, T.Aman rice could be grown with reduced fertilizer (MYG) without significant reduction of grain yield if Boro rice straw incorporated in the soil.

Table 7. Effect of rice straw on agro-economic performance of T.Aman rice at Pabna during 1999-2000

Treatment	Grain yield (t/ha)	Straw yield (t/ha)	TVC (Tk/ha)	GM (Tk/ha)	BCR
T_1=RF2	2.73b	3.54	34040	23970	1.70
T_2 = (1/3 Straw+RF_2)	3.13a	4.07	34040	25785	1.73
T_3 = (2/3 Straw +RF_2)	2.98ab	3.87	34040	24135	1.63
T_4 = (1/3 Straw+65-22-25-20-5 Kg NPKSZn/ha)	3.28a	4.26	35611	25359	1.69
T_5 = (2/3 Straw+50-18-16-20-5Kg NPKSZn/ha)	3.23a	4.20	35023	25082	1.68
T_6 = (HYG- RF_1 76-16-46-11-1.5Kg NPKSZn/ha)	3.10a	4.03	35000	24995	1.70
T_7 = (MYG- RF_2 60-8-30-4-0 Kg NPKSZn/ha)	3.23a	4.20	34387	27800	1.81
T_8 = (Farmers practice-105-23-30-21 NPKS Kg/ha)	3.08a	4.00	35108	18862	1.53

Location: Comilla **Year of conduction: 1999-2000**

Performance of Boro rice: About 5.15 t/ha and 6.9 t/ha of grain and straw yield, respectively, were recorded from recommended fertilizer.

Table 8. Performance of Boro rice under Boro-Fallow-T.Aman cropping pattern at Comilla MLT site during rabi- 98-99

Grain yield (t/ha)	Straw yield (t/ha)
5.15	6.9

Performance of T.Aman rice: No significant difference was observed in the yield of T.Aman rice. However the highest yield was obtained from T2, which was identical to other treatments. It is clear from the study that T.Aman rice could be grown with reduced fertilizer (MYG) without significant reduction of grain yield if Boro rice straw incorporated in the soil.

Table 9. Effect of rice straw on agro-economic performance of T.Aman rice at Comilla during 1999-2000

Treatment	Grain yield (t/ha)	Straw yield (t/ha)	TVC (Tk/ha)	GM (Tk/ha)	BCR
T_2 = (1/3 Straw+RF_2)	4.52	4.49	31503	67472	3.14
T_3 = (2/3 Straw +RF_2)	4.65	5.35	31572	69128	3.19
T_4 = (1/3 Straw+65-22-25-20-5 Kg NPKSZn/ha)	4.45	5.27	32331	66889	3.07
T_5 = (2/3 Straw+50-18-16-20-5Kg NPKSZn/ha)	4.42	5.58	31740	67580	3.13
T_6 = (HYG- RF_1 76-16-46-11-1.5Kg NPKSZn/ha)	4.29	4.96	32946	64844	2.97
T_7 = (MYG- RF_2 60-8-30-4-0 Kg NPKSZn/ha)	4.06	5.75	32434	65536	3.02
T_8 = (Farmers practice-105-23-30-21 NPKS Kg./ha)	4.30	5.40	35541	60759	2.71
Level of significance	NS	NS			

Development of fertilizer recommendation for T.Aus (HYV)-T.Aman (HYV)-Fallow system under rainfed condition at Surma-Kushyara floodplain soil

The experiment was conducted at FSRD site, Golapgonj, Sylhet under rainfed condition in medium high land of Surma-Kushyara flood plain soil during the year 2000 to determine the profitable fertilizer dose for T.Aus-T.Aman cropping pattern. The trial was laid out in RCB design with 5 dispersed replications. Six different treatments were tested. T.aus was transplanted in 1st week of June and harvested in mid. August and T.aman was transplanted in 1st week of September and harvested in last week of November. Crop variety BR 26 and BRRI Dhan 32 was used for T.Aus and T.Aman, respectively.

In T.Aus rice, the identical grain yield was recorded from T_1 and T_2 where recommended dose of fertilizer for HYG and MYG were applied which were significantly differed with other treatments. Reduction of S and Zn from recommended dose significantly reduced the yield. The lowest yield was recorded from farmers' practice.

Similarly, in T. aman rice, similar yield was obtained from recommended fertilizer for HYG and MYG and reduction of full or half amount of PK from recommended fertilizer dose for MYG significantly reduced the grain yield. The higher gross margin and BCR were also obtained from the same treatment.

Table : Treatments and fertilizer level for T.Aus and T.Aman

Treatment		Fertilizer level(N-P-K-S-Zn kg/ha)	
T. Aus	T. Aman	T. Aus	T. Aman
T_1 = RF_1	RF_1	77-23-54-9-1	77-15-50-4-0
T_2 = RF_2	RF_2	57-19-42-7-1	57-12-40-3-0
T_3 = RF_2-S-Zn	RF_2	57-19-42-0-0	57-12-40-3-0
T_4 = RF_2-S-Zn	RF_2-P-K	57-19-42-0-0	57-0-0-3-0
T_5 = RF_2-S-Zn	RF_2-1/2 P-1/2 K	57-19-42-0-0	57-6-20-3-0
T_6 = FP	FP	65-8-10-0-0	65-8-10-0-0

RF_1 = Recommended fertilizer dose for high yield goal
RF_2 = Recommended fertilizer dose for moderate yield goal
FP = Farmer's practice.

Table 2. Effect of different level of fertilizers on the agro-economic performance of T.Aus- T.Aman cropping pattern at FSRD, Golapganj, Sylhet during 1998-99

Treatment	Grain yield (t/ha)		Straw yield (t/ha)		TVC	GM	BCR
	T.Aus	T.Aman	T.Aus	T.Aman	(Tk/ha)	(Tk./ha)	
T_1	4.33a	5.28a	5.31a	6.70a	31111	66109	2.32
T_2	4.21ab	5.05a	5.11ab	6.28ab	29831	64929	2.34
T_3	3.98c	4.71a	4.82c	5.19bc	29491	57774	2.11
T_4	3.89d	4.27b	5.02c	5.45cd	28219	56786	2.13
T_5	3.91bc	4.52b	4.92bc	5.53d	28855	59545	2.20
T_6	3.28e	3.83c	4.23c	5.07d	27888	52572	1.99

Appendix table1. Crop management practices

Site	Crop	Variety	Seed rate (kg/ha)	Planting time	Harvesting time
Netrokona	Boro	BR 3	40	2nd week of Feb	Last week of May
	T.Aman	BRRI Dhan 29	40	4th week of July	Last week of Nov
Nilphamari	Boro	BRRI Dhan 29	40	1st week of Feb	Last week of May
	T.Aman	BR 11	40	3rd week of July	4th week of Nov
Goyeshpur	Boro	BRRI Dhan 29	50	1st week of Feb	Last week of May
	T.Aman	BR 11	50	3rd week of July	3rd week of Nov
Comilla	Boro	BRRI Dhan 29	4040	1st week of Feb	2nd week of June
	T.Aman	BRRI Dhan 33		2nd week of Aug	2nd week of Nov

Subproject: Crop Response to Added Nutrients

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

The experiment on six dominant cropping patterns was conducted during 1997-98 to 1999-2000 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 □ 1.34	HYG □1.34	HYG □1.34	HYG □1.34

Different cropping patterns tested in different locations

Cropping pattern	Locations
Mustard – Boro - T.Aman	Bagherpara, Palima, Narikeli, Muktagacha
Boro-T.Aman	Phulpur, Netrokona, Hathazari, Shibpur, Laksam
Wheat-T.Aman	Barind, Paba, Goyeshpur
Potato-Jute	Munshiganj
Onion-T.Aus-T.Aman	Kushtia
Mungbean-T.Aus-T.Aman	Lebukhali

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

Mustard

Seed yield of mustard increased with the increase of nitrogen levels. A response curve was drowning from the data but it is not possible to find out the optimum level from this curve as the yield increased linearly. Therefore the crop will be grown with another higher level of N to find out the optimum level. However, a response of PK and S was observed to some extent and the optimum level for agronomic yield and for economic yield was calculated from the response curve.

Boro rice

Grain yield of Boro rice increased up to 120 kg N/ha and there after the yield reduced slowly. More or less similar trend was found in PK and S. But the response was not very distinct. Yield increases slowly to some extent and then tended to decrease. From the response curve the optimum level was find out.

T.Aman rice

Grain yield increased with the increase of N levels up to60 kg N/ha and thereafter it becomes stagnant. Similarly the response was found in PK and S up to 16, 60and 5 kg/ha of PK and S, respectively. From the response curve the optimum level was calculated.

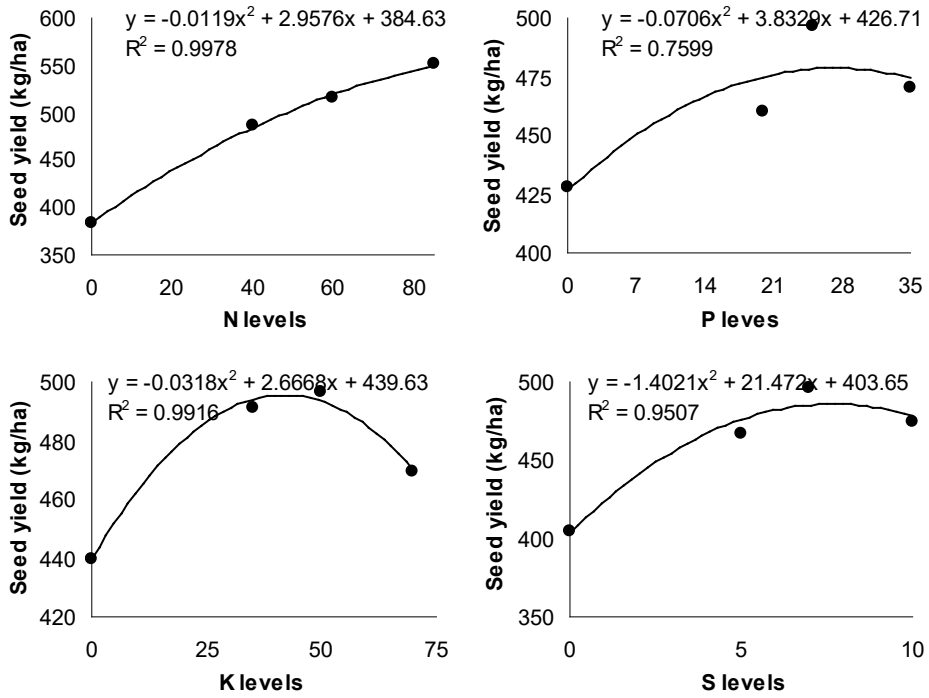


Figure 1. Response of Mustard to NPKS grown in Mustard-Boro-T.Aman cropping pattern

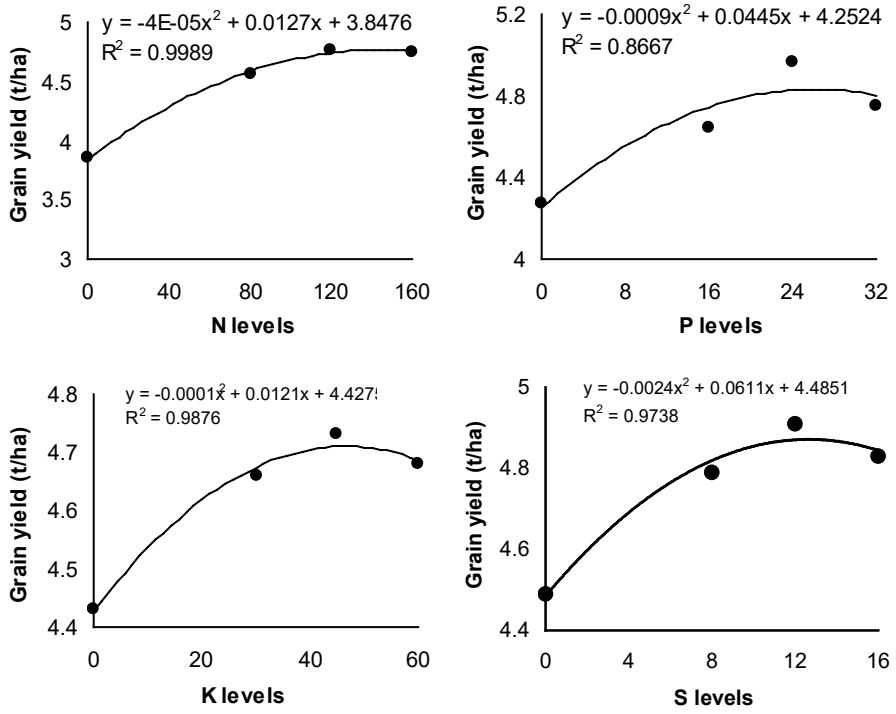


Figure 2. Response of Boro to NPKS grown in Mustard-Boro-T.Aman cropping pattern

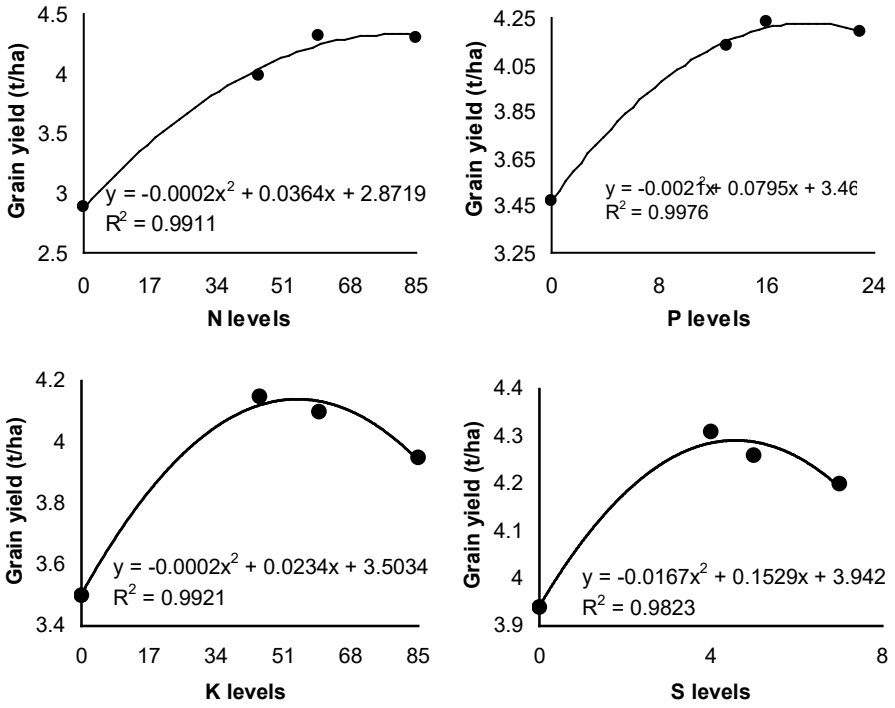


Figure 3. Response of T.Aman to NPKS grown in Mustard-Boro-T.Aman cropping pattern

From the response curve both agronomically and economically optimum level of different nutrients was calculated and it was evident that the agronomicaly optimum level is much higher than economically optimum level.

Crop	Agronomically optimum dose				Economically optimum dose			
	N	P	K	S	N	P	K	S
Mustard	-	27	42	8	-	15	25	5
Boro	160	25	60	13	90	16	21	8
T.Aman	91	19	58	5	65	15	33	5

Table 1. Effects of different levels of fertilizer nutrients on the yield of crops in Mustard-Boro-T.Aman cropping pattern at Muktagacha, Mymensingh, 1999-2000 to 2000-01

Nutrient levels (kg/ha)			Grain yield		
Mustard	Boro	T.Aman	Mustard (kg/ha)	Boro (t/ha)	T.Aman (t/ha)
N levels					
0	0	0	384.0	3.85	2.88
40	80	45	487.5	4.57	3.98
60	120	60	515.0	4.76	4.32
80	160	85	551.5	4.75	4.3
P levels					
0	0	0	428.0	4.27	3.47
20	16	13	460.0	4.64	4.13
25	24	16	496.5	4.97	4.23
35	32	23	470.0	4.75	4.19
K levels					

Nutrient levels (kg/ha)			Grain yield		
Mustard	Boro	T.Aman	Mustard (kg/ha)	Boro (t/ha)	T.Aman (t/ha)
0	0	0	440.0	4.43	3.5
35	30	45	491.5	4.66	4.15
50	45	60	496.5	4.73	4.1
70	60	85	469.5	4.68	3.95
S levels					
0	0	0	405.0	4.49	3.94
5	8	4	466.5	4.79	4.31
7	12	5	496.5	4.91	4.26
10	16	7	475.0	4.83	4.2

Location: Phulpur, Mymensingh
Cropping pattern: Boro -T.Aman Year of establishment: 1998-1999 to 1999-2000

In Boro rice, grain yield increased markedly with the increase of nitrogen up to 96 kg N/ha and after that level tended to decrease. In case of P, K and S a slow response was found and the yield increased up to the application of 12 kg, 30 kg and 14 kg/ha of P, K and S respectively. In T. Aman rice, a positive response of N was found and the grain yield increased up to 95 kg N/ha. Response of P, K and S was not clear. The optimum level of the nutrient for the crop was not possible to find out.

From the response curve the optimum doses of the nutrients for different crops were calculated.

Crop	Agronomically optimum dose				Economically optimum dose			
	N	P	K	S	N	P	K	S
Boro	110	10	30	13	70	8	18	10
T.Aman	85	5	-	-	60	5	-	-

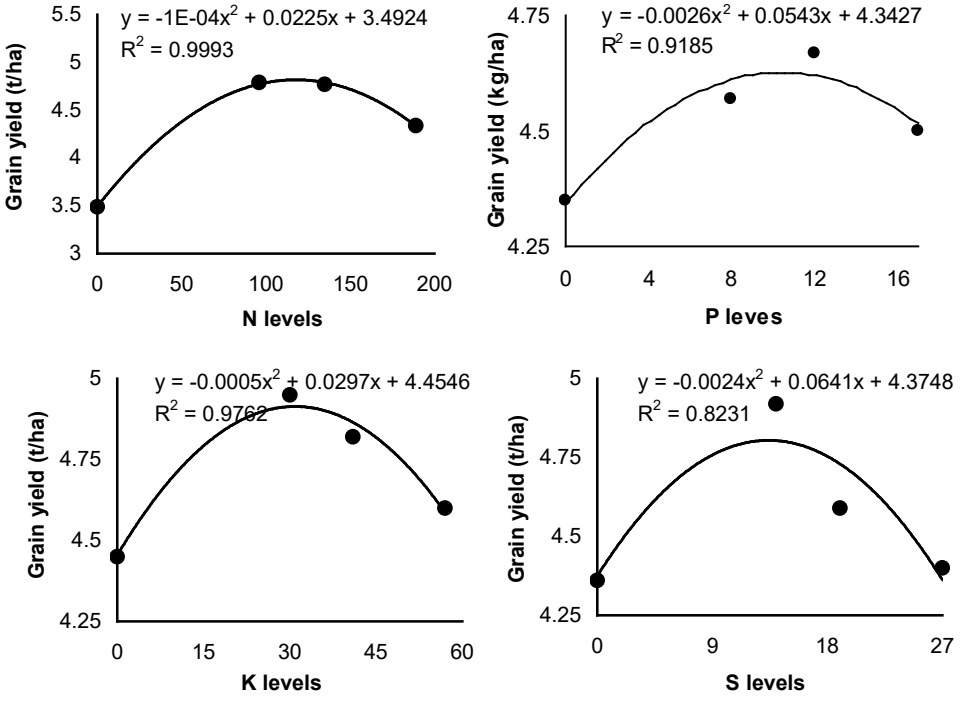


Figure 4. Response of Boro to NPKS grown in Boro-T.Aman cropping pattern at Phulpur, Mymensingh

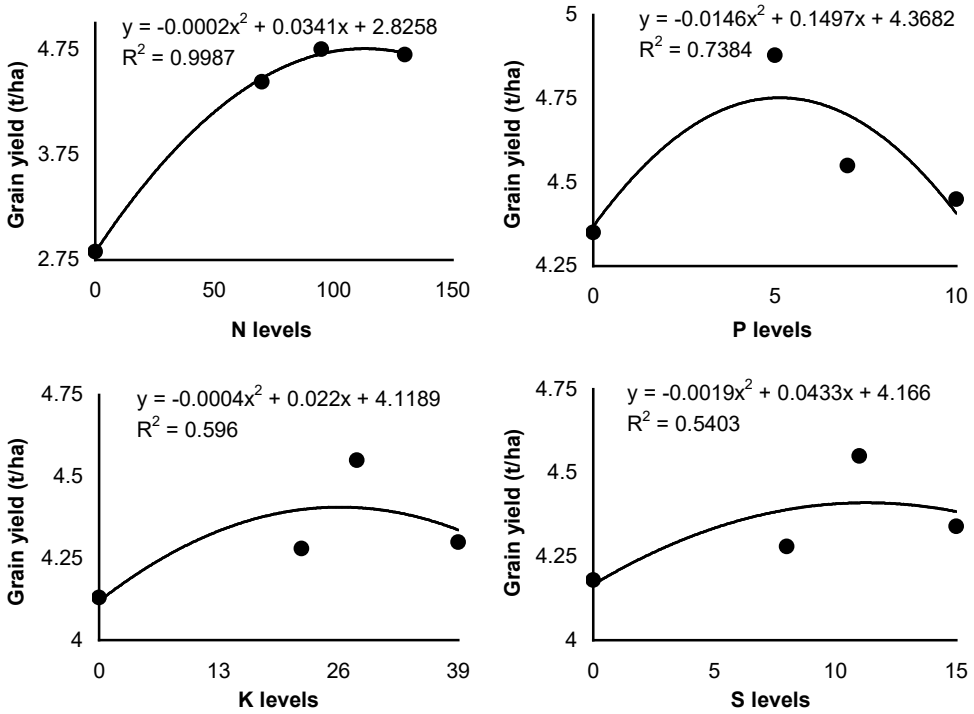


Figure 5. Response of T.Aman to NPKS grown in Boro-T.Aman cropping pattern at Phulpur, Mymensingh

Table 2. Effects of different levels of fertilizer nutrients on the yield of crops in Boro-T.Aman cropping pattern at Phulpur, Mymensingh, 1998-99 to 1999-2000

Nutrient levels (kg/ha)		Grain yield (t/ha)	
Boro	T.Aman	Boro	T.Aman
N levels			
0	0	3.49	2.83
96	70	4.79	4.44
135	95	4.77	4.75
189	130	4.34	4.70
P levels			
0	0	4.35	4.35
8	5	4.57	4.88
12	7	4.67	4.55
17	10	4.50	4.45
K Levels			
0	0	4.45	4.13
30	22	4.95	4.28
41	28	4.82	4.55
57	39	4.60	4.30
S Levels			
0	0	4.36	4.18
14	8	4.92	4.28
19	11	4.59	4.55
27	15	4.40	4.34

Location: Netrokona
Cropping pattern: Boro -T.Aman Year of establishment: 1998-1999 to 1999-2000

In Boro rice, grain yield increased linearly with the increase of nitrogen and the highest grain yield was

recorded from the highest N level. In case of P, K and S a slow response was found and the yield increased up to the application of 45 kg, 40 kg and 10 kg/ha of P, K and S respectively. In T. Aman rice, a positive response of N was found and the grain yield increased up to 95 kg N/ha and thereafter started to fall. Response of P and K was observed to some extent. A slow response of crop to S was observed and the yield increased linearly.

From the response curve the optimum doses of the nutrients for different crops were calculated.

Crop	Agronomically optimum dose				Economically optimum dose			
	N	P	K	S	N	P	K	S
Boro	-	37	40	17	-	15	20	8
T.Aman	164	18	16	-	75	10	12	-

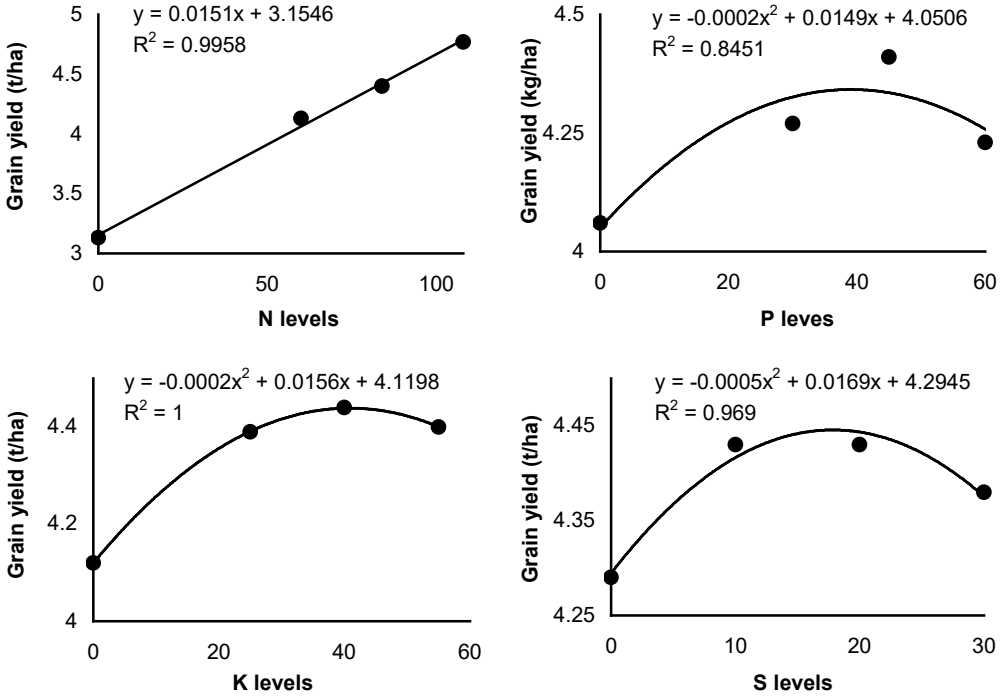


Figure 6. Response of Boro to NPKS grown in Boro-T.Aman cropping pattern at Netrokona, Mymensingh

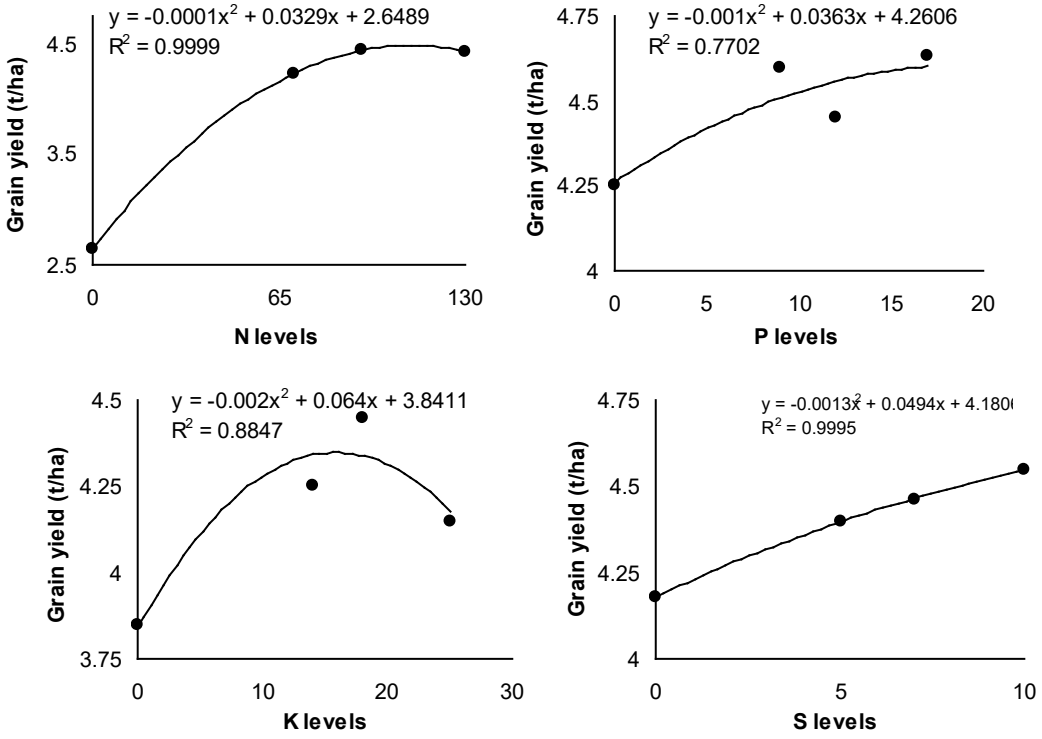


Figure 7. Response of T.Aman to NPKS grown in Boro-T.Aman cropping pattern at Netrokona, Mymensingh

Table 3. Effects of different levels of fertilizer nutrients on the yield of crops in Boro-T.Aman cropping pattern at Netrokona, 1998-99 to 1999-2000

Nutrient levels (kg/ha)		Grain yield (t/ha)	
Boro	T.Aman	Boro	T.Aman
N levels			
0	0	3.13	2.65
60	70	4.13	4.22
84	94	4.44	4.45
108	130	4.77	4.43
P levels			
0	0	4.06	4.25
30	9	4.27	4.60
45	12	4.41	4.45
60	17	4.23	4.56
K Levels			
0	0	4.12	3.85
25	14	4.39	4.25
40	18	4.44	4.45
55	25	4.40	4.15
S Levels			
0	0	4.29	4.18
10	5	4.43	4.40
20	7	4.43	4.46
30	10	4.38	4.55

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. Almost similar result was observed in three years of study. But the response of P was not evident. However, yield trended to increase up to 44 kg/ha. Application of K and S up to 124 kg/ha and 20 kg/ha, respectively, found to increase the yield. Yield of T.Aus rice increased markedly with the increase of nitrogen level and the highest grain yield was recorded from 70 kg N/ha. But PK and S have no response on the yield. However, the yield increased slowly to some extent.

Yield of T.Aman rice increased sharply up to 70 kg N/ha and thereafter the trend reduced slowly. Potassium, K and S failed to produce any significant effect on the yield of rice. However, a slow positive response towards the yield was observed to certain level.

From the response curve the optimum dose of the nutrient elements for the crops were calculated.

Crop	Agronomically optimum dose				Economically optimum dose			
	N	P	K	S	N	P	K	S
Onion	172	54	150	20	145	12	70	18
T.Aus	75	16	27	9	67	10	27	8
T.Aman	81	18	30	10	55	10	30	8

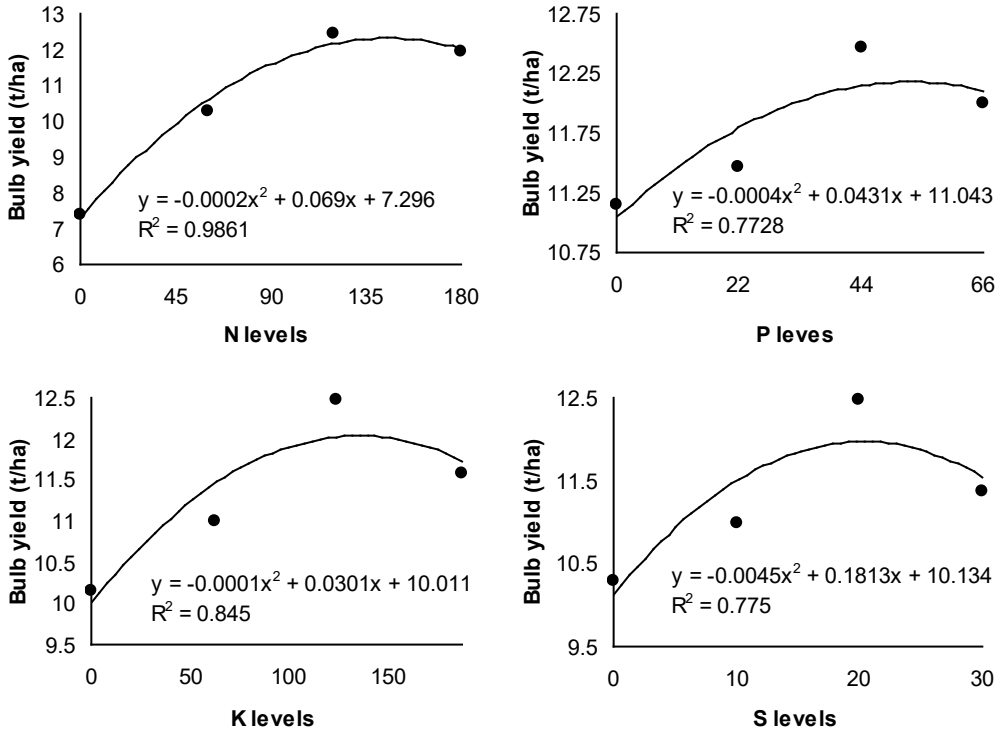


Figure 8. Response of Onion to NPKS grown in Onion-T.Aus-T.Aman cropping pattern at Kushtia Sadar during 1998-99 to 2000-01

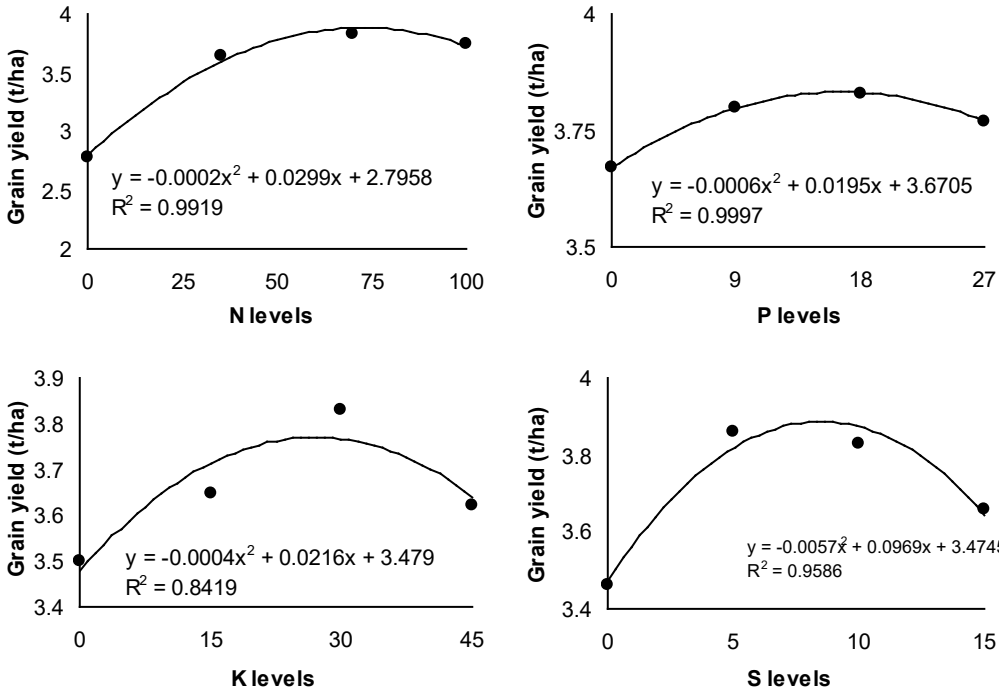


Figure 9. Response of T.Aus to NPKS grown in Onion-T.Aus-T.Aman cropping pattern at Kushtia Sadar during 1998-99 to 2000-01

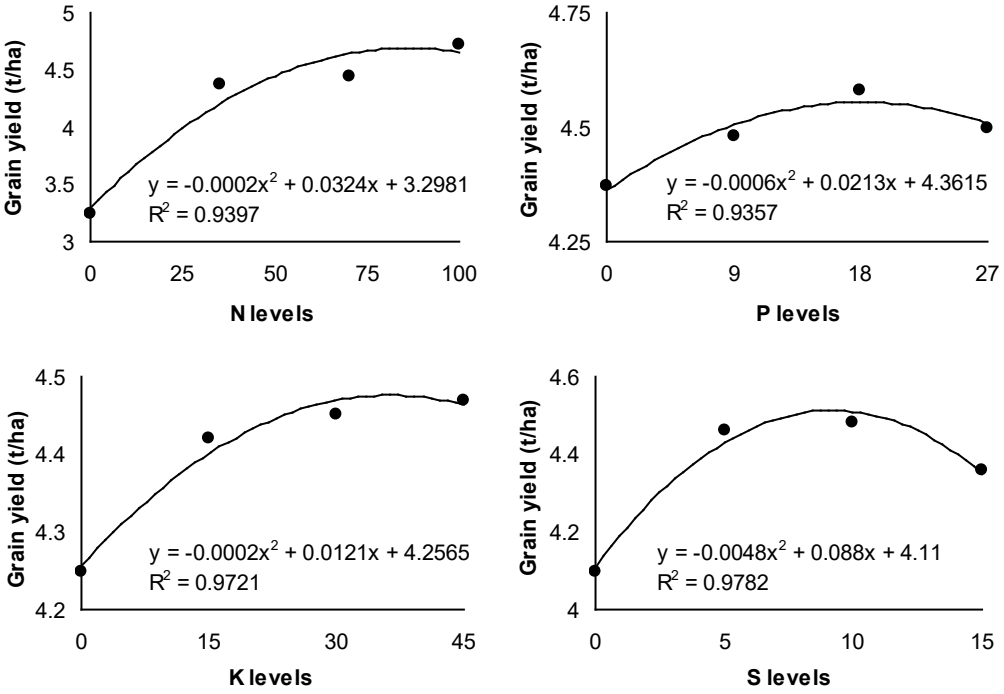


Figure 10. Response of T.Aman to NPKS grown in Onion-T.Aus-T.Aman cropping pattern at Kushtia Sadar during 1998-99 to 2000-01

Table 4. Effects of different levels of fertilizer nutrients on the yield of crops in Onion- T.Aus-T.Aman cropping pattern at Kushtia, 1998-99 to 2000-01

Nutrient levels (kg/ha)			Grain yield/ Bulb yield (t/ha)		
Onion	T.Aus	T.Aman	Onion	T.Aus	T.Aman
N levels					
0	0	0	7.40	2.78	3.24
60	35	35	10.27	3.64	4.38
120	70	70	12.47	3.83	4.45
180	100	100	11.92	3.75	4.73
P levels					
0	0	0	11.15	3.67	4.37
22	9	9	11.67	3.80	4.48
44	18	18	12.47	3.83	4.58
66	27	27	12.00	3.77	4.50
K levels					
0	0	0	10.16	3.50	4.25
62	15	15	11.00	3.65	4.42
124	30	30	12.47	3.83	4.45
187	45	45	11.59	3.62	4.40
S levels					
0	0	0	10.30	3.46	4.10
10	5	5	11.00	3.86	4.46
20	10	10	12.47	3.83	4.48
30	15	15	11.38	3.66	4.36

Location: Munshigonj
Cropping pattern: Potato – Jute Year of Conduction: 1997-98 to 1999-2000

Potato

The average of three years 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.

From the response curve the following fertilizer doses was found optimum for Potato and Jute in Munshigonj.

Crop	Agronomically optimum dose				Economically optimum dose			
	N	P	K	S	N	P	K	S
Potato	196	23	70	25	120	15	50	15
Jute	73	13	40	18	60	10	30	15

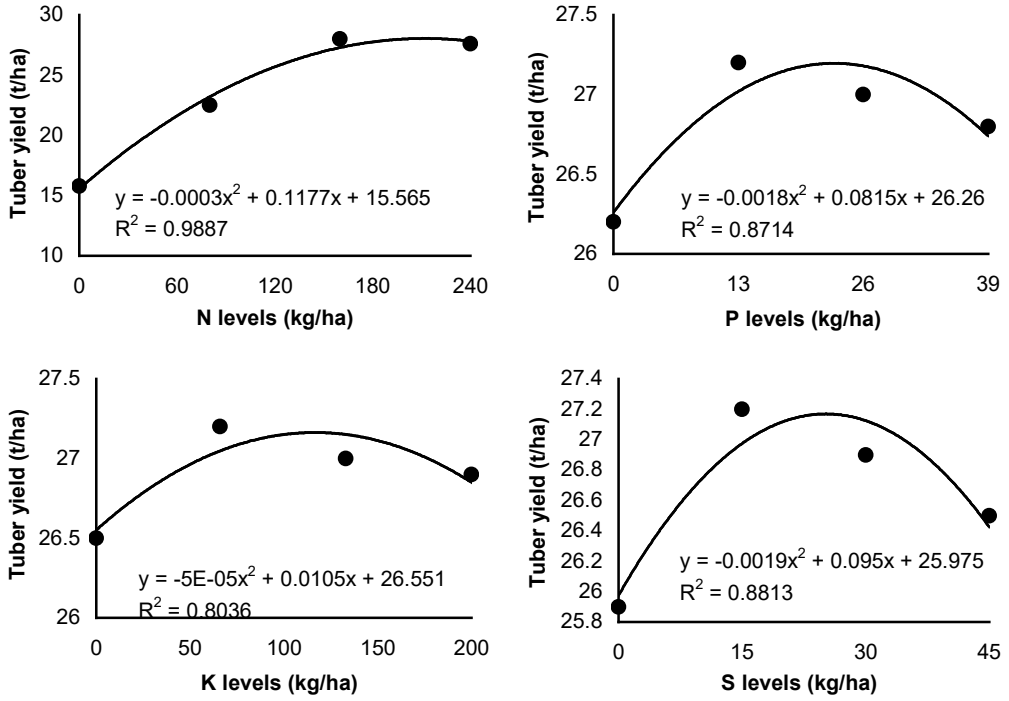


Figure 11. Response of Potato to N, P, K and S grown in Potato - Jute cropping pattern at Munshiganj during1997-98 to 1999-2000

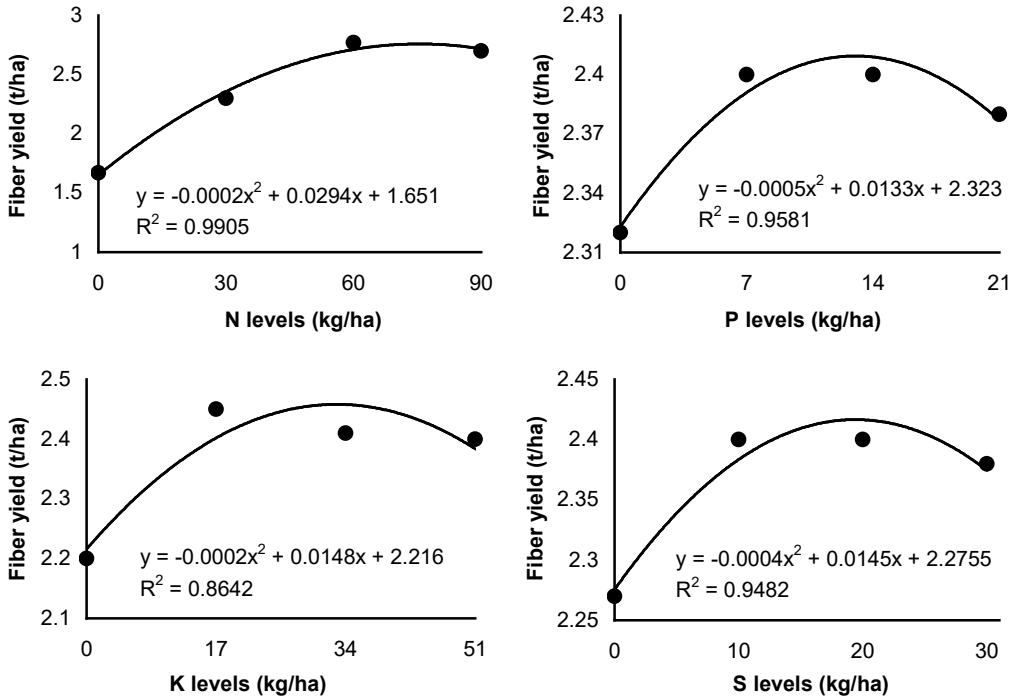


Figure 12. Response of Jute to N, P, K and S grown in Potato - Jute cropping pattern at Munshiganj during 1997-98 to 1999-2000

Table 5. Effects of different levels of fertilizer nutrients on the yield of crops in Onion- T.Aus-T.Aman cropping pattern at Munshigonj in 1998-99 to 2000-01

Nutrient levels (kg/ha)		Tuber/ Fiber yield (t/ha)	
Potato	Jute	Potato	Jute
N levels			
0	0	15.8	1.67
80	30	22.8	2.30
160	60	28.0	2.77
240	90	27.6	2.70
P levels			
0	0	26.2	2.32
13	7	27.2	2.40
26	14	27.0	2.40
39	21	26.8	2.38
K Levels			
0	0	26.5	2.20
66	17	27.2	2.45
133	34	27.0	2.41
200	51	26.9	2.40
S Levels			
0	0	25.9	2.27
15	10	27.2	2.40
30	20	26.9	2.40
45	30	26.5	2.38

Location: Palima, Tangail
Cropping pattern: Mustard-Boro T.Aman Year of establishment:1997-98 to 1999-00

Mustard

In Mustard, response of nitrogen to certain extent was observed. Seed yield increased significantly up to 60 kg N/ha and then tended to decrease. 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. Seed yield increased up to 45 kg K/ha. From the response curve an optimum level of NP and K was calculated

Boro rice

Grain yield of rice increased up to the application of N @ 90 kg/ha and thereafter the yield decreased slowly. Similar trend was observed in case of phosphorus and the highest yield was recorded from 30 kg P/ha. Response of K was not very clear but yield slightly increased up to 50 kg/ha.

T.Aman rice

Response of nitrogen was found on the yield of T.Aman rice. Yield increased markedly with the increase of nitrogen up to 60 kg/ha and thereafter slowly increased up to 80 kg /ha. After that level grain yield started to decrease.

In case of phosphorus and potassium a little response was observed and the grain yield slowly increases up to 20 and 50 kg/ha of P and K, respectively.

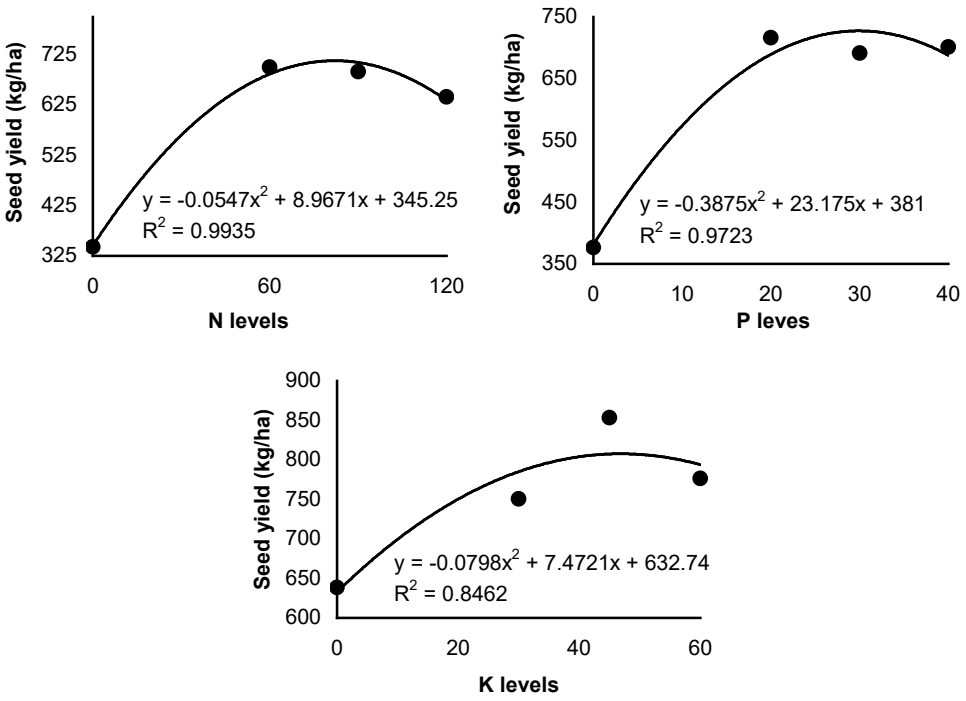


Figure 13. Response of Mustard to NPK grown in Mustard-Boro-T.Aman cropping pattern at Palima, Tangail during 1998-99 to 1999-2000

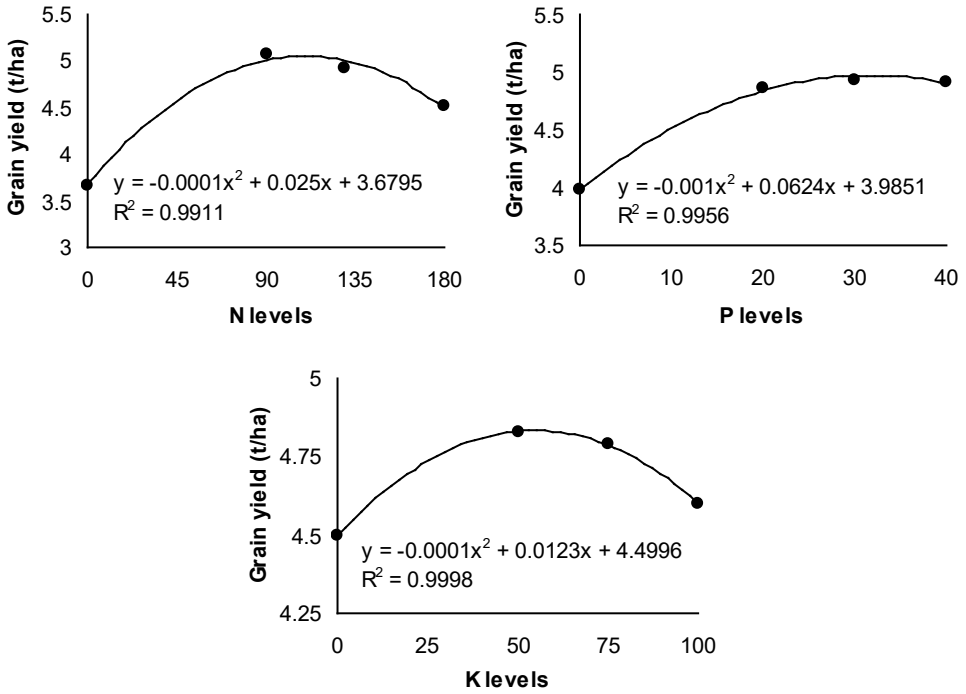


Figure 14. Response of Boro to NPK grown in Mustard-Boro-T.Aman cropping pattern at Palima, Tangail during 1999-2000

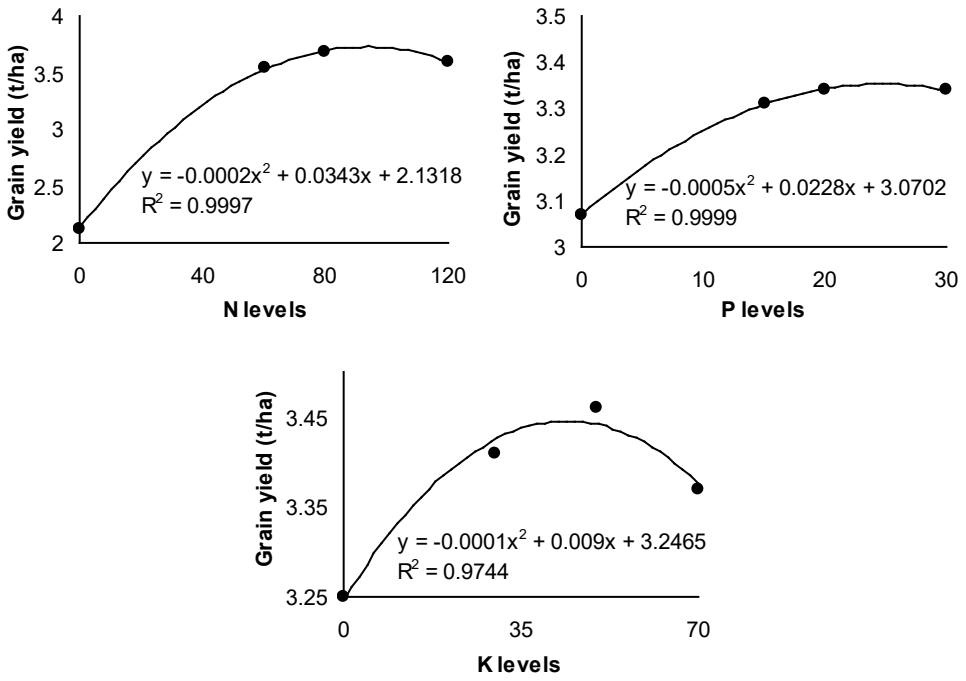


Figure 15. Response of T.Aman to NPK grown in Mustard-Boro-T.Aman cropping pattern at Palima, Tangail during 1999-2000

From the data a response curve was drown and the optimum dose of NP and K both for agronomic and economic as well was find out.

Crop	Agronomically optimum dose				Economically optimum dose			
	N	P	K	S	N	P	K	S
Mustard	82	30	47	-	60	20	35	-
Boro	125	31	62	-	70	12	45	-
T.Aman	86	23	45	-	60	12	30	-

Table 6. Effects of different levels of fertilizer nutrients on the yield of crops in Mustard- Boro -T.Aman cropping pattern at Palima, Tangail, 1999-2000 to 2000-01

Nutrient levels (kg/ha)			Grain yield		
Mustard	Boro	T.Aman	Mustard (kg/ha)	Boro (t/ha)	T.Aman (t/ha)
N levels					
0	0	0	343.0	3.67	2.13
60	90	60	700.0	5.07	3.54
90	130	80	691.5	4.93	3.68
120	180	120	640.9	4.52	3.60
P levels					
0	0	0	376.5	3.98	3.07
20	20	15	716.5	4.87	3.31
30	30	20	691.5	4.93	3.34
40	40	30	701.5	4.92	3.34
K levels					
0	0	0	638.5	4.50	3.25
30	50	30	750.5	4.83	3.41
45	75	50	853.5	4.79	3.46
60	100	70	776.5	4.65	3.37

Location: Shibpur, Narshingdi
Cropping pattern: Boro-T.Aman Year of establishment: 1998-99 to 1999-2000

Boro rice

A positive response of N was observed towards the grain yield of rice. Yield increased markedly over nitrogen up to 100 kg/ha and thereafter started to fall. Phosphorus also showed some response to the grain yield and yield increased up to the application of 26 kg P/ha.

Similarly, response of K and S was evident to some extent. Higher grain yield was recorded from 50 kg/ha and 20 kg/ha of K and S, respectively.

T.Aman rice

Grain yield of T.Aman rice increased with the increase of nitrogen and the highest yield was recorded from 100 kg N/ha. But response of phosphorus on grain yield was not clear. However a small response was found up to 26 kg P/ha. Yield of rice increased up to 50 kg K/ha. After that the yield started to decrease.

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

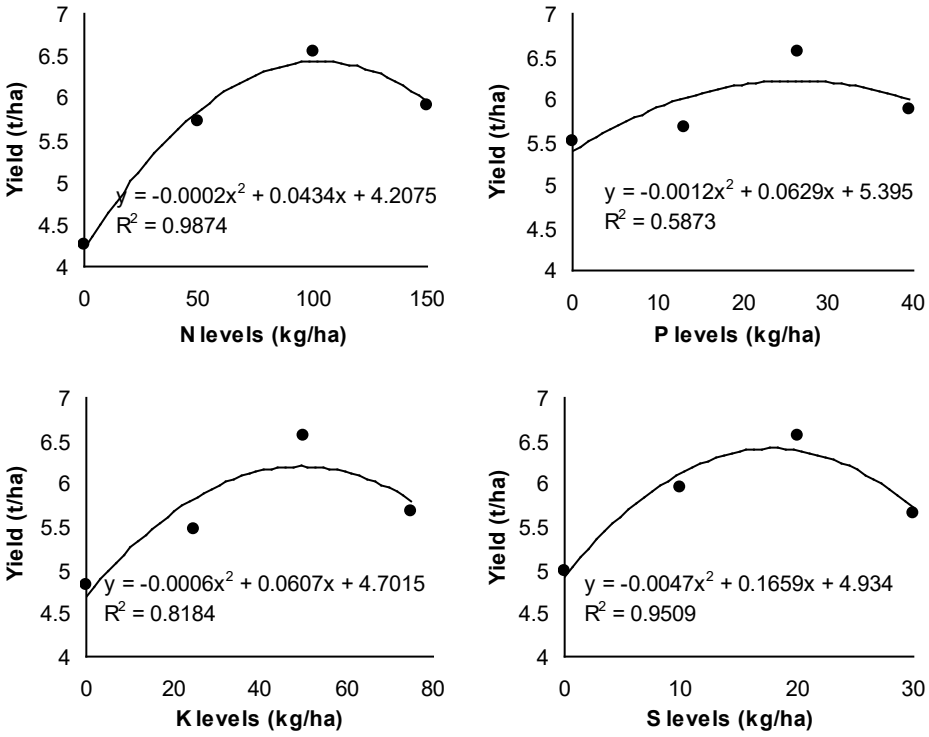


Figure 16. Response of Boro rice to NPKS grown in Boro- T.Aman cropping pattern at Shibpur, Norshingdi during 1998-99 to 1999-2000

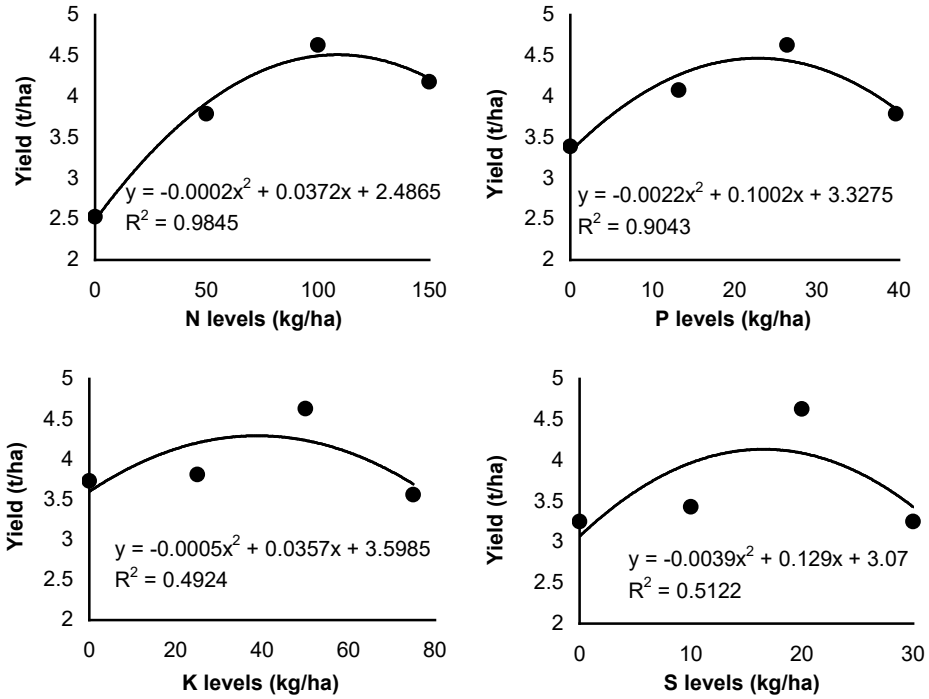


Figure 17. Response of T.Aman rice to NPKS grown in Boro-T.Aman cropping pattern at Shibpur, Norshingdi during 1998-99 to 99-2000

From the response curve the optimum doses of the nutrients for different crops were calculated.

Crop	Agronomically optimum dose				Economically optimum dose			
	N	P	K	S	N	P	K	S
Boro								
T.Aman								

Table 7. Effects of different levels of fertilizer nutrients on the yield of crops in Boro-T.Aman cropping pattern at Shibpur, Narshingdi, 1998-99 to 1999-2000

Nutrient levels (kg/ha)			Grain yield (t/ha)	
	Boro	T.Aman	Boro	T.Aman
N levels	0	0	4.25	2.53
	50	50	5.72	3.79
	100	100	6.56	4.63
	150	150	5.92	4.18
P levels	0	0	5.01	3.39
	13	13	5.67	4.08
	26	26	6.56	4.63
	39	39	5.88	3.79
K Levels	0	0	4.82	3.73
	25	25	5.48	3.81
	50	50	6.56	4.63
	75	75	5.69	3.56
S Levels	0	0	4.99	3.25
	10	10	5.96	3.43
	20	20	6.56	4.63
	30	30	5.67	3.25

Location: Lebukhali, Patuakhali Cropping pattern: Mungbean - T.Aus - T.Aman
Year of establishment: 1998 - 99 to 1999-2000

Average data of two years showed that in mungbean, the response of N and P was observed to some extent and yield increased up to 10 and 14 kg/ha of N and P, respectively. But the response of K was not clear. In T.Aus rice response of N and P was found towards the grain yield. Yield increased with the increase of N and P levels up to 75 kg/ha and 21 kg /ha, respectively. But the response of K was not very clear, however, the yield increased up to 18 kg K/ha.

In T.Aman rice grain yield increased up to the application of 75 kg N/ha. Phosphorus also shows some response towards the grain yield. Grain yield increased up to 21 kg P/ha. A small response of K was observed up to 18 kg K/ha.

From the response curve the optimum doses of the nutrients for different crops were calculated

Crop	Agronomically optimum dose				Economically optimum dose			
	N	P	K	S	N	P	K	S
Mungbean	17.2	30	9	-	10	21	8	-
T.Aus	91	32	15	-	62	15	10	-
T.Aman	150	17	15	-	80	12	12	-

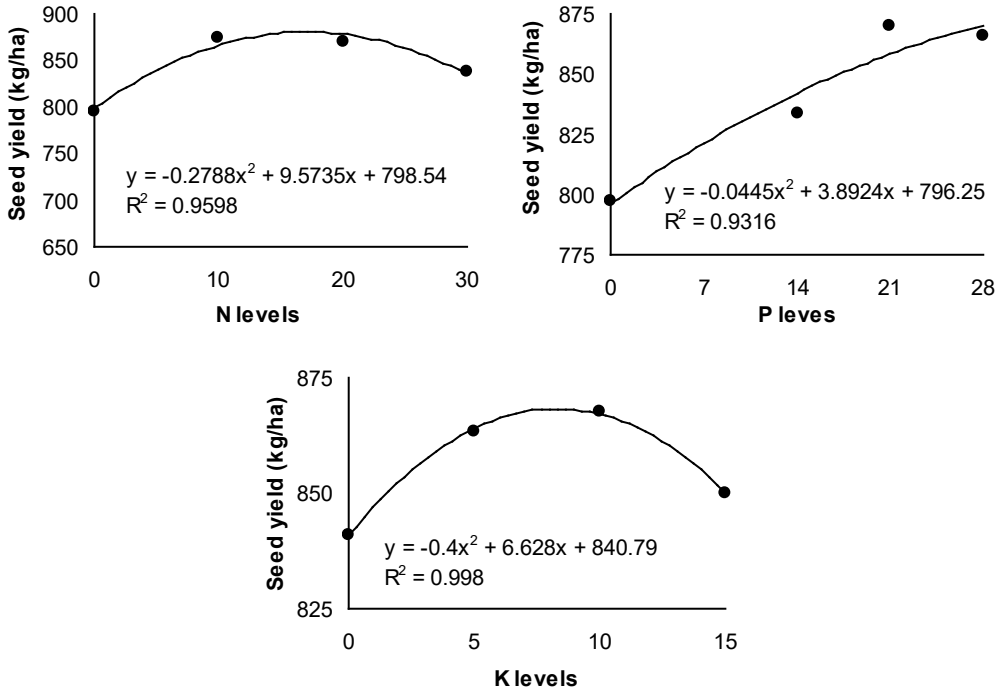


Figure 18. Response of Mungbean to NPK grown in Mungbean-T.Aus-T.Aman cropping pattern at Lebukhali, Patuakhali during 1998-99 to 1999-2000

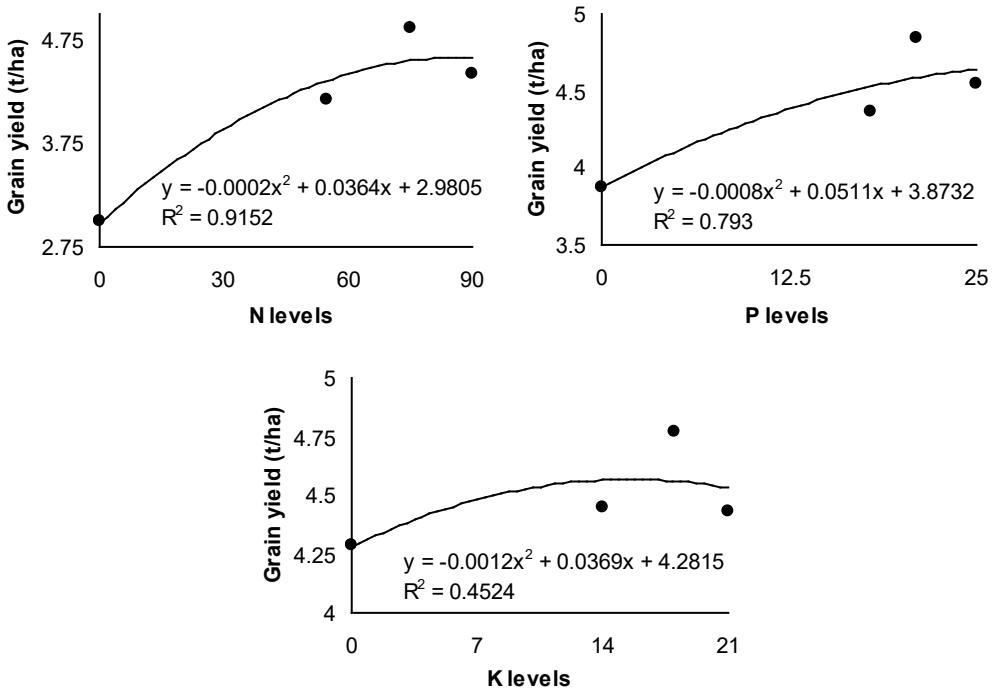


Figure 19. Response of T.Aus to NPK grown in Mungbean-T.Aus-T.Aman cropping pattern at Lebukhali, Patuakhali during 1998-99 to 1999-2000

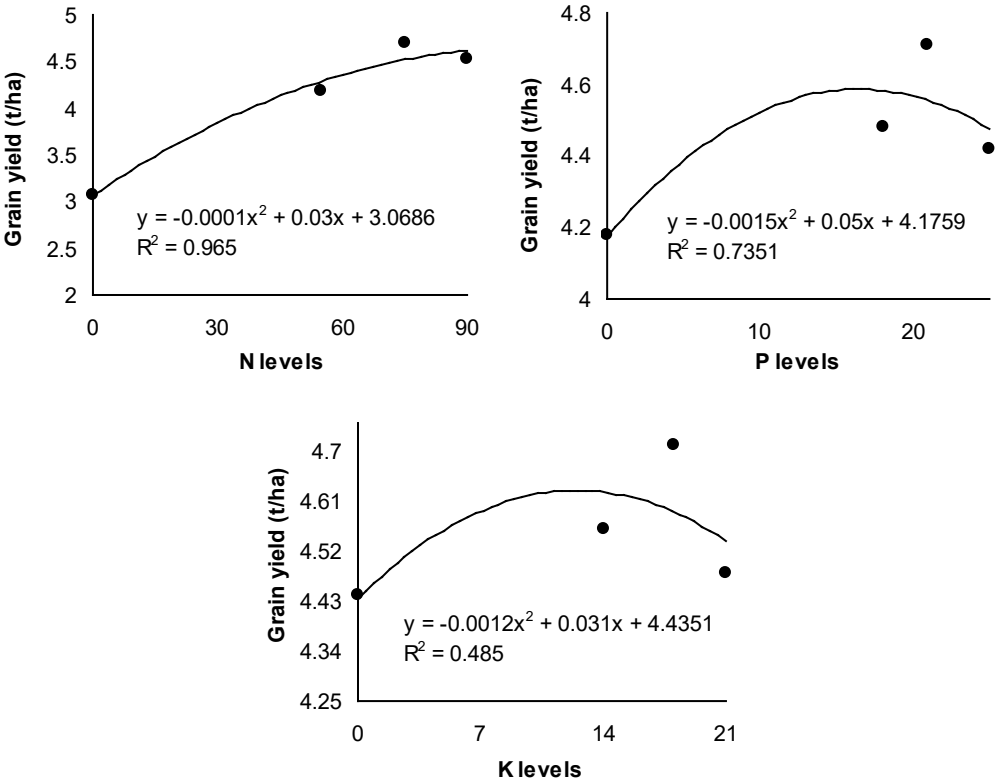


Figure 20. Response of T.Aman to NPK grown in Mungbean-T.Aus-T.Aman cropping pattern at Lebukhali, Patuakhali during 1998-99 to 1999-2000

Table 8. Effect of different levels of fertilizer nutrients on the yield of crops in Mungbean-T.Aus-T.Aman cropping pattern at Lebukhali, 1998-99 to 1999-2000

Nutrient levels (kg/ha)			Grain yield (kg/ha, t/ha)		
Mungbean	T.Aus	T.Aman	Mungbean	T.Aus	T.Aman
N levels					
0	0	0	795.7	3.00	3.08
10	55	55	874.9	4.17	4.18
20	75	75	870.0	4.87	4.71
30	90	90	837.7	4.43	4.53
P levels					
0	0	0	797.7	3.88	4.18
14	18	18	833.3	4.36	4.48
21	21	21	870.0	4.84	4.71
28	25	25	866.0	4.55	4.42
K levels					
0	0	0	841.0	4.29	4.44
5	14	14	863.3	4.45	4.56
10	18	18	867.7	4.77	4.71
15	21	21	850.0	4.43	4.48

Location: Hathazari
Cropping pattern: Boro-T.Aman Year of establishment: 1998-99 to 1999-2000

In Boro rice, grain yield increased with the increase of nitrogen and the highest yield was recorded from 140 kg N/ha and then tended to decrease. Almost similar trend was observed in case of P, K and S and grain yield increased up to the application 36 kg, 97 kg and 18 kg/ha of P, K and S respectively.

In T.Aman rice, a positive response of N was found and the grain yield increased up to 93 kg N/ha. Response of P, K and S was also observed to some extent and grain yield increased up to 22 kg, 49 kg and 10 kg/ha of P, K and S, respectively.

From the response curve the optimum doses of the nutrients for different crops were calculated.

Crop	Agronomically optimum dose				Economically optimum dose			
	N	P	K	S	N	P	K	S
Boro	190	43	130	22	100	30	70	19
T.Aman	115	39	92	10	70	22	45	8

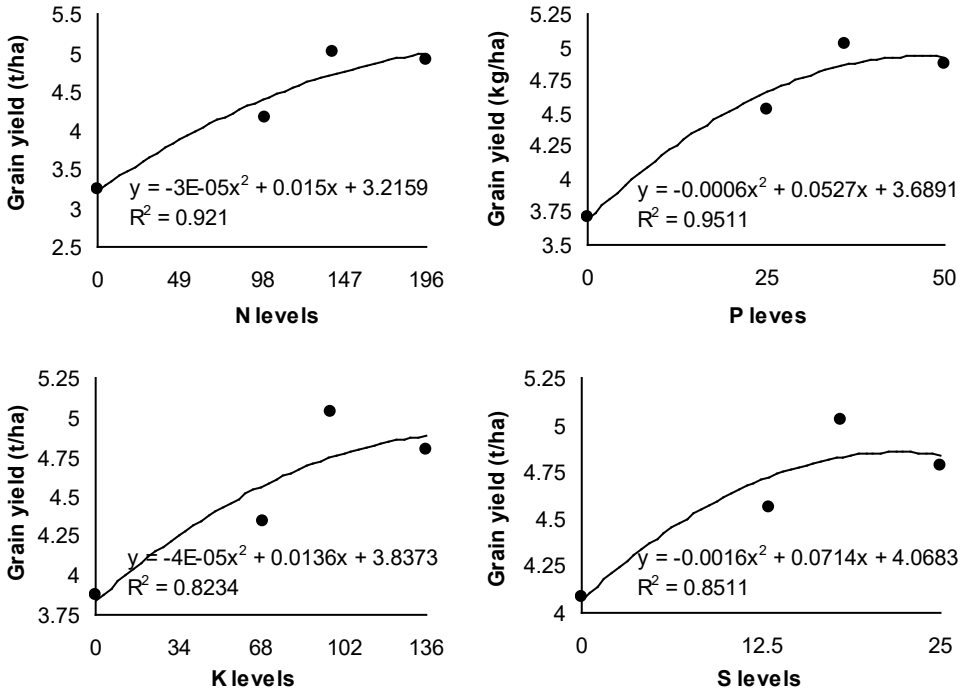


Figure 21. Response of Boro to NPKS grown in Boro-T.Aman cropping pattern at Hathazari, Chittagong in 1998-99 to 1999-2000

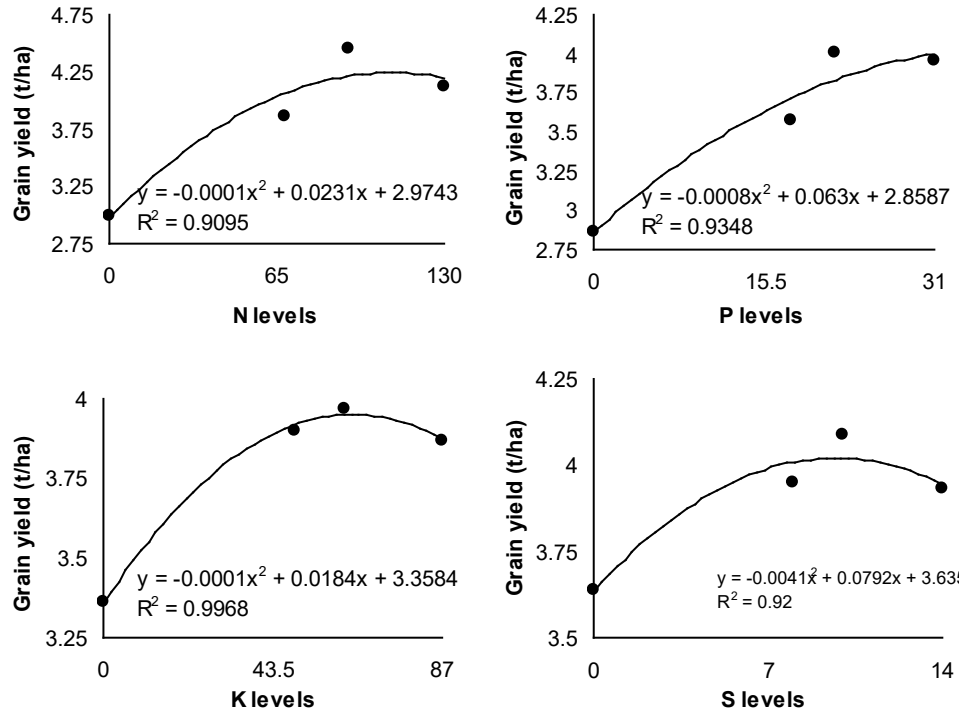


Figure 22. Response of T.Aman to NPKS grown in Boro-T.Aman cropping pattern at Hathazari, Chittagong in 1998-99 to 1999-2000

Table 9. Effects of different levels of fertilizer nutrients on the yield and economics of Boro in Boro-T.Aman cropping pattern at Hathazari, 1998-99 to 99-00

Nutrient levels (kg/ha)		Tuber/ Fiber yield (t/ha)	
Boro	T.Aman	Boro	T.Aman
N levels			
0	0	3.25	3.0
100	68	4.17	3.86
140	93	5.02	4.46
196	130	4.90	4.13
P levels			
0	0	3.71	2.87
25	18	4.52	3.57
36	22	5.03	4.01
50	31	4.87	3.96
K Levels			
0	0	3.87	3.36
69	49	4.34	3.90
97	62	5.03	3.97
136	87	4.80	3.87
S Levels			
0	0	4.09	3.64
13	8	4.56	3.95
18	10	5.03	4.09
25	14	4.78	3.93

Location: Paba, Rajshahi
Cropping pattern: Wheat - T.Aman Year of establishment: 1998 - 99 to 1999-2000

Average of two years data showed that in wheat, grain yield increased with the increase of nitrogen up to 105 kg N/ha and then started to reduce. Similar trend was observed in case of P and the yield increased up to the application of 30 kg/ha of P. Potassium and sulphur failed to show any sharp response on the yield of Wheat. However, the yield increased up to the application of 30 kg and 20 kg/ha of K and S, respectively.

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.

From the response curve the optimum doses of the nutrients for different crops were calculated.

Crop	Agronomically optimum dose				Economically optimum dose			
	N	P	K	S	N	P	K	S
Wheat	121	32	23	20	70	20	10	12
T.Aman	105	18	27	22	70	18	20	14

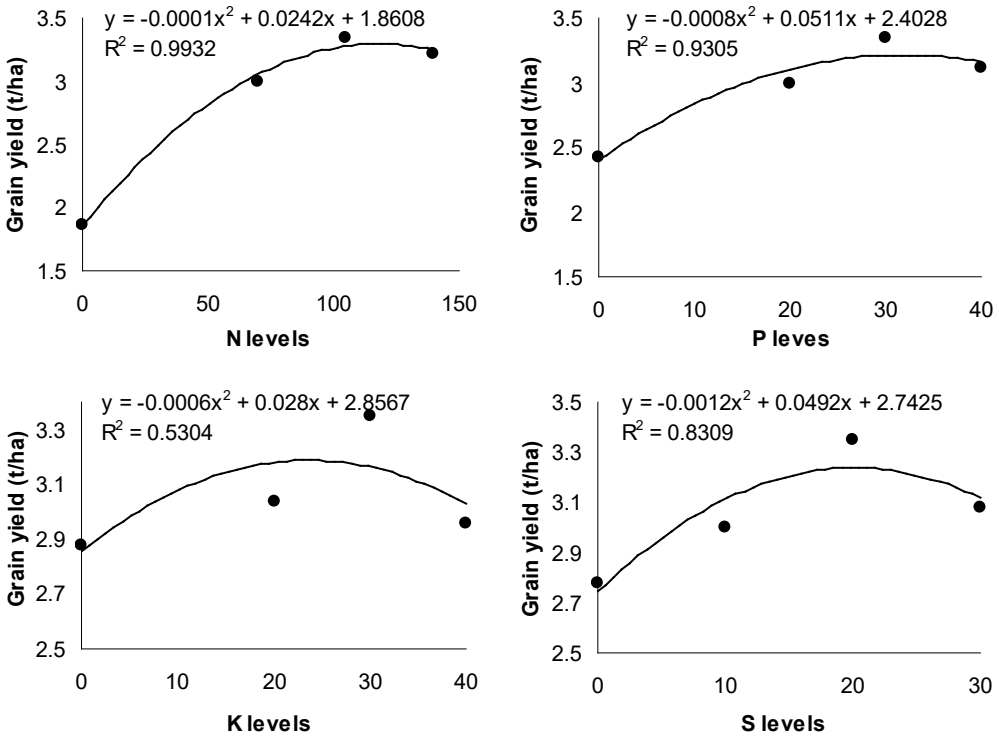


Figure 23. Response of Wheat to NPKS grown in Wheat-T.Aman cropping pattern during 1998-99 to 2000-2001 at Paba, Rajshahi

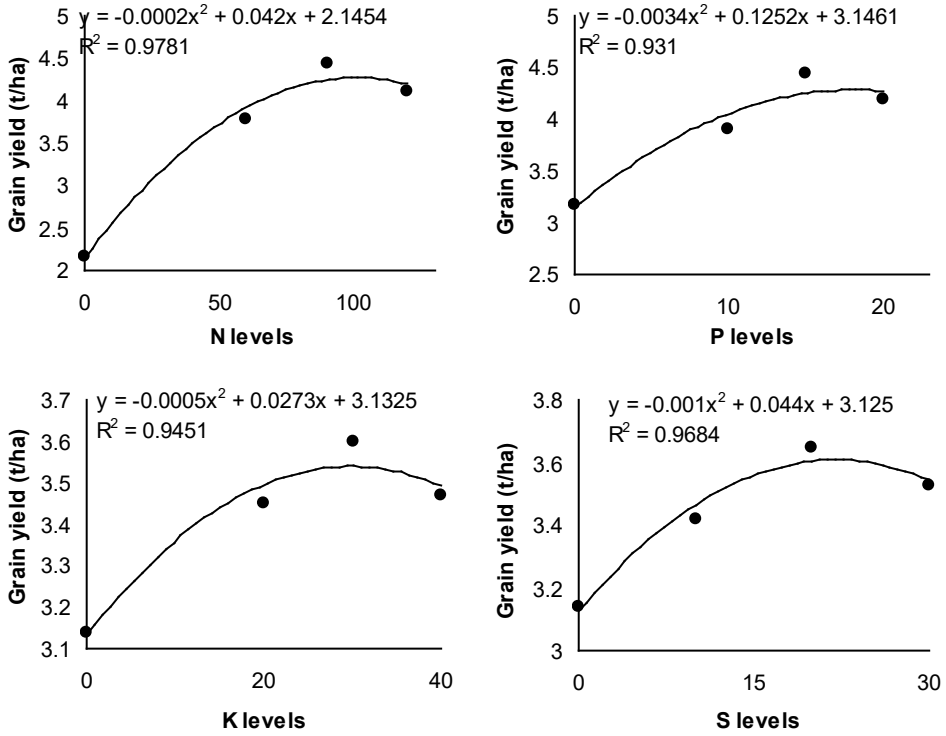


Figure 24. Response of T.Aman to NPKS grown in Wheat-T.Aman cropping pattern during 1998-99 to 1999-2000 at Paba, Rajshahi

Table 10. Effects of different levels of fertilizer nutrients on the yield crops in Wheat - T.Aman cropping pattern at Paba, Rajshahi, 1998-99 to 1999-2000

Nutrient levels (kg/ha)		Grain yield (t/ha)	
Wheat	T.Aman	Wheat	T.Aman
N levels			
0	0	1.87	2.17
70	60	3.00	3.77
105	90	3.35	4.44
140	120	3.22	4.12
P levels			
0	0	2.42	3.17
20	10	3.05	3.91
30	15	3.35	4.44
40	20	3.11	4.20
K Levels			
0	0	2.88	3.14
20	20	3.04	3.45
30	30	3.35	3.60
40	40	2.96	3.47
S Levels			
0	0	2.78	3.14
10	10	3.02	3.42
20	20	3.35	3.65
30	30	3.08	3.53

Location:Barind, Rajshahi
Cropping pattern: Wheat - T.Aman Year of establishment: 1999 - 2000

Grain yield of Wheat markedly increased up to 100 kg N/ha and then started to reduce. Phosphorus, Potassium and Sulphur also show some response towards the yield and yield increase up to 26 kg, 83 kg and 30 kg/ha of P, K and S respectively. In T.Aman rice, response of N was very distinct up to 100 kg N/ha. After that level tended to reduce. Phosphorus, Potassium and Sulphur also show some response towards the yield and yield increase up to 26 kg, 83 kg and 30 kg/ha of P, K and S respectively.

From the response curve the optimum doses of the nutrients for different crops were calculated.

Crop	Agronomically optimum dose				Economically optimum dose			
	N	P	K	S	N	P	K	S
Wheat	180	28	77	35	90	20	35	19
T.Aman	111	21	-	10	70	15	-	7

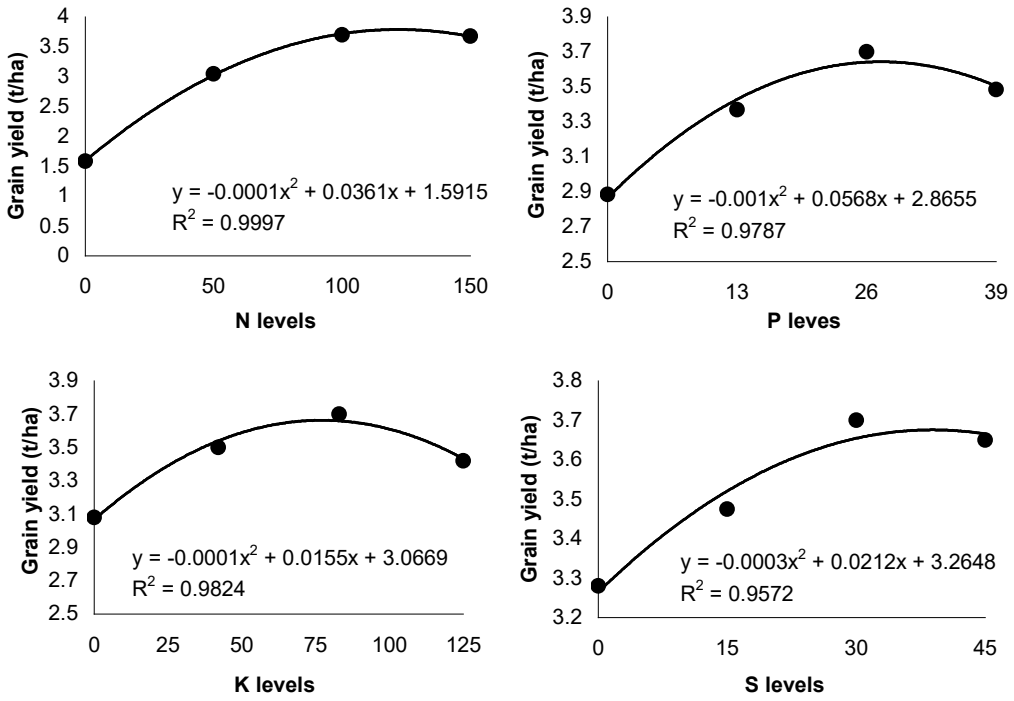


Figure 25. Response of Wheat to NPKS grown in Wheat-T.Aman cropping pattern during 1999-2000 to 2000-2001 at Barind, Rajshahi

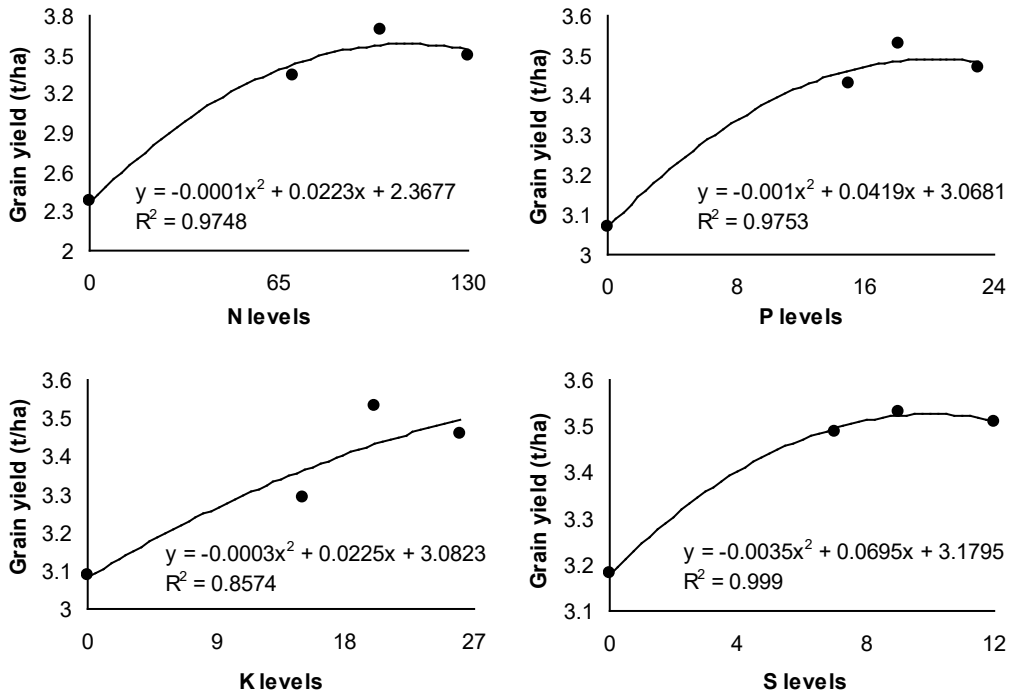


Figure 26. Response of T.Aman to NPKS grown in Wheat-T.Aman cropping pattern during 1999-2000 at Barind, Rajshahi

Table 11. Effects of different levels of fertilizer nutrients on the yield crops in Wheat - T.Aman cropping pattern at Barind, Rajshahi, 1999-2000

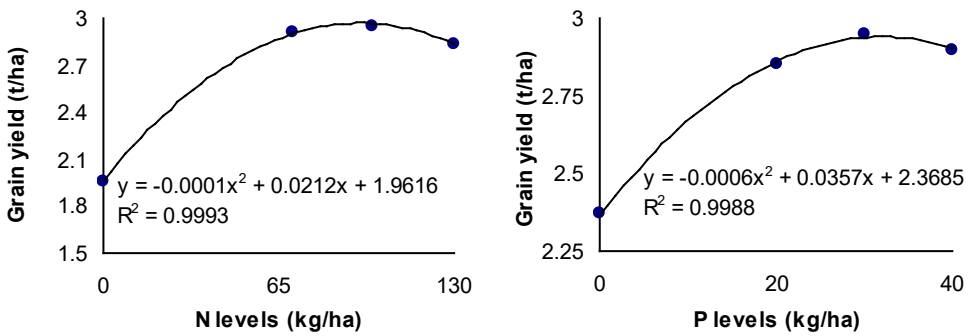
Nutrient levels (kg/ha)		Grain yield (t/ha)	
Wheat	T.Aman	Wheat	T.Aman
N levels			
0	0	1.58	2.38
50	70	3.04	3.34
100	100	3.70	3.70
150	130	3.68	3.49
P levels			
0	0	2.88	3.07
13	15	3.37	3.43
26	18	3.70	3.53
39	23	3.48	3.47
K Levels			
0	0	3.08	3.09
42	15	3.50	3.29
83	20	3.70	3.53
125	26	3.42	3.46
S Levels			
0	0	3.28	3.18
15	7	3.47	3.49
30	9	3.7	3.53
45	12	3.65	3.51

Location : Goyeshpur, Pabna
Cropping pattern: Wheat - T.Aman Year of establishment: 1999 - 2000

Grain yield of Wheat markedly increased up to 70 kg N/ha but the yield increased slowly up to 100 kg N/ha and then started to reduce. Phosphorus, Potassium and Sulphur also show some response towards the yield and yield increase up to 30 kg, 50 kg and 25 kg/ha of P, K and S respectively. In T.Aman rice, response of N was very distinct and the grain yield increased linearly with the increase of nitrogen level. Phosphorus, Potassium and Sulphur also show some response towards the yield and yield increase up to 18 kg, 20 kg and 10 kg/ha of P, K and S respectively.

From the response curve the optimum doses of the nutrients for different crops were calculated.

Crop	Agronomically optimum dose				Economically optimum dose			
	N	P	K	S	N	P	K	S
Wheat	106	30	45	26	70	22	27	18
T.Aman	-	22	20	12	-	15	15	8



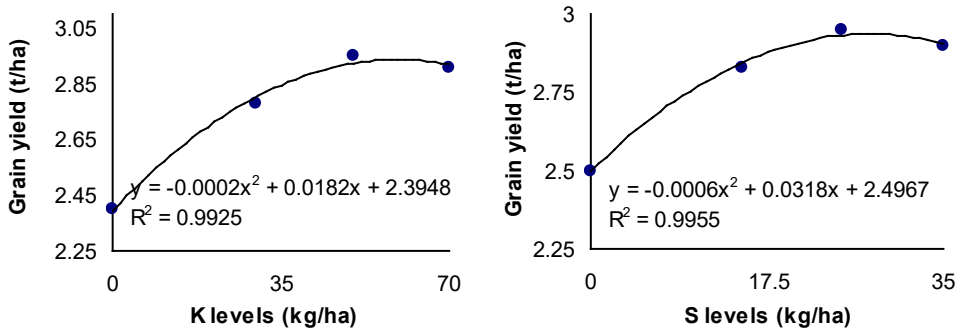


Figure 27. Response of Wheat to NPKS grown in Wheat-T.Aman cropping pattern at Goyeshpur, Pabna during 1999-2000 to 2000-01

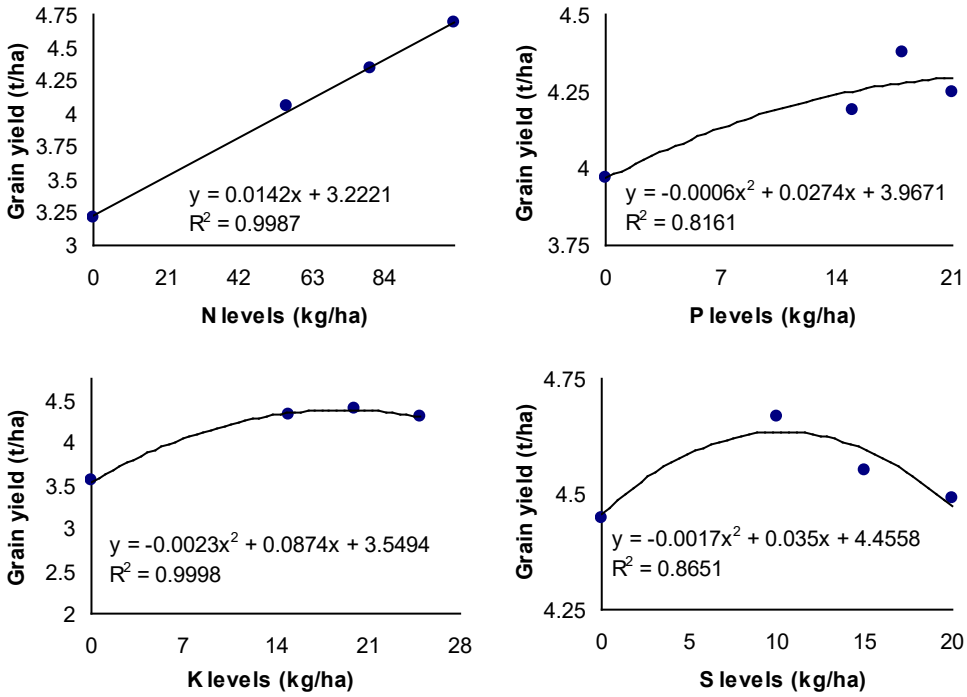


Figure 28. Response of T.Aman to NPKS grown in Boro-T.Aman cropping pattern at Goyeshpur, Pabna in 1999-2000

Table 12. Effects of different levels of fertilizer nutrients on the yield crops in Wheat - T.Aman cropping pattern at Goyeshpur, Pabna, 1999-2000

Nutrient levels (kg/ha)		Grain yield (t/ha)	
Wheat	T.Aman	Wheat	T.Aman
N levels			
0	0	1.96	3.21
70	56	2.91	4.05
100	80	2.95	4.34
130	104	2.84	4.69
P levels			
0	0	2.37	3.97
20	15	2.85	4.19
30	18	2.95	4.38

	40	21	2.90	4.25
K Levels				
	0	0	2.40	3.55
	30	15	2.78	4.34
	50	20	2.95	4.39
	70	25	2.91	4.30
S Levels				
	0	0	2.50	4.45
	15	10	2.83	4.67
	25	15	2.95	4.55
	35	20	2.90	4.49

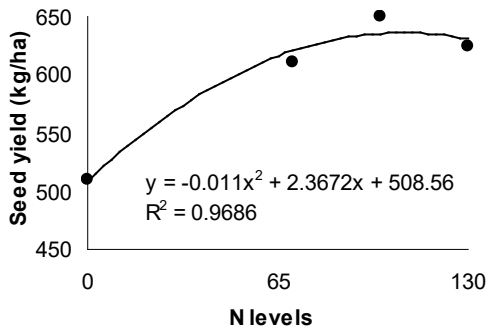
Location : Melandah, Jamalpur
Cropping pattern : Mustard-Boro-T.Aman **Year of establishment : 999-2000**

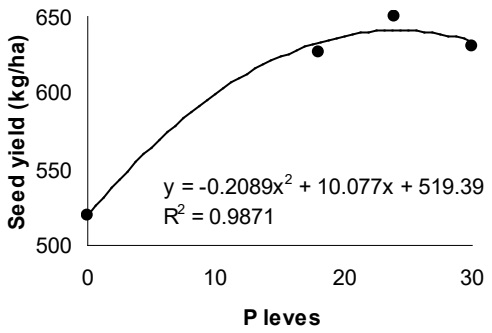
In Mustard, a positive response of N was observed. Seed yield increased with the increase of N level and the highest yield was recorded from 100 kg N/ha. Similarly P, K and S also have some response and yield increased up to 24 kg, 26 kg and 30 kg/ha of P, K and S respectively. In Boro rice, grain yield increased up to 145 kg N/ha and then showed to decrease. As regards P, K and S grain yield increased up to 24 kg, 45 kg and 22 kg P, K and S respectively.

In T.Aman rice, the grain yield increased markedly up to 90 kg N/ha and then decreased slowly. Similarly P, K and S also produced some response and yield increased up to 16 kg, 29 kg and 13 kg/ha of P, K and S respectively.

From the data a response curve was drown and the optimum dose of N P and K both for agronomic and economic as well was find out.

Crop	Agronomically optimum dose				Economically optimum dose			
	N	P	K	S	N	P	K	S
Mustard	82	30	47	-	60	20	35	-
Boro	125	31	62	-	70	12	45	-
T.Aman	86	23	45	-	60	12	30	-





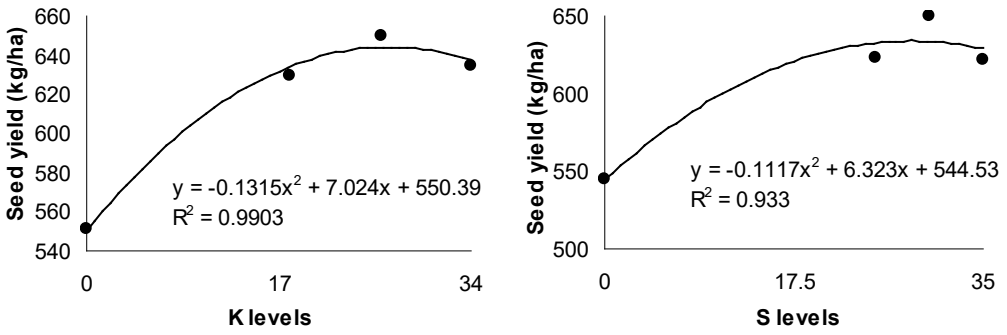


Figure 29. Response of Mustard to NPKS grown in Mustard-Boro-T.Aman cropping pattern in 1999-2000 at Melandah, Jamalpur

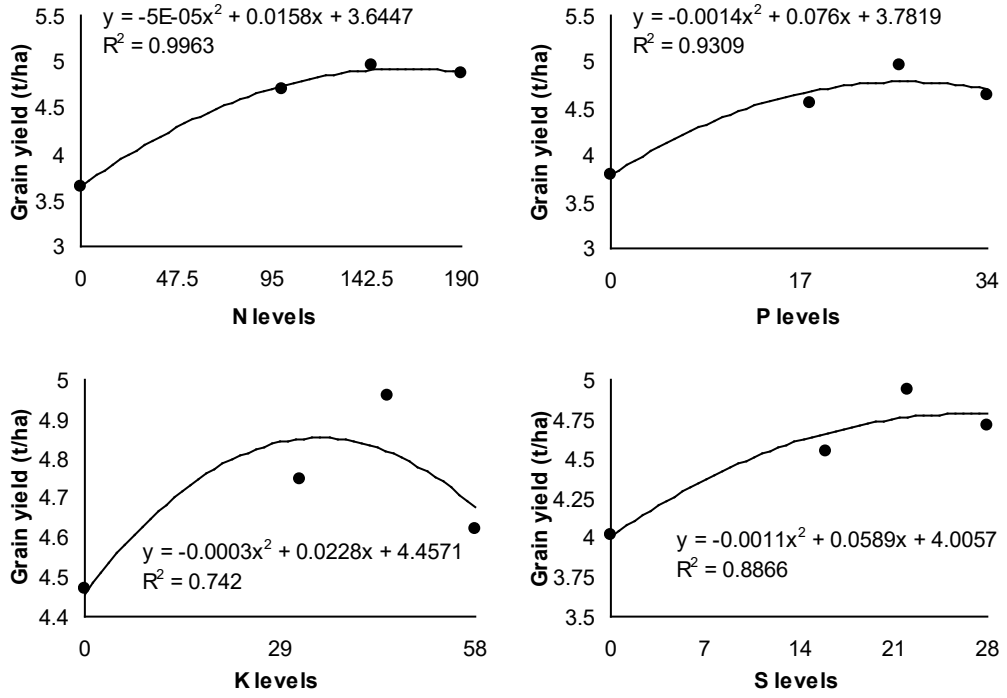
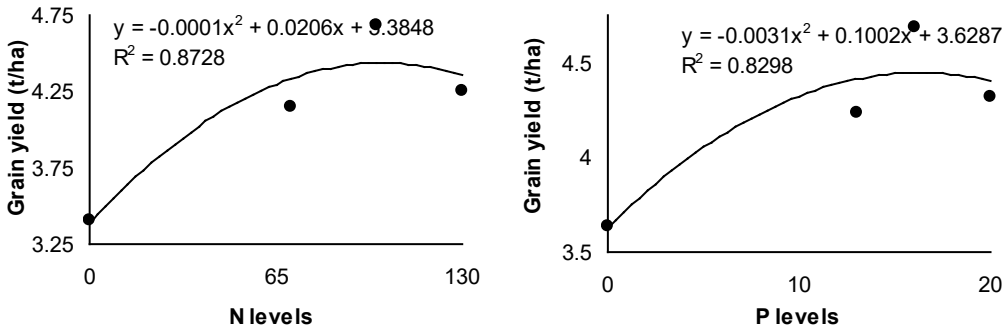


Figure 30. Response of Boro to NPKS grown in Mustard-Boro-T.Aman cropping pattern in 1999-2000 at Melandah, Jamalpur



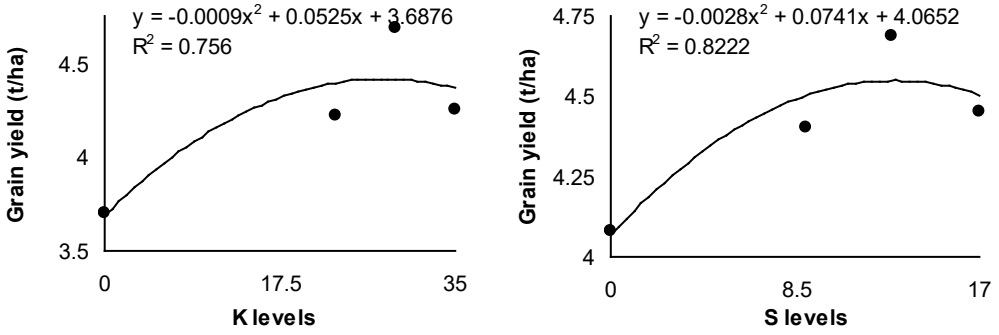


Figure 31. Response of T.Aman to NPKS grown in Mustard-Boro-T.Aman cropping pattern in 1999-2000 at Melandah, Jamalpur

Table 13. Effects of different levels of fertilizer nutrients on the yield of crops in Mustard- Boro -T.Aman cropping pattern at Melandah, Jamalpur, 1999-2000

Nutrient levels (kg/ha)			Grain yield		
Mustard	Boro	T.Aman	Mustard (kg/ha)	Boro (t/ha)	T.Aman (t/ha)
N levels					
0	0	0	510	3.65	3.41
70	100	70	610	4.70	4.15
100	145	100	650	4.96	4.69
130	190	130	625	4.87	4.26
P levels					
0	0	0	520	3.80	3.64
18	18	13	627	4.56	4.24
24	26	16	650	4.96	4.69
30	34	20	630	4.64	4.32
K levels					
0	0	0	551	4.47	3.70
18	32	23	630	4.75	4.22
26	45	29	650	4.96	4.69
34	58	35	635	4.62	4.25
S levels					
0	0	0	545	4.02	4.08
25	16	9	623	4.54	4.40
30	22	13	650	4.96	4.69
35	28	17	622	4.71	4.45

Location: Bagherpara, Jessore
Cropping pattern: Mustard - Boro - T.Aman **Year of establishment: 1999-2000**

In Mustard, a positive response of N was observed to some extent. Seed yield increased with the increase of N level and the highest yield was recorded from 86 kg N/ha. Similarly P and K also have some response and yield increased up to 15 kg and 8 kg /ha of P and K, respectively. The soil is calcareous and rich in K. Therefore, the response of K was not evident. Sulphur has a good response toward the seed yield and yield increased linearly with the increase of S.

In Boro rice, grain yield increased linearly with the increase of nitrogen level and the highest yield was obtained from highest level. As regards P and S grain yield also increased linearly but the trend was not very sharp.

In T.Aman rice, the grain yield increased linearly with the increase of N P and S levels and the highest grain yield was recorded from the highest level. As the yield of all the crops increased linearly with the increase of N P and S level, therefore, it was not possible to calculate the optimum dose of the nutrient elements. Another higher level will be tested in the next year for all the nutrients to get an optimum level.

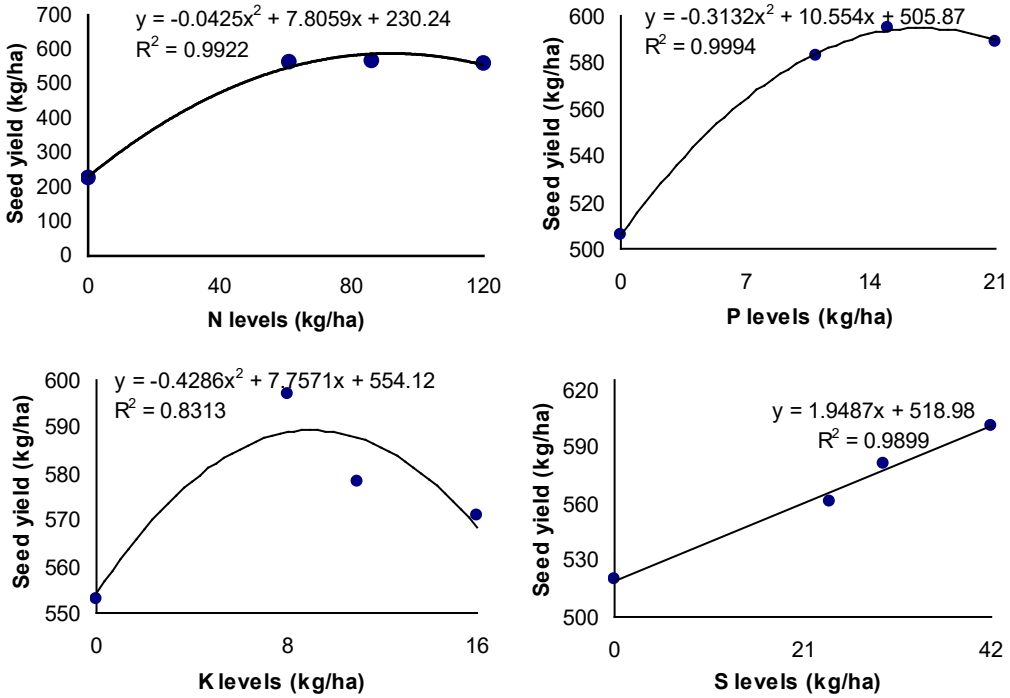
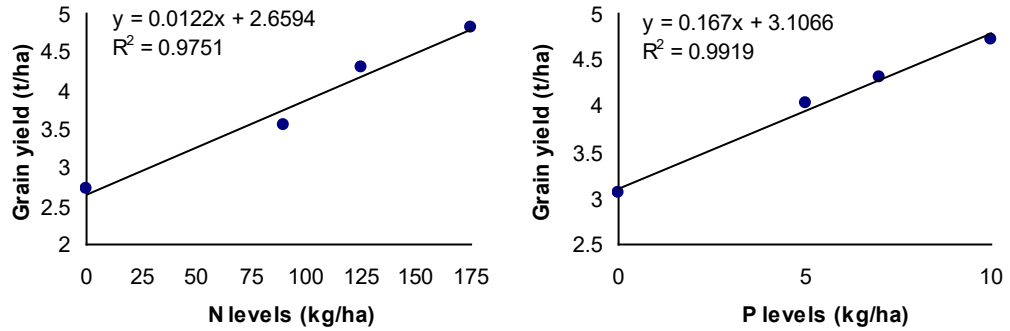


Figure 32. Response of Mustard to N, P, K and S grown in Mustard-Boro-T.Aman cropping pattern at Bagherpara, Jessore in 1999-2000



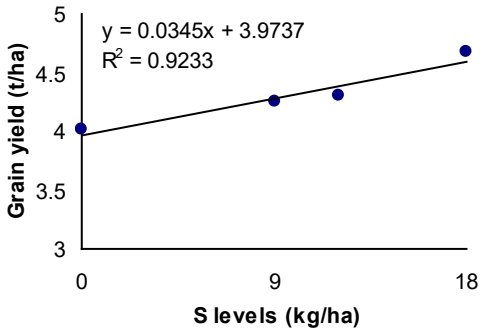


Figure 33. Response of Boro to N, P and S grown in Mustard-Boro- T.Aman cropping pattern at Bagherpara, Jessore in 1999-2000

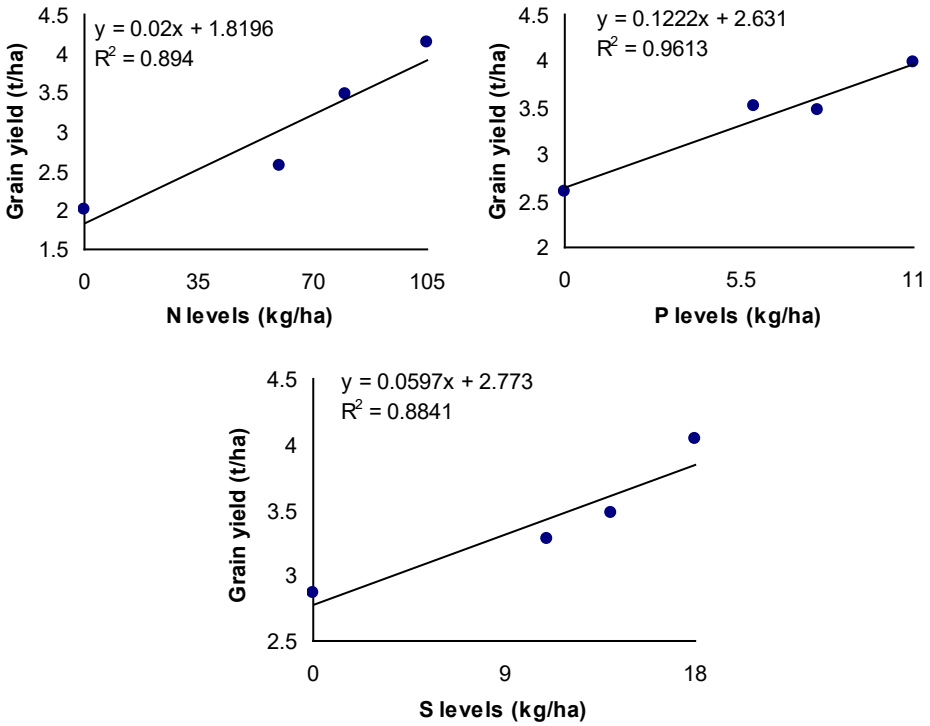


Figure 34. Response of T.Aman to N, P and S grown in Mustard-Boro-T.Aman cropping pattern at Bagherpara, Jessore in 1999-2000

Table 14. Effects of different levels of fertilizer nutrients on the yield of crops in Mustard- Boro -T.Aman cropping pattern at Bagherpara, Jessore, 1999-2000

Nutrient levels (kg/ha)			Grain yield		
Mustard	Boro	T.Aman	Mustard (kg/ha)	Boro (t/ha)	T.Aman (t/ha)
N levels					
0	0	0	228	2.73	1.82
61	90	60	564	3.55	2.57
86	125	80	568	4.30	3.48
120	175	105	561	4.83	4.14
P levels					
0	0	0	506	3.05	2.6
11	5	6	583	4.02	3.51
15	7	8	595	4.30	3.99

21	10	11	589	4.72	3.48
K levels					
0	-	-	553	-	-
8	-	-	597	-	-
11	-	-	578	-	-
16	-	-	571	-	-
S levels					
0	0	0	520	4.02	2.86
24	9	11	561	4.25	3.28
30	12	14	581	4.40	3.48
42	18	18	601	4.67	4.04

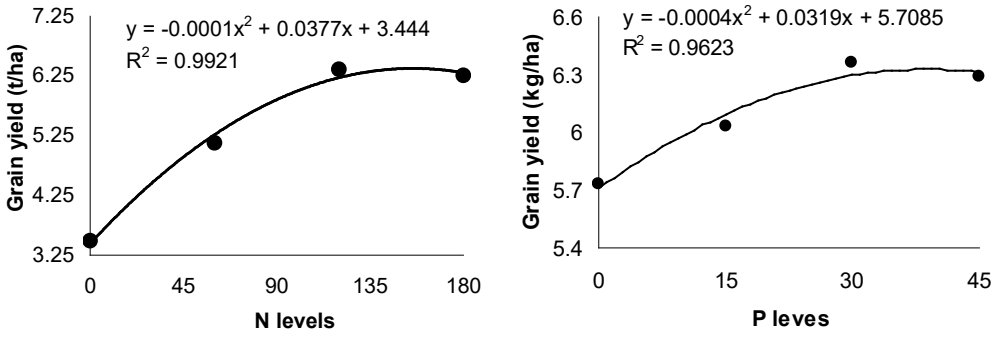
Location : Laksam, Comilla
Cropping pattern: Boro -T.Aman Year of establishment: 1998-99 to 1999-2000

In Boro rice, grain yield increased with the increase of nitrogen and the highest yield was recorded from 120 kg N/ha and then tended to decrease. But the response of P, K and S towards the grain yield was not so distinct. However the yield increased slowly up to the application 30 kg, 40 kg and 20 kg/ha of P, K and S respectively.

In T.Aman rice, a positive response of N was found and the grain yield increased up to 90 kg N/ha. Response of P, K and S was also observed to some extent and grain yield increased up to 26 kg, 20 kg and 20 kg/ha of P, K and S, respectively.

From the response curve the optimum doses of the nutrients for different crops were calculated.

Crop	Agronomically optimum dose				Economically optimum dose			
	N	P	K	S	N	P	K	S
Boro	150	40	50	28	100	17	27	19
T.Aman	117	31	23	18	70	18	10	10



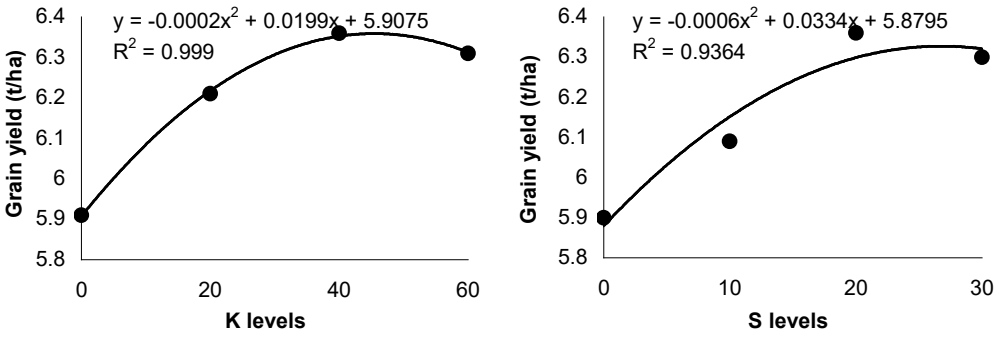


Figure 35. Response of Boro to NPKS grown in Boro-T.Aman cropping pattern at Comilla in 1999-2000

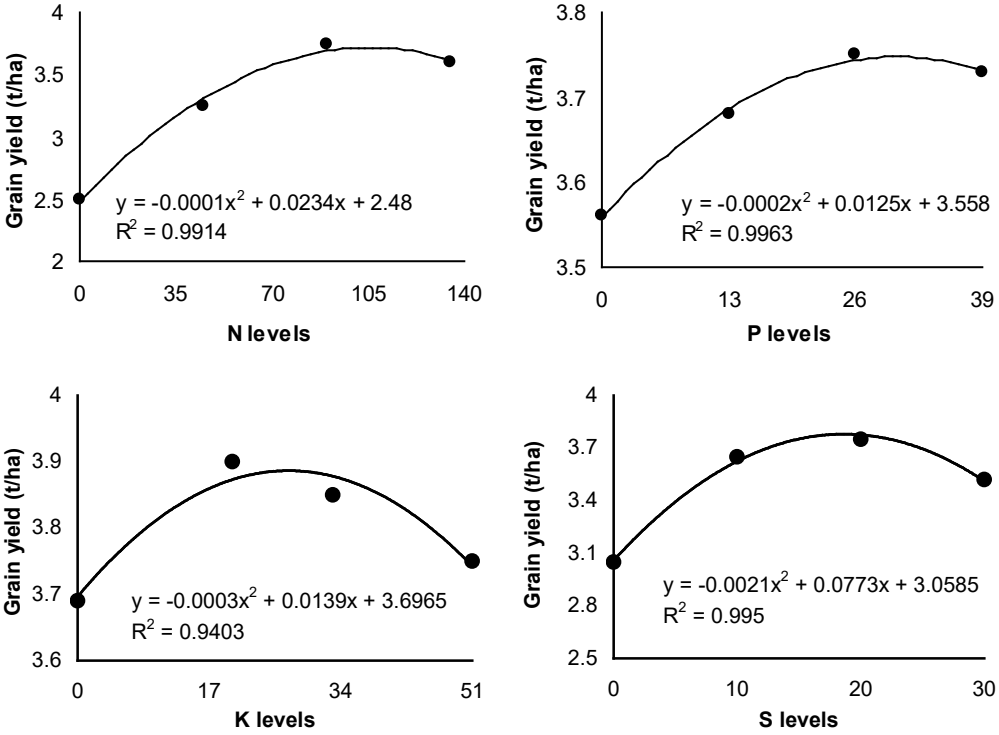


Figure 36. Response of T.Aman to NPKS grown in Boro-T.Aman cropping pattern at Comilla in 1999-2000

Table 15. Effects of different levels of fertilizer nutrients on the yield and economics of Boro in Boro-T.Aman cropping pattern at Laksam, Comilla, 1999-2000

Nutrient levels (kg/ha)		Grain yield (t/ha)	
Boro	T.Aman	Boro	T.Aman
N levels			
0	0	3.49	2.5
60	45	5.13	3.25
120	90	6.36	3.75
180	135	6.26	3.60
P levels			
0	0	5.73	3.56
15	13	6.03	3.68
30	26	6.36	3.75
45	39	6.29	3.73

	K Levels		
0	0	5.91	3.69
20	20	6.21	3.90
40	33	6.36	3.85
60	51	6.31	3.75
	S Levels		
0	0	5.90	3.05
10	10	6.09	3.65
20	20	6.36	3.75
30	30	30	3.52

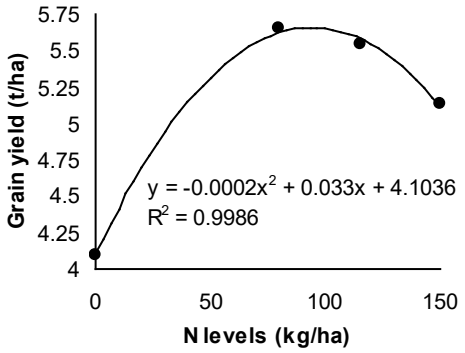
Location: Kishoregonj
Cropping pattern: Boro -T.Aman **Year of establishment: 1999-2000**

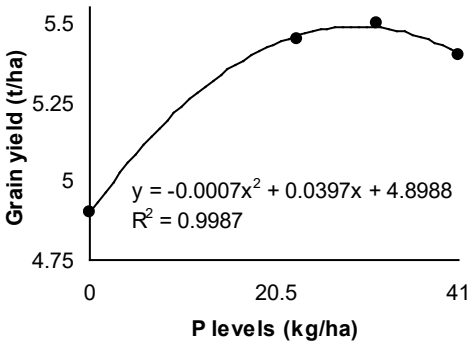
In Boro rice, grain yield increased markedly with the increase of nitrogen up to 80 kg N/ha and after that level tended to decrease. In case of P, K and S a slow response was found and the yield increased up to the application of 32 kg, 55 kg and 9 kg/ha of P, K and S respectively.

In T. Aman rice, a positive response of N was found and the grain yield increased up to 75 kg N/ha. Response of P, K and S was also observed to some extent and grain yield increased up to 21 kg, 36 kg and 5 kg/ha of P, K and S, respectively.

From the response curve the optimum doses of the nutrients for different crops were calculated.

Crop	Agronomically optimum dose				Economically optimum dose			
	N	P	K	S	N	P	K	S
Boro	82	28	68	10	60	20	30	7
T.Aman	79	25	38	5	55	13	20	4





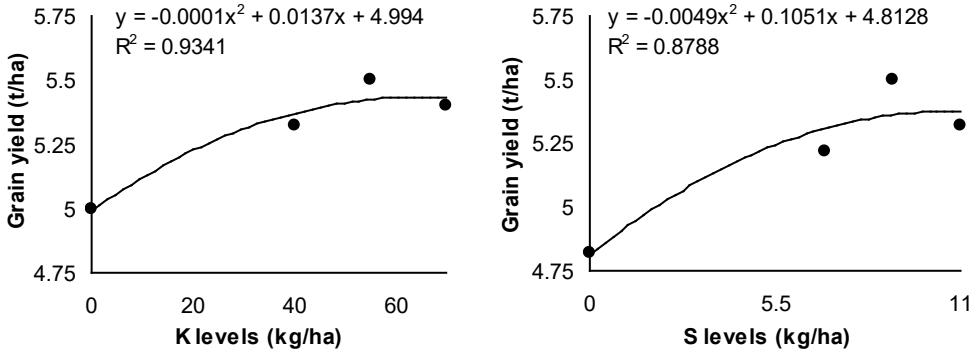


Figure 37. Response of Boro to NPKS grown in Boro-T.Aman cropping pattern at Kishoregonj 2000

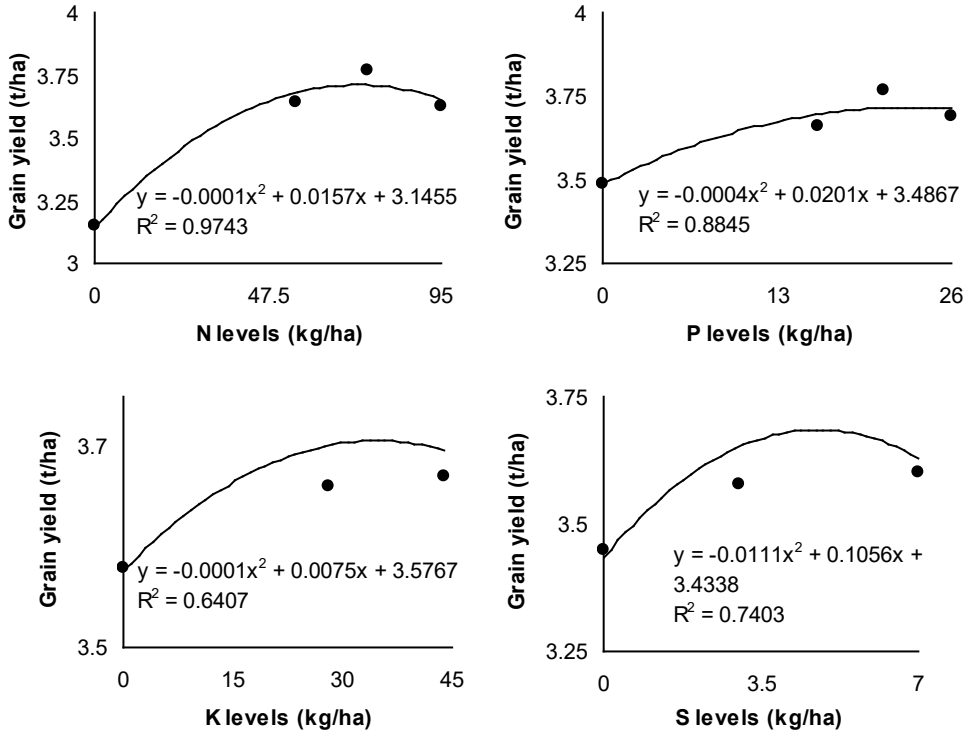


Figure 38. Response of T.Aman to NPKS grown in Boro-T.Aman cropping pattern at Kishoregonj 2000

Table 16. Effects of different levels of fertilizer nutrients on the yield of crops in Boro-T.Aman cropping pattern at Kishoregonj, 1999-2000

Nutrient levels (kg/ha)			Grain yield (t/ha)	
	Boro	T.Aman	Boro	T.Aman
N levels	0	0	4.10	3.00
	80	55	5.65	3.64
	115	75	5.55	3.77
	150	95	5.13	3.63
P levels	0	0	4.90	3.49
	23	16	5.45	3.66
	32	21	5.50	3.77
	41	26	5.40	3.69
K Levels	0	0	5.00	3.58

	40	28	5.32	3.66
	55	36	5.50	3.77
	70	44	5.40	3.67
S Levels	0	0	4.82	3.45
	7	3	5.22	3.58
	9	5	5.50	3.77
	11	7	5.32	3.60

Location: Baliakandi, Faridpur
Cropping pattern: Onion-B.Aman **Year of establishment: 1999-00**

Bulb yield of onion increased with the increase of N and the highest yield (14.5 t/ha) was recorded from 100 kg N/ha. Almost similar trend was found in case of P & S and the yield increased up to 60 kg and 20 kg/ha of P and S respectively.

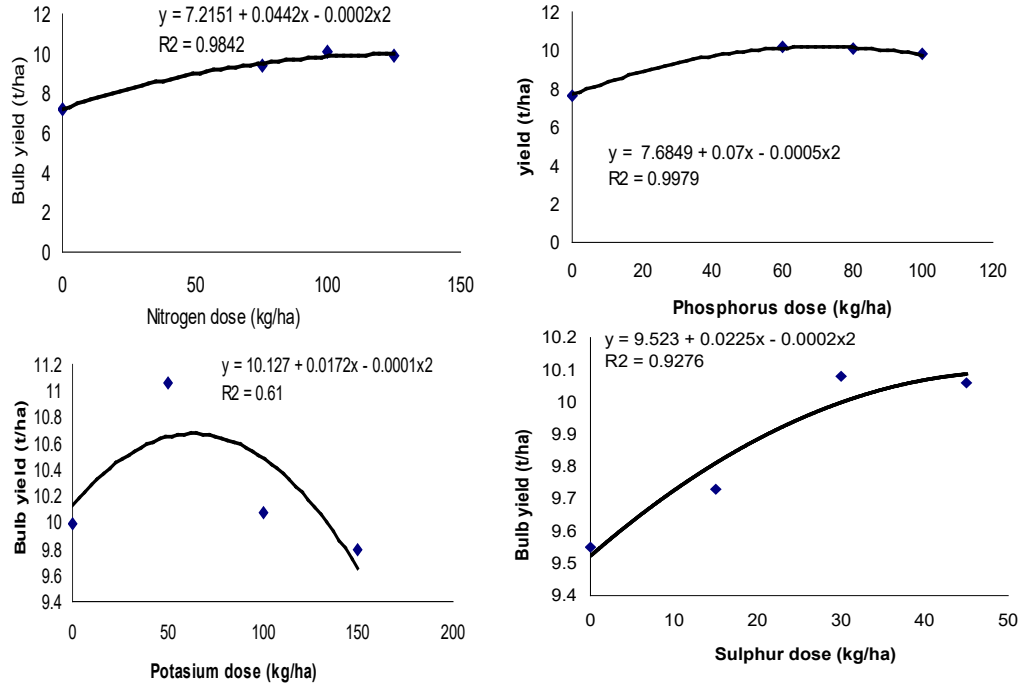


Figure 39. Response of Onion to NPKS grown in Onion-B.Aman cropping pattern at Baliakandi, Rajbari during 2000-01

Table 17. Effects of different levels of fertilizer nutrients on the yield and economics of Onion in Onion-T.Aman cropping pattern at Baliakandi, 1999-00

Fertilizer levels	Bulb yield (t/ha)
N levels (kg/ha)	
0	10.0c
50	13.0b
100	14.5a
150	14.4a
P levels (kg/ha)	
0	12.6b
30	13.9ab
60	14.5a
90	14.3a

Fertilizer levels	Bulb yield (t/ha)
S levels (kg/ha)	
0	13.5b
10	14.1a
20	14.5a
30	14.3a

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./100g 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	5.6	1.30	0.75 (L)	0.65 (O)	7.5 (L)	8.0 (L)	4.0 (M)	0.17 (L)
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	5.6	1.20	0.07 (VL)	0.62 (O)	8.0 (L)	7.8 (L)	4.0 (M)	0.17 (L)
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	8.5	1.52	0.07 (VL)	0.16 (L)	5.16 (L)	19.5 (M)	0.65 (L)	0.29 (L)
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	-
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)
Kushtia	MHL	I	8.1	2.54	0.15 (L)	0.69 (VH)	3.98 (VL)	30.0 (O)	0.82 (L)	0.36 (M)
Shibpur	MHL	I	5.62	1.70	0.13 (L)	0.17 (M)	6.1 (L)	30.8 (O)	1.17 (M)	0.22 (L)
Bagherpara	MHL	I	-	-	0.11 (L)	0.39 (H)	17.9 (M)	7.34 (VL)	3.29 (VH)	0.4 (M)
Norail	MHL	I	-	-	0.11 (L)	0.27 (M)	1.88 (VL)	36.0 (H)	2.57 VH)	0.82 (O)
Goyeshpur	MHL	I	7.7	2.06	0.12 (L)	0.23 (M)	6.5 (VL)	5.36 (M)	0.45 (M)	0.33 (O)
Chatmohor	MHL	I	7.4	1.61	0.08 (VL)	0.13 (O)	2.5 (VL)	17.67 (M)	0.81 (M)	0.20 (O)

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	BR 28	40	2nd week of Feb	3rd week of May
	T.Aman	BRRI Dhan 33	40	4th week of July	1st week of Nov
Bagherpara	Mustard	Tori-7	08	3rd week of Nov	2nd week of Feb
	Boro	BR 28	40	3rd week of Feb	Last week of May
	T.Aman	BR 11	40	Last week of July	4th week of Nov

Site	Cropping pattern	Variety	Seed rate (kg/ha)	Planting time	Harvesting time
Narikeli	Mustard	Tori-7	08	3rd week of Nov	Last week of Jan
	Boro	BRRI Dhan 29	50	1st week of Feb	Last week of May
	T.Aman	BRRI Dhan 32	50	3rd week of July	1st week of Nov
Palima	Mustard	Tori-7	10	3rd week of Nov	3rd week of Jan
	Jute	O-9897	12	3rd week of April	2nd week of Aug
	T.Aman	BRRI Dhan 33	40	2nd week of Aug	2nd week of Nov
Narikeli	Wheat	Kanchan	100	4th week of Nov	4th week of March
	Jute	O-9897	10	1st week of April	1st week of Aug
	T.Aman	BRRI Dhan 32	50	1st week of Aug	2nd week of Nov

Site	Cropping pattern	Variety	Seed rate (kg/ha)	Planting time	Harvesting time
Kishoregonj	Wheat	Kanchan	120	1st week of Dec.	3rd week of March
	Jute	Falgunitosa	08	1st week of April	1st week of Aug
	T.Aman	BR 11	50	2nd week of Aug	4th week of Nov
Lebukhali	Mungbean	Kanti	40	2nd week of Feb	4th week of April
	T.Aus	BR 2	40	1st week of May	3rd week of Aug.
	T.Aman	BR 23	40	Last week of Aug	Last week of Dec
Palima	Boro	BR 29	40	1st week of Feb	4th week of May
	T.Aman	BRRI Dhan 33	40	3rd week of July	1st week of Nov
Kendua	Boro	BR 3	40	1st week of Feb.	3rd week of May
	T.Aman	BRRI Dhan 32	40	Last week of July	3rd 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
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	O-9897	10	2nd week of April	2nd week of July
Atkapalia	T.Aman	BRRI Dhan 32	40	Last week of July	Last week of Nov
Goyeshpur	Wheat	Kanchan	120	1st week of Dec.	3rd week of March
	Jute	O-9897	08	3rd week of April	3rd week of July
	T.Aman	BR 11	50	Last week of July	3rd week of Nov
Chatmohor	Wheat	Kanchan	120	1st week of Dec.	3rd week of March
	T.Aman	BR 11	40	Last week of July	3rd week of Nov
Chandina	Potato	Diamont	1500	1st week of Dec.	2nd week of Feb.
	T.Aus	BRRI Dhan 32	40	Last week of April	3rd week of July
	T.Aman	BR 11	40	1st week of Aug.	3rd week of Nov.
Laksam	Boro	BRRI Dhan 29	40	Last week of Jan.	2nd week of May
	T.Aman	BRRI Dhan 32	40	1st week of Aug.	1st week of Dec.
Shibpur	Boro	BRRI Dhan 29	40	Last week of Jan.	3rd week of May
	T.Aman	BRRI Dhan 32	40	1st week of Aug.	1st week of Dec.
Kushtia	Onion	Taherpuri	-	1st week of Jan.	1st week of April.
	T.Aus	IR 50	40	4th week of May	1st week of Aug.
	T.Aman	BR 22	40	3rd week of Aug.	2nd week of Dec.

Subproject: Verification of Fertilizer Management Practices

Effect of urea super granule (USG) on the performance of upland vegetable crops

The experiment was carried out at Palima FSRD site, Tangail during 2000-2001 under AEZ-8 to see the efficiency of USG on upland vegetable crops. The crop was Brinjal and Cabbage. The experiment was carried out followed by RCBD with 6 dispersed replications. Five treatments were; T_1= Prilled urea (Recommended dose for HYG), T_2= USG (Recommended dose for HYG), T_3= USG (10%<Rec. dose for HYG),T_4= USG (20%<Rec. dose for HYG), T_5= Farmers practice

Treatment	N (kg/ha)	P (kg/ha)	K (kg/ha)	S (kg/ha)	CD (t/ha)
T_1	195	56	162	3	3
T_2	195	56	162	3	3
T_3	175	56	162	3	3
T_4	155	56	162	3	3
T_5	125	35	115	-	5

Performance of USG on Brinjal and Cabbage:

Significantly higher fruit yield of Brinjal was recorded from recommended dose of USG which was also identical to 10% less recommended dose of USG (Table 1). Prilled urea of recommended dose produced identical yield with 20% less USG. Almost similar result was observed in head yield of cabbage (Table 2). Regarding economics the highest gross margin and BCR was also calculated from the same treatment.

Therefore, from the result of one year experimentation it might be concluded that the efficiency of USG is more than prilled urea in upland vegetable crops and 10-20% nitrogen could be saved if USG was used as source of N instead of prilled urea.

Table 1. Effect of Urea Super Granule (USG) on the agro-economic performance of Brinjal at Palima, Tangail, 2000-01

Treatment	Yield (t/ha)	TVC (Tk/ha)	Gross margin (Tk/ha)	BCR
Prilled urea (Rec.)	48.0b	57531	230769	5.01
USG (Rec.)	68.1a	60001	389079	7.48
USG (10%<Rec.)	65.3a	59853	350247	6.85
USG(20%<Rec.)	51.9b	59705	251935	5.22
Farmer's dose	39.6c	51159	186681	4.65

Market price : Fruit = @ Tk. 6/kg

Table 2. Effect Urea Super Granule (USG) on agro-economic performance of Cabbage at Palima, Tangail, 2000-01

Treatment	Yield of head (t/ha)	TVC (Tk/ha)	Gross margin (Tk/ha)	BCR
Prilled urea (Rec.)	56.940b	59277.00	57997.83	3.13
USG (Rec.)	65.040a	59277.00	73092.34	5.65
USG (10%<Rec.)	60.140ab	58773.00	68875.50	4.58
USG (20%<Rec.)	55.090b	58285.00	56033.67	3.16
Farmer's dose	46.160c	53307.00	45304.83	1.00

Market price: Head=@Tk 2.34/kg; Leaves=@Tk.

Effect of different levels and methods of nitrogen application on the growth and yield of Cauliflower

The experiment was conducted at FSRD site Goyeshpur, Pabna during the winter season of 2000-01 to find out an optimum dose and method of application of nitrogen for Cauliflower. The experiment was laid out in two factor RCB design with three replications. Four level of nitrogen fertilizer were used e.g. Control (No), Medium yield goal (MYG=68kgN/ha), High yield goal (HYG=98kg N/ha) and farmers practice (FP=120kgN/ha). Three management practices were M1= Half of N will be applied as basal and rest two equal splits at 30 and 45 DAP, M2= In three equal installment at 15,30 and 45 DAP(farmers practice), M3= In 2 equal installments at 15 and 35 DAP (Rec. practice) as top dress.

The result showed that the highest yield achieved from High Yield Goal (HYG) with M1 treatment where 50% nitrogen used as basal and two equal top dress used at 30 and 45 DAP. This yield was at par with HYG and FP treatment where different management was used.

From economic profile it was found that highest gross return, added return, and highest MBCR were obtained from High Yield Goal with M1 treatment (Table-2).

Table 1. Yield and yield contributing characters of cauliflower with different fertilizer doses and different management

Treatment	Curd length (cm)	Breath (cm)	Marketable wt (kg)	Yield (t/ha)
No	6.41b	12.41b	0.70d	25.99d
MYG+M1	7.50a	15.70a	1.14c	41.98c
MYG+M2	7.73a	16.00a	1.21bc	44.70bc
MYG+M3	7.83a	15.30a	1.18c	43.15c
HYG+M1	8.57a	16.63a	1.62a	59.39a
HYG +M2	7.57a	15.97a	1.22bc	44.70bc
HYG+ M3	8.23a	17.17a	1.52ab	55.64ab
FP+M1	7.87a	16.43a	1.36a	44.31bc
FP+M2	8.10a	17.03a	1.21bc	49.04abc
FP+M3	7.97a	15.07a	1.35ab	44.47bc
CV (%)	7.2	7.9	13.7	13.5

Table 2. Economic performance of different treatment of cauliflower

Treatment	Yield (t/ha)	Gross return (Tk/ha)	Added return (Tk/ha)	TVC (Tk/ha)	Added cost (Tk/ha)	MBCR (%)
No	25.99	129950	-	33998	-	-
MYG+M1	41.98	209900	79950	34898	900	88.83
MYG+M2	44.70	223500	93550	35108	1110	84.28
MYG+M3	43.15	215750	85800	34898	900	95.33
H YG+M1	59.39	296950	167000	35074	1076	155.20
HYG +M2	44.70	223500	93550	35484	1480	62.95
HYG+ M3	55.64	278200	148250	35074	1076	137.78
FP+M1	44.31	246550	91600	34631	633	144.70
FP+M2	49.04	265200	115250	34841	843	136.71
FP+M3	44.47	222370	92400	34631	633	145.91

Verification of fertilizer doses of pineapple at Madhupur Tract area (AEZ-28) Tangail

The experiment was initiated during 1998 at Madhupur Tract (AEZ-28) of Tangail to find out an optimum fertilizer dose and verify the present national recommendation of fertilizer for pineapple. Five different fertilizer doses were tested which were; T_1=RF (HYG) = 300-112-40-27 NPKS kg/ha,

T_2=RF (MYG) = 240-88-30-21 NPKS kg/ha, T_3=IFM (HYG) = 290-106-30-27 NPKS kg/ha+10 t/ha cow dung, T_4=FP = 927-80-1030-30 NPKS kg/ha and T_5=Absolute Control

Pineapple was transplanted on 20-12-98 to 30-12-98.Flowering started from 20-3-2000 and harvesting started on 02-7-2000

The highest no. of plant flowered (68.59 %) in the dose T_1 (RF for HYG) followed by T_3 (IFM for HYG). The highest fruit length was found from T_2 (11.94cm) followed by T_4 (11.72). Highest fruit weight was obtained from T_2 (1.59kg) followed by T_1 & T_3. The highest fruit yield (38.95t/ha) was obtained from T_1 followed by T_3 (38.78). The highest Gross margin was obtained from T1 followed by T_2 (Tk. 90133.34) and MBCR was highest in T_1 (1.29) followed by T_2.

Table 1. Effect of different fertilizer doses on the performance of Pineapple, 2000

Treatments	Plants flowered (%)	Fruit length (cm)	Fruit breath (cm)	Fruit wt. (kg/ fruit)	Fruit yield (t/ha)	Gross return (Tk/ha)	Fertilizer cost (VC) Tk/ha	Gross margin (tk/ha)	MBCR
T_1=RF (HYG)	68.59	11.63a	36.46	1.55a	38.95a	105427	15294	90133	1.29
T_2=RF (MYG)	62.00	11.94a	38.56	1.59a	37.19a	99365	12068	87297	1.13
T_3=IFM (HYG)	67.72	11.26b	37.07	1.55a	38.78a	105448	24493	80955	0.81
T_4=FP	55.01	11.72a	36.65	1.45b	29.37a	87302	43165	44137	0.04
T_5=Ab.Control	52.51	8.84c	33.03	0.97c	19.52b	85688	0.00	85688	-
CV (%)	23.65	2.77	15.26	5.49	24.74				

Multilocation verification of trial of promising cropping patterns

The trial was conducted at Tangail and Bogra with two different cropping patterns during 1999-2000 to verify the productivity and profitability of new fertilizer recommendation with current recommendation and farmers practice. Location and cropping patterns tested are shown below-

Cropping pattern	**Location**
Mustard Boro-T.Aman	Tangail, Bogra
Potato-Boro-T.Aman	Bogra

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

The trial was conducted at Palima FSR site Tangail during 1999-00. The results showed that the new recommendation produced the highest seed yield in Mustard that was identical to farmers' dose. But in Boro and T.Aman rice the grain yield was not differed significantly among the fertilizer doses.

From economic point of view, the highest gross margin and BCR was calculated from the new recommendation followed by farmers' dose. New fertilizer recommendation is superior to present recommendation in respect of yield and economics.

Table 1. Yield of Mustard-Boro-T.Aman cropping pattern as affected by different fertilizer recommendation at Palima, Tangail during 1998-99

Treatment	Grain yield (t/ha)			TVC (Tk/ha)	GM (Tk/ha)	BCR
	Mustard	Boro	T.Aman			
Current dose	0.69b	6.0	3.87	42792	38578	1.8
New dose	0.78a	6.3	3.85	43551	46671	2.13
Farmers dose	0.65c	3.92b	3.56	33093	44200	2.0

Fertilizer doses (kg/ha)

Treatment	Crops

N-P-K-S-Zn (kg/ha)	Mustard	Boro	T.Aman
Current dose	70-10-20-20-1	100-15-35-6	70-8-25-4
New dose	100-26-33-20-0	80-6-25-0	70-5-20-4
Farmers' dose	100-15-20-0-0	110-10-20-0	45-12-20-0

Cropping pattern: Mustard-Boro-T.Aman **Location : Bogra**

The trial was conducted at Narhatta, Bogra during 1999-2000. The results are given in Table 4d. Results revealed that the current fertilizer recommendation gave the highest seed yield in Mustard. But in boro identical yield was obtained from present and new recommendation. In T.Aman rice produced significantly higher yield over present recommendation.

Table 2. Yield of Mustard-Boro-T.Aman cropping pattern as affected by different fertilizer recommendation at Narhatta, Bogra during 1998-99

Treatment (N-P-K-S-Zn-B kg/ha)	Grain yield (t/ha)		
	Mustard	Boro	T.Aman
Current dose	0.94ab	4.88a	4.76a
New dose	1.12a	4.97a	4.64a
Farmers' dose	0.79b	4.18a	4.07b
Control	0.36c	2.45b	2.39c

Fertilizer doses (kg/ha)

Treatment N-P-K-S-Zn (kg/ha)	Crops		
	Mustard	Boro	T.Aman
Current dose	80-60-40-20-0	100-34-72-8-0	50-18-48-3-0
New dose	70-46-42-20-1-1.5	80-60-30-0-0	70-30-20-10-0
Farmers' dose	78-35-38-0-0	78-32-31-0	50-17-21-0-0
Control	0-0-0-0-0	0-0-0-0	0-0-0-0

Cropping pattern: Potato -Boro-T.Aman **Location: Bogra**

The trial was conducted at Narhatta, Nandigram and Joypurhat MLT site of Bogra during 1999-2000. It reveals that at Narhatta, Nandigram and Joypurhat the new recommendation produced the superior tuber yield of Potato. Current recommendation and Farmers' dose produced identical yield. In Boro both the recommended doses produced identical yield irrespective of locations. But in T.aman rice new recommendation produced significantly higher yield in all the locations.

Table 3. Yield of Potato-Boro-T.Aman cropping pattern as affected by different fertilizer recommendation at Narhatta, Nandigram and Joypurhat of Bogra, 1999-2000

Treatment	Tuber yield of Potato (t/ha)			Grain yield of Boro (t/ha)			Grain yield of T.Aman (t/ha)		
	Narhatta	Nandigram	Joypurhat	Narhatta	Nandigram	Joypurhat	Narhatta	Nandigram	Joypurhat
Current dose	20.8b	23.4b	23.1b	4.86a	4.56a	4.96a	3.75b	3.82b	3.97b
New dose	24.2a	28.3a	27.0a	4.96a	4.76a	5.28a	4.12a	4.28a	4.46a
Farmers' dose	22.2ab	26.4ab	24.5b	4.45b	4.08b	4.55b	3.55b	3.64b	3.61c

Fertilizer doses (kg/ha)

Treatment N-P-K-S-Zn (kg/ha)	Crops		
	Potato	Boro	T.Aman
Current dose	100-26-90-15-4	100-15-45-8-0	75-12-40-5-0
New dose	160-43-133-0-0	100-13-20-0-0	80-13-20-10-4
Farmers' dose	156-31-112-0-0	73-13-12-0-0	56-10-13-0-0

Boron fertilization to Mustard

Mustard is the major oil seed crop grown about 70% of the total oil seed area in Bangladesh. But the average yield of Mustard per unit area is very low. During the recent years micro nutrient problems have been warranted due to intensive cropping of rice with other crops. A widespread Boron deficiency is now exists in different parts of Bangladesh soil and it might be responsible for low yield of Mustard. Gupta (1980) reported that Boron deficiency causes less siliqua formation and reduce yield. In this regards a number of experiments were conducted to find out an optimum dose of Boron for Mustard in different locations. A recommendation for Boron in Mustard has come out from these experiments and it needs to be verified in other Mustard growing areas. Therefore the trial was conducted to verify the recommendation in Mustard at different locations.

The trial was conducted at Phulpur and Netrokona MLT sites of Mymensingh, Narikeli FSRD site of Jamalpur during 1999-2000. The experiment was laid out in RCB design with 5-6 replications. Mustard variety Tori-7 was used in different locations. Three different fertilizer doses - i. Recommended dose as per BARC fertilizer recommendation guide, ii. Alternative recommendation as per On-station experiment results and iii. Farmers' dose were tested. Seeds were sown during 5-20 November in different locations. Boric acid was used as the source of Boron. Recommended spacing and seed rate was used and different intercultural operations were done as and when required

Location: Mymensingh Variety : Tori-7

The trial was conducted at Phulpur and Netrokona MLT sites of Mymensing during 2000-01. At Phulpur seed yield of Mustard increased significantly over farmers dose as the farmers did not applied Boron in Mustard. However, 1kg or 1.5 kg Boron/ha are identical (Table1). But at Netrokona seed yield increased significantly, with the increase of Boron level. Highest yield (618 kg/ha) was recorded from the application of 1.5 kg Boron/ha.

Table 1. Effect of Boron fertilization on the yield of Mustard at Phulpur and Netrokona during 2000-01

Treatment	(N-P-K-S-Zn-B kg/ha)	Seed yield (kg/ha)	
		Phulpur	Netrokona
Recommended dose	80-26-33-20-2-1	680a	522b
Alternative recommendation	80-26-33-20-1.5	760a	618a
Farmers' dose	50-13-33-4-0 +CD @ 5 t/ha	560b	382c

Location : Jamalpur Variety : Tori-7

The trial was conducted at Narikeli FSRD sites of Jamalpur during2000-01. Results revealed that Boron fertilization has significant effects on the seed yield of Mustard (Table 2). Highest seed yield was obtained from the application of Boron @ 1.5 kg/ha followed by current recommendation. Farmers dose produced the least yield where no Boron was applied at all.

Table 2. Effect of Boron fertilization on the yield of Mustard at Narikeli FSRD site, Jamalpur 2000-01

Treatment	(N - P - K - S - Zn -B kg/ha)	Seed yield (kg/ha)
Recommended dose	80 - 26 - 33 - 20 - 2-0	956b
Alternative recommendation	80 - 26 - 33 - 20 - 2-1.5	1247a
Farmers' dose	67 - 23 - 23 - 0 - 0	813c

Testing of NPKS multi-nutrient fertilizers under farmer's condition

The experiment was conducted at eight different locations across the Bangladesh during 2000-01 to test the utility of multi-nutrient fertilizers in terms of productivity and labour cost and to enhance balance application of fertilizer nutrients in Boro rice. Variety BRRI Dhan-28 and BRRI Dhan-29 were transplanted during last week of January to 1st week of February across the locations. The following treatments were tested:

Treatments:
T_1 = Control
T_2 = FP (158-56-45-18 kg NPKS/ha for Bagharpara)
(108-60-28-16-6 kg NPKSZn/ha for Magura)
T_3 = MNF for MYG: 100-20-30-10 kg NPKS/ha
T_4 = MNF for HYG: 140-28-42-14 kg NPKS/ha
T_5 = Single fert. For MYG: 100-20-30-10 kg NPKS/ha
T_6 = Single fert. for HYG: 140-28-42-14 kg NPKS/ha

Performance of Boro rice at different locations:

The results showed that almost there was no significant difference in grain yield of boro rice was observed in most of the locations. Single fertilizer and multinutrient fertilizer produced identical yield in most of the sites. Only at Magura a significant difference was observed in grain yield of boro rice between the single and multinutrient fertilizers. Even, no difference in grain yield was found between the fertilizers of two levels-MYG and HYG at Jessore, Jamalpur and Gazipur.

Therefore, from the study it might be concluded that no significant difference in grain yield of boro rice was observed between the single and multinutrient fertilizers.

Table 1. Performance of NPKS Multinutrient fertilizer on Boro rice at different locations

Treatment	Grain yield at different locations							
	Jessore	Magura	Jamalpur	Tangail	Rangpur	Nilphamari	Pabna	Gazipur
T_1	3.27b	2.37d	2.42b	2.90c	2.14c	2.01c	3.32c	2.35b
T_2	6.52a	4.58b	4.64a	5.70ab	6.15b	5.80b	4.66b	7.08a
T_3	6.14a	5.60a	4.84a	5.90ab	5.96b	5.88b	5.11ab	7.28a
T_4	6.94a	5.74a	4.92a	6.15a	7.40a	7.11a	5.97a	6.42a
T_5	6.51a	4.24c	4.80a	5.65b	5.89b	5.90b	5.09ab	6.62a
T_6	6.56a	4.46bc	5.09a	5.85ab	7.26a	6.99a	4.92b	6.91a

Improvement of Agroforestry Systems

Performance of *Dioscorea bulbifera* and *Dioscorea alata* grown together on Ziga plant

The experiment was conducted at the Regional Agricultural Research Station, Jessore for two years during 1999-2000 and 2000-01 with five replications. Six planting systems *viz.* (1) 1 plant of *bulbifera*, (2) 1 plant of *alata*, (3) 1 *bulbifera* + 1 *alata*, (4) 2 *bulbifera* + 1 *alata*, (5) 1 *bulbifera* + 2 *alata* and (6) 2 *bulbifera* + 2 *alata* were studied using a single Ziga plant as support. The unit plots measured 3 x 3m. Pits measuring 50 x 50 x 50cm were dug beside the Ziga plants during the third week of April. Yam seeds of 100-200g were planted during the fourth week of April. *D. alata* was harvested during the second week of January while *D. bulbifera* during the second week of February. Data on bulbil and rhizome number and yield were recorded and analyzed statistically. *D. alata* was found to produce much higher yield than *D. bulbifera*. Rhizome was the main contributor to the yam yield in *D. alata* while bulbil contributed more to the yield in *D. bulbifera*. Since the yam yield in *D. alata* was higher than that in *D. bulbifera* the combined yam yield from the two yam species was higher where the relative number of *D. alata* plants was higher in the mixture. Yield of the individual species and combined yield from the two species per support increased with the increase in planting density (Table 1 and 2).

Table 1. Yam yield of *D. alata* and *D. bulbifera* on Ziga plant at RARS, Jessore

Treatment	Yam yield (kg/support)						
	D. alata			*D. bulbifera*			*D. alata* + *D. bulbifera*
	Bulbil	Rhizom	Total	Bulbil	Rhizom	Total	
				1999-2000			
T_1	-	-	-	0.76	0.18	0.94	0.94
T_2	0.19b	3.14ab	3.30b	-	-	-	3.30
T_3	0.16b	2.50b	2.71b	0.83	0.09	0.88	3.59
T_4	0.40b	4.01ab	4.43ab	1.21	0.20	1.41	5.84
T_5	0.49b	3.93ab	4.33ab	0.27	0.19	0.46	4.79
T_6	1.14a	5.04a	6.18a	1.01	0.19	1.20	7.38
				2000-01			
T_1	-	-	-	1.64	0.18	1.82	1.82
T_2	0.36	2.42b	2.78b	-	-	-	2.78
T_3	0.22	2.29b	2.51b	1	0.11	1.11	3.62
T_4	0.23	3.59ab	3.82ab	1.06	0.18	1.24	5.06
T_5	1.34	5.21a	6.15a	1.09	0.1	1.19	7.34
T_6	0.59	3.48a	6.07a	1.18	0.21	1.39	7.46
F test	NS	*	*	NS	NS	NS	**
				Year mean			
T_1	-	-	-	1.20	0.18	1.38	1.38
T_2	0.28	2.78	3.04	-	-	-	3.04
T_3	0.19	2.40	2.61	0.92	0.10	1.00	3.61
T_4	0.32	3.80	4.13	1.14	0.19	1.33	5.45
T_5	0.92	4.57	5.24	0.68	0.15	0.83	6.07
T_6	0.87	4.26	6.13	1.10	0.20	1.30	7.42

Table 2. Number of bulbil and rhizome of *D. alata* and *D. bulbifera* on Ziga plant at RARS, Jessore

Treatment	Bulbil and rhizome number/support					
	D. alata		*D. bulbifera*		Total	
	Bulbil	Rhizome	Bulbil	Rhizome	Bulbil	Rhizome
			1999-2000			
T_1	-	-	13	1	13	1
T_2	8	1	-	-	8	1
T_3	6	1	12	1	18	2
T_4	12	1	12	2	24	3
T_5	12	2	6	1	18	3
T_6	37	2	14	2	51	4
			2000-01			
T_1	-	-	11	1	11	1
T_2	11	1	-	-	11	1
T_3	7	1	13	1	20	2
T_4	15	1	11	2	26	3
T_5	91	2	11	1	102	3
T_6	71	2	10	2	81	4
			Year mean			
T_1	-	-	12	1	12	1
T_2	10	1	-	-	10	1
T_3	7	1	13	1	19	2
T_4	14	1	12	2	25	3
T_5	52	2	9	1	60	3
T_6	54	2	12	2	66	4

Performance of Potato yam grown on the existing homestead trees at Jamalpur

The experiment was conducted at FSRD Site, Narikeli, Jamalpur during March 2000 to January 2001 to determine the compatibility of potato yam with different tree species. Four common tree species were selected in five farmers' houses. Each house was treated as a replication. The selected tree species viz. drumstick (*Moringa oleifera*), ziga (*Odina woodier*), mander (*Erythrina indica*), pitraj (*Aphanamixix polystachya*) were compared with the vertical bamboo support. Single standard sized germinated yam seed (average weight of 120 g) was planted in the pit in the third week of April 2000. Bamboo fencing was given in all the pits to protect the creeper from animals as well as to support for climbing on the host plant. The yam started flowering in the middle of September 2000 and harvesting began from November 2000. The periodical harvesting continued up to January 2001. The data on different characters were statistically analyzed and the means were separated as per LSD test.

The different types of support significantly influenced the number of yam/plant and the total weight of yam/plant. All the living tree species produced the similar yield among which drumstick produced the highest yam yield/plant (5.6 kg). The lower yield in the tree species might be due to the competing with the growing canopy of the host plant as well as the nutrient. Vertical bamboo support gave enough space for canopy development and thus produced highest yam yield (Table 3). Moreover, there was no nutrient competition. However, in conclusion it could be said that for the low cost involvement existing homestead tree species might be utilized for potato yam cultivation.

Table 3. Performance of potato yam in different plant species at FSRD site, Narikeli, Jamalpur

Treatment	Yam/plant (no.)	Average weight of individual yam (g)	Total weight of yam/plant (kg)
Drumstick	26.0ab	212.4	5.6b
Ziga	24.4b	203.2	4.7b
Mander	22.0b	208.4	4.7b
Pitraj	24.6b	221.4	4.8b
Vertical bamboo support	31.8a	213.6	6.8a
F	**	NS	**
CV%	17.66	9.31	10.95

Figure in a column having similar/no letter do not differ significantly

Study on the feasibility of growing vegetables in home garden round the year

The trial was initiated at FSRD site, Narikeli, Jamalpur in rabi 1999-2000 with a view to find out a profitable sequence of vegetables pattern and to utilize the shady place of homestead. Five vegetables pattern, which included 17 different kinds of vegetables to cultivate in three different seasons of the year. The patterns were as follows:

Rabi	Kharif-I	Kharif-II
Tomato	Indian spinach	Data
Lalsak+Cabbage	Brinjal	Kangkong
Corriander+ Onion	Okra	Broad leaf coriander
Spinach+ Garlic	Chili	
Carrot+ Bitter gourd	Latiraj kachu	

Rabi: The highest yield was obtained from Lalshak + Cabbage (13+53 t/ha) followed by Tomato (38.5 t/ha) and Carrot + Bitter gourd (20.4+6.40 t/ha). The lowest yield was obtained from Spinach+Garlic (6.6+5.2 t/ha). The highest gross benefit (Tk.385000/ha), Net return (Tk.265000/ha) and benefit cost ratio (3.2) were obtained from Tomato (Table 4).

Table 4. Yield, cost and return of different vegetables of Rabi at FSRD site, Narikeli, Jamalpur 1999-2000

Crop	Date of planting	Date of 1st harvesting	Field duration (days)	Yield (kg/ plot)	Yield (t/ha)	Gross benefit (Tk/ha)	TVC (Tk/ha)	NR (Tk/ha)	BCR
Rabi vegetables									
Tomato	23/10/99	1/12000	107	19.25	38.5	385000	120000	265000	3.20
Lalsak +	23/10/99	20/11/99	37	6.5	13.00	291000	122000	169000	2.38
Cabbage	26/10/99	1/1/2000	76	26.5	53.00				
Corriander	23/10/99	3/1/2000	97	0.5	1.00	150000	112000	38000	1.33
+ Onion	23/10/99	5/2/2000	102	6.0	12.00				
Spinach	17/10/99	28/11/99	41	3.3	6.60	189000	112000	77000	1.68
+ Garlic	23/10/99	12/2/2000	109	2.6	5.20				
Carrot+	9/11/99	15/1/2000	66	10.2	20.4	201600	110000	91600	1.83
Bitter gourd	20/11/99	15/1/2000	90	3.2	6.40				
Kharif vegetablesI									
Indian Spinach	23-3-2000	30-4-2000	100	31.7	63.4	190200	100000	90200	1.90
Brinjal	25-3-2000	25-6-2000	125	17.5	35.0	175000	96000	79000	1.82
Okra	23-3-2000	5-5-2000	102	15.0	34.0	180000	90000	90000	2.00
Kharif II vegetables									
Data	2-7-2000	15-8-2000	68	17	34	102000	84000	18000	1.24
Kangkong	12-8-2000	15-9-2000	48	20	40	200000	80000	120000	2.5
Broad leaf coriander	20-7-2000	20-8-2000	65	4.0	8	240000	76000	164000	3.15
Chili	25-4-2000	10-6-2000	141	3.5	7	40000	110000	30000	1.27
Latiraj kachu	19-4-2000	15-6-2000	146	14.5	29	203000	116000	87000	1.75

Kharif-I: The highest yield was performed by the Indian Spinach (63.40 t/ha) followed by Brinjal 35.00 t/ha and Okra 34.00 t/ha respectively. The highest gross benefit was obtained by Indian Spinach (Tk.190200/ha) followed by Okra Tk.180000/ha and Brinjal Tk.175000/ha respectively. The highest benefit cost ration was found by the Okra (2.0) followed by Indian Spinach (1.9) and Brinjal (1.82) respectively. Benefit cost ratio from Okra was the highest because total variable cost of Okra was minimum than other vegetable grown.

Kharif-II: The highest yield was obtained from the Kangkong (40 t/ha) followed by data (34 t/ha) and Latiraj Kachu (29 t/ha). The lowest was obtained from Chili (7 t/ha). The highest gross benefit was obtained from broad leaf lovi (Tk.2, 40,000/ha) followed by Latiraj kachu and Kang-kong (Tk.2, 03,000/ha) and (Tk.2,00000/ha) respectively. The lowest gross benefit was obtained from the data (Tk. 1,02,000/ha). The maximum benefit cost ratio were obtained from Broad leaf coriander (3.15) and lowest was from data (1.24).

Performance of the vegetables patterns: Tomato-Indian Spinach-Data was better than those of others patterns. This pattern gave the highest net return (Tk.373200/ha) and BCR (2.22) compared to Lalsak + Cabbage – Brinjal - Kangkong (Net return Tk. 368000/ha, BCR 2.20), Coriander + Onoin – Okra - Broad leaf coriander (Net return Tk. 292000/ha, BCR 2.00) and Carrot + Bitter gourd - Latiraj kachu (Net return Tk. 178600/ha, BCR 1.79) respectively (Table 5).

Table 5. Cost and return of different vegetables pattern round the year at FSRD site, Narikeli, Jamalpur 1999-2000

Patterns	Gross return (Tk.)	TVC (Tk.)	Net return (Tk.)	BCR
Tomato- Indian spinach –Data	677200	304000	373200	2.22
Lalsak + Cabbage- Brinjal –Kangkong	666000	298000	368000	2.20
Coriander+Onion- Okra -Broad leaf coriander	570000	278000	292000	2.00
Spinach+ Garlic -Chili-Chili	329000	404600	107000	1.41
Carrot+ Bitter gourd -Latiraj kachu	222000	226000	178600	1.79

Among the five vegetables patterns tested Tomato - Indian spinach - Data gave the highest net return (Tk. 3,73,200/ha) followed by Lalshak + cabbage – Brinjal - Kangkong (Tk. 3,68,000/ha) and Coriander + Onion – Okra -Broad leaf coriander (Tk. 2,92,000/ha). This pattern may be continued for the next year as the source of vitamin and minerals which most essentials for the farmers' health and cash earning.

Performance of Potato yam grown on the existing homestead trees at Faridpur

The experiment was conducted at FSRD site, Ishan Gopalpur, Faridpur during 2000-01. The experiment was laid out in RCB design with five replications. Five different treatments (support) viz. Drumstick, Ziga, Mandar, Pitraj and vertical bamboo were included in the study. A pit measuring 50x50x50 cm were dug under the tree trunk. Well de composed cowdung @ 5 kg/pit and Furadun @ 10 g/pit was applied and mixed in the soil during pit preparation. Two germinated yam seeds were planted in each pit. Adequate plant protection measures are being taken as and when necessary. Yams were harvested during 29/10/2000 to 05/12/2000. Data on yield and yield components were recorded and analyzed statistically. Highest average yield of potato yam (15.00 kg/bamboo) was obtained from vertical bamboo support. The second highest yield (14.08 kg/plant and 12.68 kg/plant) were obtained from Ziga and drumstick support. Lowest yield (3.75 kg/plant) was obtained from Pitraj (Table 6).

Table 6. Performance of potato yam grown on existing homestead trees at FSRD site, Ishan Gopalpur, Faridpur during 1998-2001

Treatment	Yam/ treatment (no.)	Weight/yam (g)	Yield/treatment (kg)			
			1998-99	1999-00	2000-01	Average
Drumstick	42.5d	295b	3.92	12.35b	12.68c	9.66
Ziga	48.3a	289c	4.13	12.84b	14.08b	10.35
Mander	20.8c	157c	4.40	2.94c	6.62d	4.65
Pitraj	16.7d	147d	3.88	1.36d	3.75e	3.00
Bamboo support	41.3b	325a	4.25	14.74a	15.00a	11.00
CV (%)	5.6	1.8	11.4	6.3	5.1	
Level of significance	**	**	--	**	**	

** means significant at 1% level

Performance of potato yam grown on the existing homestead trees at Sylhet

The experiment was conducted at FSRD site, Golapgonj, Sylhet during 1999-2000 to 2000-01. The experiment was laid out in RCB design with four replications. The four different treatments (Support) such as mango, coconut, rain tree and betel nut were included in the study. Pit measuring 50×50×50cm were dug and well-decomposed cowdung at the rate of 4kg/pit was applied and mixed the soil during pit preparation. Farmer's homestead yam planting was made during 20 April to 28 April. To protect pest (leaf eating) furadan was used at the rate of 5gm/plant. Harvesting was done from last week of December to second week of January. The highest yield of potato yam (5.27 kg/plant) was obtained from betel nut as support tree followed coconut as support tree (3.98/kg/plant). The lowest yield (2.40 kg/plant) was obtained from rain tree support (Table 7).

Table 7. Yield performance of potato yam with different tree species at FSRD site, Golapgonj, Sylhet during 1999-2001

Support tree	No. of yam			Average wt/yam (g)			Yeild/plant (kg)		
	1999-2000	2000-01	Mean	1999-2000	2000-01	Mean	1999-2000	2000-01	Mean
Coconut	15	17	16	250	248	249	3.70	4.21	3.98
Betelnut	16	20	18	290	295	292.5	4.50	5.90	5.27
Mango	15	16	15.5	225	236	230.5	3.20	3.78	3.57
Raintree	10	13	11.5	200	218	209	1.90	2.83	2.40

Performance of Potato yam grown on the existing homestead trees at Tangail

The experiment was conducted at FSRD site, Palima during 2000–2001. Five tree species i) Drumstick ii) Ziga iii) Mandar iv) Kadam v) Mehagoni and vi) Bamboo were used as support.The pit size was 50×50×50 cm. One pit was prepared for one tree species and bamboo with 100gm urea, 75gm TSP and 80gm MP in ten cooperator farmers homestead. Yam planting was done during 1st week of April, 2000.To protect pest (leaf feeder) furadan was applied at the rate of 5gm/plant. Harvesting was done during 10 Nov. 2000 to 15 February 2001. The highest yield of potato yam (6.5kg/plant) was obtained from bamboo as vertical support material while the lowest yield (2.1kg/plant) was obtained from Mandar tree support. The highest yield of bamboo support might be due to large seed size (400g), sufficient light and comparatively less affected by pest at vegetative stage. The lowest yield from Mandar support might be due to small seed size (300g), large canopy of Mandar tree and severely affected by leaf feeder in vegetative stage. It was observed that the survival rate was highest (80%)

with bamboo made support which was followed by Mehagoni (70%.) Kadam tree required the highest days for initiation and harvesting of yam and Drumstick required the lowest days for initiation and harvesting of yam (Table 8).

Table 8. Performance of potato yam grown on some homestead supports at FSRD site, Palima, Tangail during 1999-2000

Supporting materials	Survival (%)	Flowering (days)	Days to harvest	Yam/plant (no.)	Yield/plant (kg)
Drumstick	66	126	213	21ab	4.4bc
Ziga	62	133	215	14d	2.9d
Mandar	44	137	219	11e	2.1e
Kadam	60	141	231	19bc	3.9c
Mehagoni	70	132	229	17c	4.2c
Bamboo (vertical)	80	127	220	24a	6.5a
CV (%)	--	--	--	11.23	9.21

Performance of Potato yam grown on the existing homestead tree spices at Barind, Rajshahi

The trial was conducted at FSRD site, Chabbishnagar, Rajshahi, during 2000-01. The trial was laid out in RCB design with six dispersed replications. Each replication represents one farmer. In some replications, Potato yam could not be established due to drought. That is why statistical analysis was not possible. Five different treatments (support) viz. Drumstick, Ziga, Mandar, Babla and Neem trees were included for the support of potato yam. Pits size was 50x50x50 cm and well-decomposed cow dung @ 5kg per pit was applied and mixed with the soil during pit preparation. Potato yams were planted from April 21, 2000.

Data on number of potato yam and yield of potato yam (kg/plant) were taken. The number of potato yam ranged from 6 to 10.6. The maximum number of potato yam was received from drumstick tree (10.6) where as minimum number of potato yam was received from Ziga tree (6). The yield of potato yam ranged from 1.51 to 4.2 kg/plant. The highest yield (4.20 kg/plant) was produced by the drumstick support where as lowest yield (1.51 kg/plant) was received from the Ziga tree support (Table 9).

Table 9. Yield of potato yam on the existing homestead tree spices

Name of tree	No. of potato yam	Yield of potato yam (kg/plant)
Drumstick	10.6	4.20
Ziga	6	1.51
Mandar	7.6	2.92
Babla	7.1	2.98
Neem	6.2	2.2

Performance of Potato yam grown on different homestead trees at Rangpur

The trial was carried out for three consecutive years from 1998-99 to 2000-01 at FSRD site, Syedpur, Rangpur and MLT sites Lalmonirhat, Polashbari and Nilphamari MLT sites. A total of six farmers, in each of the years were involved in this study. Five different support were used. These were Mandar, Ziga, Drumstick, Pitraj and Bamboo. Planting was done during the month of April of each individual years. Two germinating yam seedling were planted in two pits near each tree trunk. Pit size was 50x50x50 cm. Soil of each pit was well mixed with 5 kg cowdung. In the initial stage care was taken so that the creepers were not damaged by the animals and can climb the tree. Granular insecticide was applied time to time at the base of the yam plants and it was well mixed with the soil to control the

leaf feeder which affects the growth of the yam plant. Data on number and weight of yam per plant were recorded after harvest and analyzed. The mean potato yam yield on different support arrangements for three successive years has been presented in the table. It is evident from the study that the highest number (38) and weight (5.5 kg) of yam per plant was obtained when it was allowed to grow on the bamboo support. Presence of sufficient sunlight and absence of shading effect might have contributed to the better yield of yam on vertical bamboo support. Ziga and Mandar support produced 30 numbers of yam which yielded more than 4 kg/plant. Pitraj support produced less number of yam (26) per plant weighing 4.4 kg/plant (Table 10 and 11).

Table 10. Performance of potato yam grown on different support trees for 3(three) years at four locations of greater Rangpur area during 1998-99 to 2000-01

Tree Species	Yam per plant (no.)				Weight of yam per plant (kg)			
	2000-01	1999-00	1998-99	Mean	2000-01	1999-00	1998-99	Mean
Mandar	29	42	20	30.3	4.53	5.1	3.6	4.4
Ziga	29	43	18	30.0	5.16	5.3	2.8	4.4
Drumstick	26	35	19	26.7	5.74	4.0	3.4	4.3
Pitraj	33	26	23	27.3	5.39	3.9	3.1	4.1
Bamboo (sole)	43	41	30	38.0	6.79	5.6	4.2	5.5

Table 11. Performance of potato yam grown on different support trees for 3(three) years four locations of greater Rangpur during 1998-99, 1999-00 and 2000-01

Tree Species	Yam/support (no)	Wt. of yam/support (kg)
Mander	30b	4.41ab
Zigha	30b	4.42ab
Drumstick	27b	4.38ab
Pitraj	27b	4.13b
Bamboo sole	38a	5.53a
CV (%)	8.9	12.8

On-Farm Trials with Advance Lines and Technologies

On-farm trial with phosphorus efficient genotypes of Wheat

Four advance lines/varieties of wheat (Kanchan, Chirya, BAW-923, BAW-966) were tested with three levels of phosphorus (0, 30 and 60 kg P_2O_5/ha) in the farmers field at MLT site Sherpur during rabi 2000-01. Application of 30 and 60 kg P_2O_5/ha increased the yield of genotypes significantly over control. The highest grain yield was obtained from 60 kg P_2O_5/ha application (Table 1). Among the genotypes tested Chirya produced the highest grain yield (4.83 t/ha) followed by Kanchan and BAW 966 (4.38 t/ha each) respectively.

Table 1. Interaction effect of variety/ lines and phosphorus level on the grain yield of wheat

Levels of P_2O_5 (kg/ha)	Variety/ lines	Grain yield (t/ha)
0	Kanchan	3.53d
	Chirya	3.89cd
	BAW 923	3.36d
	BAW 966	3.31 d
30	Kanchan	3.88cd
	Chirya	4.33b
	BAW 923	3.98cd
	BAW 966	3.83cd
60	Kanchan	4.38b
	Chirya	4.83a
	BAW 923	4.13c
	BAW 966	4.38b
F-test		**
CV (%)		7.5

On-farm performance of promising Groundnut varieties

To evaluate the yield performance of some groundnut varieties and lines at farmers field three trials were conducted at FSRD site, Noakhali, Lebukhali and Kalapara during 2000-01. At Noakhali, BARI Badam-6 yielded better (2.93 t/ha) which is identical with the yield obtained from BARI Badam-5 and ICG-89257 (yield range: 2.52-2.87 t/ha). The tested variety ACC-12 (Jhinga) produced significantly the highest yield at Lebukhali (2.15 t/ha) and Kalapara (2.25 t/ha). Over the locations Noakhali performed better than other two sites (Table 2).

Table 2. Yield performance of groundnut varieties/lines at different locations during 2000-01

Varieties/lines	Pod yield (t/ha)		
	Noakhali	Lebukhali	Kalapara
Local	2.32b	-	-
BARI Badam-6	2.93a	1.77c	1.88c
BARI Badam-5	2.87ab	-	-
ICG 89257	2.52ab	-	-
DG-2	-	1.91b	1.93b
Dhaka-1	-	1.33d	1.67d
Acc-12 (Jhinga)	-	2.15a	2.25a
CV (%)	11.30	7.3	15.6

Evaluation of chickpea varieties for intercropping with Mustard

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 at the farmers field of Chowgacha MLT site during rabi 2000-01. Results revealed that chickpea yield was mainly influenced by the planting system but not by the chickpea variety. Four rows of chickpea alternate with two rows of mustard produced the highest chickpea yield (344 kg/ha) whereas two rows of chickpea alternate with two rows of mustard produced the highest mustard yield (219 kg/ha).

Chickpea equivalent yield did not vary widely among different planting systems and chickpea variety (332-438 kg/ha). There was no significant difference in yield between the two varieties of chickpea (Table 3).

Table 3. Yield performance of chickpea, intercropped with mustard at the MLT site Chowgacha during rabi 2000-01

Treatments	Yield (kg/ha)		
	Chickpea	Mustard	Chickpea equivalent
Two rows of chickpea (Var. BARI chola-2) alternate with two rows of mustard (50c:50m)	247	213	332
Four rows of BARI Chola-2 alternate with two rows of mustard (67c:33m)	330	158	438
Two rows of BARI chola –5 alternate with two rows of mustard (50c:50m)	255	219	404
Four row of BARI chola –5 alternate with two rows of mustard (76c:33m)	344	139	339

Price: Chickpea = Tk 22.00/kg, Mustard = Tk. 15.00/kg

On-farm adaptability trial of Country bean varieties at Madhupur

On-farm adaptability trial of six promising country bean varieties against local check was conducted at MLT site, Modhupur, Tangail during 2000-01 to evaluate the suitable variety/varieties for the area. Among the varieties tested the highest yield (3.51 kg/pit) was obtained from BARI Sheem–1 followed by IPSA Sheem-2 (3.46 kg/pit) and Kartikoda Sheem (3.39 kg/pit) respectively. BARI Sheem-2, Bata Sheem and local gave also identical yield (2.24-2.12 kg/pit). BARI Sheem-2 gave higher yield it was also 45 days earlier over the local variety. Bata Sheem, Kartikoda Sheem, BARI sheem-2 produced sheem for longest duration (80-108 days) and BARI Sheem-2 was the earliest variety (Table 4).

Table 4. Performance of country bean varieties at MLT site, Modhupur, Tangail during 2000-01

Varieties	1st harvest to last harvest (days)	Yield (kg/pit)
BARI Sheem 1	137-211	3.51a
BARI Sheem 2	70-178	2.25bc
IPSA Sheem 2	137-211	3.46a
Kartikoda seem (MCC)`	108-197	3.39a
Madhupur seem (MCC)	137-211	3.24a
Bata Sheem (MCC)	107-187	2.24c
Local (Check)	148-211	2.12c
CV (%)	-	8.45

Advance yield trial of Chickpea

The trial was conducted at FSRD site, Chabbishnagar, Rajshahi during rabi 2000-01 to select chickpea lines having high yield potential. Five lines (Viz. ICC-4958, Anugri, BC-3, BC-5, BC-6) were tested in this trial. Yield performance of five lines of chickpea are presented in table 5. Among the lines a significant variation was observed in seed yield of chickpea. The line Anugri gave superior yield (1.13 t/ha) followed by ICC-4958 (1.02 t/ha) respectively. From other three lines the yield ranged 0.63-0.76 t/ha. Days to maturity of the tested lines also differed significantly. The lowest duration was observed in Anugri and BC-5 (99 days) and the highest was ICC-4958 (107 days).

Table 5. Performance of advance lines of chickpea at FSRD site, Chabbishnagar, Rajshahi

Treatments	Days to maturity	Yield (t/ha)
ICC-4958	107	1.02
Anecgri	99	1.13
BC-3	103	0.63
BC-5	99	0.65
BC-6	100	0.755
CV (%)	8.7	3.78
LSD (0.05)	5.67	3.4

On-farm verification of different levels of N-fertilizer for growing Bushbean

An experiment was conducted at farmers field of Shahrasti MLT site, Comilla during rabi 2000-01 to determine the optimum and economic dose of N-fertilizer of bushbean. Six different N-levels (Viz. 0, 30, 60, 90, 120 and 150 kg/ha) were used as six treatments. Results revealed that there was significant response of bushbean to N-fertilizer application. There were variation among different doses of N for yield. Upto the application of 120 kg N/ha the yield of bushbean increased (1.22-5.45 t/ha) but further addition of N (150 kg/ha) decreased the yield and gross margin. Highest length and breadth of bushbean were obtained from 150 kg N/ha along with recommended doses of other fertilizers (Table 6).

Table 6. Yield and yield attributes of Bushbean at Shahrasti, Comilla during rabi 2000-01

N-level (kg/ha)	Length of bushbean (cm)	Breadth of bushbean (cm)	Yield (t/ha)	Gross margin (Tk/ha)
T_1=0	8.5	2.75	1.22	3,913
T_2=30	9.3	2.86	2.51	13,839
T_3=60	10.5	3.41	3.76	23,429
T_4=90	11.7	3.95	4.36	27,819
T_5=120	12.4	4.30	5.45	36,177
T_6=150	13.3	4.44	5.23	33,981
CV (%)	6.7	3.2	11.4	

Preliminary yield trial of Barely for saline areas

To find out the suitable lines/variety with high yield potentials for the saline areas of Noakhali, Khulna and Patuakhali, the tiral was conducted during rabi 2000-01. Six varieties/lines viz., BSH-32, BSH-2, BB-1, BSHL-6, BSHL-2, BSHL-4 were tested in the trial. It was observed from the results that among the locations barley yielded better at Khulna (yield ranged from 780-1830 kg/ha) followed by Patuakhali (644-1922 kg/ha). Noakhali showed poor performance (yield ranged from 303-842 kg/ha) from other locations. The highest yield was obtained from advance line BSH-2 (1922 kg/ha) at Patuakhali followed by BSHL-6 (1830 kg/ha) at Khulna**.** BSHL-2 gave lower yield in three locations (303, 780 and 727 kg/ha) respectively (Table 7.)

Table 7. Performance of different Barely lines in saline areas during rabi 2000-01

Lines/variety	Grain yield (kg/ha)		
	Noakhali	Khulna	Patuakhali
BSH-32	708	790c	1425b
BSH-2	400	1180b	1922a
BB-1	575	1410b	1475b
BSHL-6	842	1830a	644c
BSHL-2	303	780c	727c
BSHL-4	408	1230b	730c
CV (%)	23.21	11.14	

On-farm variety trial with some BINA released Mustard varieties

Six BINA released mustard varieties/lines viz. BINA Sharisha-3 and 4, Agroni, Safal, MM-19 and 20 with two check varieties were tested at the FSRD site, Syedpur, Rangpur during rabi season of 1999-2001 to evaluate their performance and to identify the suitable mustard varieties with good yield potentials to fit the existing cropping pattern. Results revealed that BARI Sharisha-8 produced significant highest seed yield (2.31 and 1.89 t/ha) for both the year and also earlier to 96 and 100 days than the BINA mustard varieties/lines. The next higher seed yield was obtained from BINA Sharisha-3 (1.74 and 1.63 t/ha) for both the years which were at per with the yield of BINA Sharisha-4, MM-20 and Shajal respectively (Table 8).

Table 8. Yield performance of BINA released mustard varieties at the FSRD site Syedpur, Rangpur during rabi 1999-2000 and 2000-01

Varieties/lines	Days to maturity		Seed yield (t/ha)	
	1999-2000	2000-01	1999-2000	2000-01
BINA Sharisha 3	98a	101ab	1.74b	1.63b
BINA Sharisha 4	97b	97c	1.54c	1.51b
Agroni	98a	99bc	1.46c	1.18d
Shafal	98a	99bc	1.34d	1.50d
MM-19	-	102a	-	1.46bc
MM-20	-	102a	-	1.52b
Jata	-	102a	-	1.27cd
BARI Sharisha 8	96c	100ab	2.31a	1.89a
CV (%)	0.2	1.2	5.7	8.4

Adaptive trial of developed and advanced lines/varieties of Rapeseed and Mustard at farmers field

Four different experiments were conducted at FSRD site Faridpur and Tangail, MLT sites Damurhuda and Gangni during rabi season of 2000-01 to evaluate promising Rape and Mustard varieties/lines at farmers field. At Tangail all the lines and varieties produced similar yields were obtained ranging from 1.32 to 1.50 t/ha respectively. At Damurhuda and Gangni almost similar yields ranging from 1.25 to 1.88 t/ha and 1.10 to 1.70 t/ha respectively. At Fardipur the line OTBC-1193 yielded the best (2.02 t/ha) over the locations (Table 9).

Table 9. Yield performance of some promising rape mustard varieties/lines at different locations during rabi season of 2000-01

Varieties/lines	Yield on locations (t/ha)			
	Faridpur	Damurhuda	Gangni	Tangail
OTBC-1193	2.02a	1.25c	1.48cd	1.38a
OTBC-1097	1.64b	1.88a	1.70a	1.43a
Jamalpur-1	1.52bc	1.52abc	1.55bc	1.32a
BARI Sharisha-9	1.29c	1.63ab	1.40de	1.45a
ISD local	1.43bc	1.43bc	1.67a	1.44a
Tori-7	-	1.40bc	1.10f	-
BARI Sharisha-7	-	1.46bc	1.38de	-
BARI Shahisha-8	-	1.65ab	1.56bc	-
Jata	-	1.76ab	1.64ab	-
Rai-5	-	1.64ab	1.30e	1.50a
CV (%)	1.1	14.5	5.7	15.09

Adaptability trial of newly released Potato varieties

Eight varieties of potato viz. Chamak, Ailsa, Diamant, Heera, Dheera, Multa, Petronis and Cardinal as check were tested to select the suitable variety for those regions. Results revealed that Heera, Dheera, Cardinal, Diamont were statistically superior (yield ranged from 33.86 to 27.03 t/ha at Rangpur and at Comilla was 20.62 to 16.19 t/ha). Multa and petronis gave intermediate levels of yields. Large scale production program may be initiated with the above varieties provided the seed tubers are available (Table 10).

Table 10. Performance of potato varieties at different locations during rabi 2000-01

Varieties	Tuber yield (t/ha)			
	Chandina	Syedpur	Nilphamari	Polashbari
Chamak	17.76b	30.44a	-	-
Ailsa	12.09d	23.81c	-	-
Diamont	16.19bc	28.32ab	30.53a	31.98ab
Heera	20.6a	30.79a	29.76a	32.83a
Cardinal	20.43a	27.03a	29.24a	32.27ab
Dheera	20.43a	31.18a	30.59a	33.86a
Multa	-	-	26.07b	27.71cd
Petronis	-	-	24.79b	27.13c
CV (%)	11.7	10.3	8.2	5.4

Eeffect of management practices on the performance of late sown Rapeseed mustard

The experiment was conducted at two FSRD sites Jamalpur and Pabna and a MLT site, Comilla during rabi 2000-01 to identify a suitable management practice for minimizing the yield loss of rapeseed/mustard under late sown condition. The significant highest grain yield was obtained from high management practices due to high fertilizer packages and high management practice in all over the locations. Lowest yield was obtained from low management practices. Similar trend was found in last year (1999-2000) (Table 11).

Table 12. Effect of management practices on the yield of late sown rapeseed mustard at different locations during rabi season of 1999-2000 and 2000-01

Treatments		Seed yield on locations (Kg/ha)		
		Jamalpur	Pabna	Comilla
Low management (60-40-30-10kg/ha of N-P_2O_5-K_2O-S, respectively + no irrigation + no weeding + no use of insecticide & fungicide.	1999-2000	286c	114.33c	-
	2000-01	166c	941.00b	671c
Medium management(100-60-45-20 kg/ha of N-P_2O_5-K_2O-S, respectively+one weeding and thinning at 21 DAS+insecticide (Ripcord) spray only at the time of aphid infestation + fungicide (Rovral 50 WB) spray only during disease prevalence)	1999-2000	617b	442.00b	-
	2000-01	491b	1133.33b	1270b
High management (140-80-60-30 kg/ha of N-P_2O_5-K_2O-S, respectively + two irrigation one at 21 DAS and 42 dAS + two hand weeding at 21 DAS and 35 DAS+ insecticide (Ripcord) and fungicide (Rovral 50 WB) spray at every 20 days interval from seedling emergence to harvest).	1999-2000	1079a	844.33a	-
	2000-01	782a	1483.33a	1483a
CV (%)	1999-2000	10.33	20.97	-
	2000-01	11.70	10.71	13.8

Yield trial of Potato in saline area

An on-farm adaptability trial was conducted to assess the yield performance of potato in saline area, Noakhali during rabi 2000-01. Twenty different varieties and lines were tested under this trial. Dheera produced the highest yield of 9.86 t/ha followed by 384011.3 (9.39 t/ha). Marilia and 94.66 gave identical yield (8.48 and 7.70 t/ha). Other varieties/lines of potato showed less yield due to late planting and high salinity in the soil during growing period (Table 12).

Table 12.Yield performance of new varieties/lines in the saline area at Atkapalia, Noakhali

Lines/varieties	Tuber yield (t/ha)
94.319	3.81
384011.3	9.39
Pontiac	6.56
93.41	4.07
982013.5	3.34
93.314	4.98
94.66	7.70
Marilia	8.48
384091.11	5.37
88.163	5.16
Heera	5.68
Dheera	9.86
93.44	3.85
93.16	3.36
Cardinal	4.03
384558.10	3.76
86.140	2.35
Diamant	3.32
94.42	2.10
93.319	1.80

Performance of Onion varieties in farmers field

On-farm performance of onion varieties (viz. BARI Piaj-1, HYV Taherpuri, Zitka and Skhsagar) at Gangni MLT site and Khustia Sadar during rabi 2000-01 to find out a suitable variety of onion for use in Khustia region. Results revealed that highest bulb yield was obtained from BARI Piaj-1 (10.05 t/ha) (Table 13). The rest three varieties gave identical yield with BARI Piaj-1.

Table 13. Yield performance of onion varieties at Kushtia Sadar and Gangni MLT sites

Varieties	Plant height (cm)	No.of bulb per kg	Bulb yield (t/ha)
Taherpuri	35.57	70.67	9.36a
BARI Piaj-1	36.07	70.33	10.05
Zitka	35.23	73.00	8.87
Sukhsagar	35.23	71.67	8.97
LSD (0.05)	ns	ns	ns
CV (%)	1.5	3.8	5.5

Validation trial of newly improved varieties of Mukhikachu

The performance of mukhikachu varieties/lines viz. local, Bilashi and MK-140 were evaluated in the faremrs field at FSRD site, Narikeli and MLT site Sherpur during the kharif-II season of 2000 under AEZ-9. Significantly yield was obtained from Bilashi (18.79 t/ha) which produced 37% higher than local variety (11.77 t/ha). There was found no significant effect on yield of two different locations (16.28 and 15.58 t/ha). The highest weight of secondary corm and cormels/plant was produced from Bilashi (613g) followed by MK-140(587g) respectively. But the local variety gave higher number of corm and carmels/plant (18) than Bilashi (14) and MK-140 (15) (Table 14).

Table 14. Yield and yield contributing characters of Mukhikachu at two different locations in Jamalpur

Treatment		Secondary corm and cormel/plant (no.)	Weight of secondary corn and cormel/plant (g)	Yield (t/ha)
Location	Narikeli (FSRD)	16	505	16
	Sherpur (MLT)	16	548	16
F-test		ns	ns	ns
Variety/line	Local	18a	380b	12c
	Bilashi	14b	613a	19a
	MK-140	15b	587a	17b
F-test		*	**	*
CV (%)		8.37	12.89	1097

Performance of newly released Wheat varieties

To evaluate the yield performance of four different newly released varieties of wheat conducted at different FSRD and MLT sites during rabi season of 2000-01. It was found that the yield performance of different varieties varied with the locations. On an average, all the varieties performed best at Faridpur (3.17 t/ha) followed by Kushtia (3.07 t/ha). Tangail (2.24 t/ha), Jhalokati (2.18 t/ha) and Pirojpur (2.13 t/ha) performed almost same within the locations. Among the new varieties Saurav yielded the best at Kushtia (3.50 t/ha). The varieties under trial were produced an average yield of more than 2 t/ha except in Pirojpur.

Table 15. Yield performance of newly released wheat varieties at different locations during rabi 2000-01

Varieties	Yield (t/ha)					
	Jhalokati	Pirojpur	Kushtia	Tangail	Faridpur	Mean
Protiva	2.33a	2.54a	2.79a	2.26a	3.13b	2.61
Kanchan	2.26a	2.21b	3.37a	2.33a	3.48a	2.73
Gourab	2.06b	1.96ab	2.60a	1.94b	3.13b	2.34
Sourav	2.06b	1.81ab	3.50a	2.42a	2.93b	2.54
Mean	2.18	2.13	3.07	2.24	3.17	
CV (%)	2.64	19.89	18.6	7.13	8.2	

Varietal trial of Brinjal

Six varieties of brinjal viz. Jamalpuri, Singnath, Khatkhatia, Uttara, Kazla, Nayantara were tested at FSRD site Syedpur and BARI-GKF program Kurigram to select the suitable variety for Rangpur region. The results showed that Nayantara gave the highest yield (22.54 t/ha) compared to other tested varieties and 2nd highest yield from Kazla (20.49 t/ha). In Kurigram, number of fruits per plant (53) and fruit yield (50.2 t/ha) was significantly highest in Uttara than the other varieties of brinjal. The lowest yield (3.09 t/ha) was obtained from Noyantara (Table 16).

Table 16. Performance of the yield of brinjal varieties at different locations during rabi 2000-01

Varieties	No. of fruits/plant		Fruit yield (t/ha)	
	Syedpur	Kurigram	Syedpur	Kurigram
Islampuri	2f	7.0c	12.80d	33.1d
Singnath	3de	27.5b	13.03d	33.7d
Khatkhatia	3e	10.5d	16.78c	40.7b
Uttara	6b	52.5a	17.58c	50.2a
Kazla	7a	23.3c	20.49b	36.3c
Nayantara	3e	10.0d	22.54a	30.9e
CV (%)	12.3	6.7	8.5	3.9

Superimposed trial of T.Aman rice

Seven T.aman rice varieties viz. BRRI Dhan-30, 31, 32, 34 and 39 were evaluated against BR-11 as check at FSRD sites. Tangail and Rangpur during kharif-II 2000. Result revealed that BRRI Dhan 32 yielded the best (4.28 t/ha) which was identical to those of BRRI Dhan-30 & 31 and BR-11 at Tangail. Among the varieties BR-11 gave highest yield (4.57 t/ha) within at per with BRRI Dhan-30 and 31 (4.14 and 3.87 t/ha) at Rangpur. BRRI Dhan-33 was found to be the shortest duration (199 and 76 days) variety at both locations (Table 17).

Table 17. Grain yield of T.aman rice varieties at different locations during 2000-01

Variety	Tangail		Rangpur	
	Duration (days)	Yield (t/ha)	Duration (days)	Yield (t/ha)
BRRI Dhan-30	143	3.96a	96b	4.14ab
BRRI Dhan-31	140	3.82a	-	-
BRRI Dhan-32	133	4.28a	89c	3.87bc
BRRI Dhan-33	119	3.44b	76c	3.52c
BRRI Dhan-34	-	-	-	-
BRRI Dhan-39	-	-	81d	3.70bc
BR-11	148	3.78a	103a	4.57a
CV (%)	-	12.6	3.4	9.2

Superimposed variety trial of Jute

A superimposed variety trial was conducted at the FSRD site Syedpur, Rangpur during the kharif-I season of 1998 to 2000. The objective was to observe the performance of different jute varieties under research and farmers management. Five varieties viz. OM-1, 0-9897, Atompat-38, BINA Deshipat-2 and JRO-524 (local) were tested in research as well as under farmers management. Under research management fertilizers @ 132-25-42-28 kg N-P-K-S/ha was used while farmer management received no fertilizer. Results revealed that research managed OM-1 and 0-9897 gave significantly higher fibre yield (2.21 and 2.24 t/ha) in three successive years. Fibre yield of BINA released jute

varieties were more than 2.0 t/ha. Under farmers management all varieties gave identical yield (ranged from 1.86 to 1.94 t/ha) over JRO-524 (1.73 t/ha) (Table 18).

Table 18. Performance of Jute varieties under different management at FSRD site, Rangpur during kharif 1998 to 2000

Management	Treatment	Fibre yield (t/ha)			
		2000	1999	1998	Mean
Research	OM-1	2.63a	1.94ab	2.06	2.21ab
management	0-9897	2.49b	2.10a	2.14	2.24a
(132-25-42-28	Atompat-38	2.36bc	1.82bc	-	2.09ab
kg N-P-K-S/ha)	BINA Deshi pat-2	2.28c	1.86bc	-	2.07ab
	JRO-524(local)	2.37bc	1.70c	2.01	2.03b
	CV (%)	5.0	9.5	7.2	
Farmer	OM-1	2.48a	1.64a	-	1.94
management	0-9897	2.22b	1.66a	-	1.94
(no fertilizer)	Atompat-38	2.17bc	1.54a	-	1.86
	BINA Deshi pat-2	2.10c	1.54a	-	1.78
	JRO-524(local)	2.13bc	1.32b	-	1.73

On-farm performance of promising Sweet potato varieties

On-farm performance of sweet potato varieties namely BARI Sweet potato-4, BARI Sweet potato-5, Daulatpuri (at Faridpur) and Tripti (at Jamalpur) were evaluated against one local variety at FSRD sites Faridpur and Jamalpur during rabi season of 2000-01. At Faridpur among the varieties farmers accepted BARI Sweet potato-5 because of its high yielding (35.68 t/ha) character and rich in carotene where as the local variety produced the least yield (29.48 t/ha). It's taste also good and market price is almost similar to the local variety but local variety is sweeter than BARI developed varieties. At Jamalpur, Tripti gave significantly highest yield (30.34 t/ha) which was followed by BARI SP-5 (27.71 t/ha) and BARI SP-4 (23.52 t/ha) where as local variety gave the lowest tuber yield (15.96 t/ha). Farmers opined that local variety had better keeping quality than the released varieties when preserved under normal condition. These new varieties may harvest few days earlier than the local and can sale it in higher price. They also prefer the yellow colour of BARI SP-4 and SP-5 (Table 19).

Table 19. Yield obtained from different sweet potato varieties at different locations

Variety	Yield (t/ha)	
	Faridpur	Jamalpur
BARI sweet potato-4	34.80b	23.52c
BARI sweet potato-5	35.68a	27.71b
Daulatpuri	34.26b	-
Tripti	-	30.34a
Local	29.48c	15.96d
CV (%)	2.6	4.35

Varietal trial of Turmeric in shady places in fruit orchard

The yield of turmeric varieties evaluated against a local variety at the farmers field under shade of fruit orchard at FSRD site, Faridpur during 1999-2000 and 2000-01. The highest fresh and average dry yield was obtained from Turmeric line T-063 (28.82 t/ha and 5.80 t/ha) which was followed by Dimla (27.32 t/ha and 5.46 t/ha) and local variety (13.88 t/ha and 2.69 t/ha) (Table 20).

Table 20. Yield performance of turmeric under shady place at FSRD site, Faridpur

Variety/line	Fresh yield (t/ha)	Dry yield (t/ha)		
		1999-2000	2000-01	Average
T-063	28.82a	5.83	5.76	5.80
Dimla	27.32b	-	5.46	5.46
Local	13.38c	2.70	2.68	2.69
CV (%)	1.2	-	-	-

Yield performance of some newly released Boro rice varieties under farmers' condition

To evaluate the yield performance and acceptability of newly released Boro rice varieties an experiment was carriedout at FSRD site Palima, Tangail during 1998 to 2000. Results showed that the maturity period of different varieties varied from 137-169 days. Among the four tested varieties BRRI Dhan 29 gave superior yield (5.43 and 5.98t/ha) for both the years and it was 10 days earlier over check variety IR-8 (169 days). It was at per with BR-14 (5.38 and 5.40 t/ha). The lowest yield was obtained from IR-8 (4.38 and 4.40 t/ha) for both the years (Table 21).

Table 21. Duration and yield performance of Boro rice varieties at FSRD site Palima, Tangail during 1998-2000

Varieties	Duration (days)		Grain yield (t/ha)		Straw yield (t/ha)	
	1998-99	1999-2000	1998-2000	1999-2000	1998-99	1999-2000
BRRI Dhan 29	156	159	5.98A	5.53a	6.36a	6.05a
BRRI Dhan 28	144	137	5.33c	4.70bc	5.65b	5.38bc
BR-28	142	139	4.60dc	3.98d	5.22b	4.59d
BR –14	155	158	5.40bc	5.38a	5.72b	6.04a
IR-8(Check)	166	169	4.40e	4.38cd	5.44b	5.05cd
CV (%)	-	-	-	5.69	8.35	6.65

Performance of different Tomato varieties at Tangail

An experiment was conducted at FSRD site Palima, Tangail during 2000-01 to select the suitable varieties of tomato. BARI released six varieties were tested under this trial. The results showed that BARI Tomato 3, 7 and 9 gave better yield (ranged from 75.75 to 86.72 t/ha). A significant difference was found in fruits/plant from BARI Tomato 9 (26.70) followed by BARI Tomato 7 (25.82) and BARI Tomato 3 (19.01). The highest gross margin was found from BARI Tomato 3 which was followed by BARI Tomato 7 and BARI Tomato 9 respectively (Table 22).

Table 22. Performance of different Tomato varieties at FSRD site, Palima, Tangail

Varieties	No. of fruits/plant	Tomato yield (t/ha)	Gross margin (Tk/ha)	BCR
BARI Tomato-3	19.01b	75.75c	428102	3.83
BARI Tomato-4	12.34c	27.24e	59921	1.40
BARI Tomato-5	14.40c	26.34e	53003	1.35
BARI Tomato-6	11.22c	37.36d	96120	1.64
BARI Tomato-7	25.82a	86.72a	351794	3.33
BARI Tomato-9	26.70a	80.45b	315419	3.09
CV (%)	10.42	4.55	-	-

Adaptive trial of summer Tomato in Patuakhali area

The trial was conducted at FSRD site Lebukhali, Patuakhali during kharif 2000 to evaluate the performance of summer tomato varieties in Patuakhali region. Out of two varieties, BARI Tomato-5 performed better than BARI Tomato-4 in respect of yield (20.62 t/ha), fruits/plant (17) and weight of fruit (32g) (Table 23).

Table 23. Fruit yield of summer tomato varieties during kharif 2000 at Lebukhali, Patuakhali

Variety	Days of 50% flowering	Fruits/plant (no.)	Weight/fruit (g)	Yield (t/ha)
BARI Tomato 4	28	15	30	17.61
BARI Tomato 5	29	17	32	20.62

On-farm adaptability of two summer Tomato varieties

An on-farm study was carried out at FSRD site, Goyeshpur, Pabna during kharif-II season of 2000. Performance of two summer tomato variety viz. BARI Tomato-4 and BARI Tomato-5 were evaluated under farmers condition. Yield and other economic profile were presented in Table-24. The yield of BARI Tomato–4 was 58 kg/tunnel and that of BARI Tomato-5 was 46 kg/tunnel. On an average yield of the varieties was 23 t/ha and gross margin obtained was Tk. 142220/ha.

Table 24. Performance of BARI released summer tomato varieties at FSRD site, Goyeshpur, Pabna during Kharif-II of 2000

No. of co-operator	Av. yield (kg/tunnel)		Total yield (kg/tunnel)	Yield (t/ha)	Gross margin (Tk/ha)
	BARI Tomato-4	BARI Tomato 5			
8	58	46	104	23	142200

Bread wheat adaptive lines trial at farmers field

The performance of 4 advanced lines of bread wheat viz. BAW 444, BAW 966, BAW 969, ABW 989 were evaluated against two previously released wheat variety Kanchan and Gourab at different FSRD sites and MLT sites during rabi 2000-01. The yields of the tested lines differed significantly among themselves and among the locations. All the lines performed best at Jessore (4.68 t/ha) followed by Palima (4.26 t/ha), Rangpur (4.24 t/ha), Rajshahi (3.83 t/ha) and Jamalpur (3.80 t/ha). The advance line BAW 444 yielded the best at Jessore (5.39 t/ha) which was identical with BAW 969 (5.02 t/ha) at Pabna. The new BAW line BAW 969 produced maximum average yield of 4.16 t/ha over the locations. Tangail and Comilla showed similar yield potentialities (3.49 and 3.61 t/ha) (Table 25).

Table 25. Yield obtained from different advance lines/varieties of bread wheat

Varieties/ lines	Yield on locations (t/ha)							
	Jessore	Jamalpur	Tangail	Pabna	Comilla	Rangpur	Rajshahi	Mean
Kanchan	4.78b	3.80bc	3.67ab	4.65a	2.97a	4.44a	3.93	4.03ab
Gourab	4.67b	3.96ab	3.08c	4.58a	3.67b	4.23b	4.00b	4.03ab
BAW-944	5.39a	3.58de	3.70ab	3.47b	3.67b	4.30ab	3.73	3.98b
BAW-966	4.17c	4.2a	3.07c	3.97b	4.10a	4.34ab	3.97ab	3.97b
BAW-969	4.72b	3.50de	3.67ab	5.02a	3.75b	4.28b	4.20a	4.16b
BAW-989	4.33bc	3.74cd	3.77a	3.90b	3.52bc	4.24b	3.83c	3.87b
Mean	4.68b	3.80c	3.49c	4.26b	3.61c	4.24b	3.83c	4.01
F-test	**	*	ns	-	*	ns	-	-
CV (%)	-	1.93	1.41	6.8	4.2	8.2	7.1	-

On-farm trial of off-season Pineapple production using growth regulator (Ethrel)

The experiment was carried out during September 1996-97 at Modhupur MLT site, Tangail to achieve extra income from off-season pineapple (using growth regulaor) though high market price. It was found that September forcing (Ethrel solution 39%) produced earliest inflorescence and first flowering (359 days). The highest flowering percentage (84%) was obtained from control plot followed by November forcing (78%). In ripening control plot takes longest time (622 days) than other treated plots (ranged from 533-667 days). Highest fruit yield was obtained from control plot (31.28 t/ha) but the price/fruit, gross margin and BCR were found highest in September forcing and the lowest form November forcing (Table 26 and 27).

Table 26. Effect of growth regulation (Ethrel) of off-season pineapple at MLT site of Modhupur, Tangail

Treatment	Plant age (days)	1st flowering (days)	Flowering (%)	Ripening (days)	Fruit weight with crown (kg)
September forcing	313	359d	45c	535c	1.63
October forcing	343	382c	38bc	610bc	1.51
November forcing	373	477b	78ab	607c	1.62
Without hormone	313	510a	84a	622a	1.53
CV (%)	-	0.42	19.65	0.94	6.88

Table 27. Cost and return of off-season pineapple at MLT site Modhupur, Tangail

Treatment	Fruits/ha (no.)	Fruit yield (t/ha)	Variable cost (Tk.)	Gross margin (Tk/ha)	BCR
September forcing	14312c	19.62c	132494	227141	2.71
October forcing	16473b	20.59bc	74002	118103	2.60
November forcing	20219ab	27.89ab	86978	101280	2.16
Without forcing	24350a	31.28a	80918	121464	2.50
CV (%)	14.98	18.14	-	-	-

Technology Transfer

Pilot production

Title	Location	Area (ha)	Farmers involved (no.)	Yield/Impact
1. Production program of wheat at farmers levels	Jamalpur	0.8	10	3.14 t/ha
2. Production program Mustard at farmers level	Jamalpur	0.6	12	0.813 t/ha
3. Production program Okra (BARI Derosh-1)	Mymensingh	0.21	10	14.95 t/ha
	Jamalpur	0.204	12	11.30 t/ha
4. Production program of Bottle gourd (BARI Lau-1)	Sylhet	15	50	232 no./family
5. Pilot production program of BARI JPS-1 & 2	Rangpur	0.328	164	16.49 t/ha
6. Improvement of quality fruit production through top working of Jujube	Jamalpur	20	12	15 kg/plant
7. Plantation of improve varieties of fruits trees in homestead area	Jamalpur			
BARI Guava			30	60 sapling
Kagi Lemon			30	30 sapling
Langra			30	40 sapling
Fazli			30	40 sapling
Khirshapati			30	40 sapling
Gopalbhog			10	40 sapling
Tissue culture			10	10 sapling
Banana			10	20 sapling
Betel vine			10	30 sapling
8. Production program of Mustard-Boro-T.Aman cropping pattern using balanced fertilizer recommendation	Jamalpur	0.04	10	Mustard: 0.89 t/ha
		0.04	10	Boro: 5.6 t/ha
		0.04	10	T.Aman: 4.09 t/ha
9. Production program of Wheat-Jute-T.Aman cropping pattern using balanced fertilizer recommendation	Jamalpur	0.10	10	Wheat: 3.2 t/ha
		0.10	10	Jute: 2.0 t/ha
		0.10	10	T.Aman: 4.37 t/ha
10. Production program of Boro/GM (Sesbania)-T.Aman cropping pattern using balanced fertilizer recommendation	Jamalpur	0.04	15	Boro: 5.32 t/ha
		0.04	15	GM: 16.0 t/ha
		0.04	15	T.Aman: 4.25 t/ha

Technology Transfer

a. Crops

Technology	Location	Area (ha)/ Pit (no.)[a]	Farmers involved (no.)	Yield (t/ha)	Impact
BARI Lou-1	Faridpur	0.37	100	30.70	Not much interested to grow for small sizeless testy
	Sylhet	2 (pits)[a]	52	28.8	More interested for yield bigger size
BARI Chola-5	Faridpur	14	40	1.40	Recommended for large-scale extension
BARI Chola-1,2,3, 4, 5, 6, 7	Bogra	40 (m^2)	Crop museums	1.12	-
BARI Onion-1	Faridpur	2	8	11	For shinny color long duration
Taherpuri	Sylhet	2.5	20	12	Storage ability to produced seed
BARI Sheem-1	Faridpur	1	15	16	Able to get better price for early harvest soft and testy
BARI Moshur-4	Faridpur	30	100	1.10	For bold size seed and color
	Pabna	6	24	1.32	High quality than local
	Bogra	4	-	1.03	-
BARI Derosh-1	Faridpur	0.08	16	10.50	Virus free and earliness than local
	Sylhet	2.5	20	12.0	Virus free and earliness than local
	Patuakhali	0.3	50	12.0	High yield potential and virus free
	Tangail	1.97	29	12.88	
Radish					
Tasakisan	Faridpur	2	20	62.0	High yielded and testy
Pinky	Sylhet	1.6	13	50.0	
Mustard (BARI Sarisha-8	Faridpur	8.5	25	1.70	High yielded variety
BARI Sarisha 8, 9 (Minimum tillage)	Sylhet	2.5	10	1.19	To cultivate mustard in fallow land
	Noakhali	3.5	15	0.93	Minimize the effect of salinity
	Rajshahi	13	28	1.23	
	Pabna	15	60	1.09	High yielded
	Bogra	40 sqm	-	1.33	High yielded
Maize (Hybrid)	Faridpur	0.1	6	11.0	High yielded
Barnali	Noakhali	1.12	20	3.5	
	Patuakhali	0.15	10	2.5	-
Carrot	Pabna	0.40	2	22.68	
Cauliflower	Pabna	7.58	30	64.85	-
	Sylhet	1.5	13	28.1	Most economic for high return and high market demand
Cabbage (Provati)	Pabna	1.05	7	61.92	
	Sylhet	2.0	13	40.0	Performance encouraging
	Bogra	0.004	-	50.0	
Tomato (BARI 4 and 5)	Pabna	0.43	4	21.59	-
	Faridpur	0.0138	6	70.00	Harmony not available to cultivate for higher return
	Sylhet	4	38	40-50	
Sweet potato	Patuakhali	0.12	10	32	-
Yard long bean	Sylhet	0.64	12	7	-
Aroids (Bilashi)	Sylhet	1.5	10	16	-

Technology	Location	Area (ha)/ Pit (no.)[a]	Farmers involved (no.)	Yield (t/ha)	Impact
Late jute seed	Tangail	96 (deci)	6	0.37	-
Wheat (Min. tillage)	Noakhali	4.0	20	3.12	New crop in site

b. Cropping patterns

Cropping pattern	Location	Area (ha/ plant)	Farmers involved (no.)	Yield/Impact
Wheat-Jute-T.Aman	Faridpur	20	50	Kanchan: 3.20 Jute (O-9897): 2.30 BARI Dhan-32: 4.60
	Tangail	2.11 1.68 1.65	19	Sourav: 1.89 O-9897: 2.36 BRRI Dhan-32: 3.45
Mustard-Boro-T.Aman	Tangail	1.80	19	BARI Sarisha-8: 1.62 Tori-7: 0.73
Wheat-Dhaincha- T.Aman	Rajshahi	17 12 10	10 7 5	Kanchan: 1.7 Local: 13.7 Sharna: 3.20
Chickpea- Dhaincha-T.Aman	Rajshahi	12 15	-	BARI chola-5: 1.25 Local: 13.0 Sharna: 3.05
Wheat-Mungbean- T.Aman	Pabna	16.4	5	Kanchan: 3.06 Kanti: 4.5 BR11: 4.33
Maize-GM-T.Aman	Pabna	16.26 5	85 85	Pacific-11: 9.16 Hybrid maize: 9.5
Potato-T.Aus-T.Aman (no tillage)	Patuakhali	2.0	42	Heera: 18.00 BRRI Dhan-27: 3.75 BRRI Dhan-32: 4.50
Mungbean-T.Aus- T.Aman	Patuakhali	3.0	30	Kanti: 0.95 BRRI Dhan-27: 3.50 BRRI Dhan-32: 4.60
Inter cropping paired row Sugarcane with Potato-Onion-Chilli	Patuakhali	0.75	12	Sugarcane: 12500 cane Potato: 10.00 Onion: 5.00 Chilli: 0.13
Sorjan method of cropping on Tidally flooded area	Patuakhali	0.031	-	Banana: 650 kg/ha Red amaranth: 0.60 Tomato: 0.15 Cabbage: 0.50 Cauliflower: 0.50 Chilli: 0.25 Amaranth: 0.75 Okra: 0.30 Bitter gourd: 0.15 Ribbed gourd: 0.30 Marginal: 0.50
Controlling of Mango hopper	Faridpur	1500	350	101
Production of fruit trees	Faridpur	40 44 41	24 24 24	Mango: 130 Coconut: 125 Jackfruit: 100

Cropping pattern	Location	Area (ha/ plant)	Farmers involved (no.)	Yield/Impact
Improving Jujube by top working	Patuakhali	25	10	5 kg/plant
	Faridpur	40	40	30.00
Improving production of fruit trees by fertilizer management	Sylhet	95	25	Better performance
Plantation of guava, BARI Litchi, Seedless leman, BARI kormel, and coconut	Sylhet	860	80	Better performance
Composting with kitchen and farmer waste	Sylhet	10	8	750 kg/heap
Mango hopper control	Faridpur	1500	35	101 kg/plant
	Tangail	5	40	125 kg/tree
	Patuakhali	500	160	50-60 kg/plant

c. Seed production program

Technology	Location	Area (ha)	Farmers involved (no.)	Yield/ Impact
BARI Dhaincha	Rajshahi	54	-	1.01
BARI Sarisha-7, 8	Rajshahi	13.0	28	1.32
Chickpea (BARI Chola-2, 3, 4, 5, 6)	Rajshahi	18.0	62	1.23
Wheat (Kanchan, Inkilab)	Rajshahi	3.5	11	2.8
Sunflower (Kironi)	Rajshahi	0.5	3	1.2
Safflower (Saff-1)	Rajshahi	1.0	4	0.92
Linseed (Nila)	Rajshahi	0.96	1	0.60
Cauliflower	Bogra	0.004	-	0.496
BARI Motoshuti-1, 2	Bogra	0.004	-	0.150
BARI Onion-1	Bogra	0.004	-	0.680
BARI Jhar sheem-1)	Bogra	0.004	-	1.74
Late Jute (O-9897)	Tangail	0.38	6	0.373
Year round Homestead vegetables production	Patuakhali	0.0008	30	31.60

d. Seed Exchange program

Technology	Location	Area (ha)	Farmers involved (no.)	Yield/Impact
Mustard	Rajshahi	21	130	1.23
Chickpea	Rajshahi	50	220	1.34
Wheat	Rajshahi	1	5	2.90
Sunflower	Rajshahi	0.66	3	0.98
Through DAE				
Mustard	Rajshahi	30	180	1.02
Chickpea	Rajshahi	42	220	1.34
Fodder production	Faridpur	0.4	6	150 t/ha

e. Homestead vegetable production

Technology	Location	Area (ha)	Farmers involved (no.)	Yield/Impact
Tomato	Tangail	2 plots	-	23 kg/ farm
Okra	Tangail	2 plots	-	30 kg/ farm
Indian spinach	Tangail	2 plots	-	32 kg/ farm
Brinjal	Tangail	2 plots	-	24 kg/ farm
Chilli	Tangail	2 plots	-	2.4 kg/ farm

Vegetables		Patuakhali	0.008	30	4.32 kg/ farm
Potato yam		Tangail	6 pits	-	4 kg/ plant
BINA Dhan-6		Sylhet	1.0	4	6.00
BRRI Dhan-32		"	5.0	11	5.10
BRRI Dhan-26		"	6.0	8	5.80
BRRI Dhan-31		Noakhali	1.0	6	4.58
BRRI Dhan-32		"	10.5	35	4.58
BINA-6		Faridpur	12	47	7.50
BRRI Dhan-29		"	12	47	6.90
BRRI Dhan-33		Tangail	1.15	12	4.17
Local T.Aman		Patuakhali	2	35	2.38
CP-1	Okra	Rajshahi	10.5 sqm	10	9.00
	Data	"	10.5 sqm	10	10.00
	Tomato	"	10.5 sqm	10	16.00
CP-2	Spinach	Rajshahi	10.5 sqm	10	11.95
	Lalshak	"	10.5 sqm	10	10.00
	Brinjal	"	10.5 sqm	10	38.00
CP-3	Kangkong	Rajshahi	10.5 sqm	10	9.5
	Lalshak	Rajshahi	10.5 sqm	10	14.76
	Brinjal	Rajshahi	10.5 sqm	10	19.00
CP-3	Lalshak	Rajshahi	10.5 sqm	10	14.66
	Okra	Rajshahi	10.5 sqm	10	15.23
	Spinach	Rajshahi	10.5 sqm	10	19.00

f. Crop Museum

Technology	Location	Area (ha)	Farmers involved (no.)	Yield/Impact
Wheat (Provati)	"	0.13	4	Kanchan: 2.15 Akbar: 32 Inkilab: 3.20
Maize (SP-1)	Barind	0.18	4	10.10
Chickpea (Anigeri)	Barind	0.16	4	0.86 ICC-958:0.74 Local: 1.18
Kaon	Barind	0.06	4	1.80
China	Barind	0.06	4	2.08
Linseed	Barind	0.06	4	1.16
Safflower	Barind	0.26	4	0.91
Sunflower	Barind	0.22	4	1.02
Gujitil	Barind	0.06	4	0.65
Potato	Barind	0.20	4	Cardinal:35.0 BADC: 28.0
Chickpea	Bogra	0.4	-	BARI Chola-1: 0.80 BARI Chola-2: 1.20 BARI Chola-3: 1.10 BARI Chola-4: 1.20 BARI Chola-5: 1.25 BARI Chola-6: 0.97 BARI Chola-7: 1.34 BARI Chola-8: 1.10
Moshur	Bogra	0.4	-	BARI Mushur-1: 1.03 BARI Mushur-2: 1.11 BARI Mushur-3: 1.00

Technology	Location	Area (ha)	Farmers involved (no.)	Yield/Impact
				BARI Mushur-4: 1.01
				BARI Faln-1: 0.92
Tomato	Bogra	0.4	-	BARI Tomato-1: 80.0
				BARI Tomato-2: 85.0
				BARI Tomato-3: 83.75
				BARI Tomato-5: 70.25
				BARI Tomato-6: 70.50
				BARI Tomato-7: 63.75
				BARI Tomato-8: 77.50
				BARI Tomato-9: 74.25
Bush bean	Bogra	0.4	-	BARI Jharseem-1: 20.21
Mustard	Bogra	0.4	-	Tori-7: 1.31
				Katlynia: 1.28
				Sonali Sarisha: 1.30
				BARI Sarisha-6: 1.33
				BARI Sarisha-7: 0.86
				BARI Sarisha-8: 1.26
				BARI Sarisha-9: 1.33
Linseed	Bogra	0.4	-	Nila: 1.16
Niger	Bogra	0.4	-	Shova: 1.21
Safflower	Bogra	0.4	-	BARI Saf-1: 1.04
Sunflower	Bogra	0.4	-	Kironi: 1.12
Soybean	Bogra	0.4	-	Shohag: 1.24
				Soybean-4: 1.16
Coriander	Bogra	0.4	-	BARI Coriander-1: 0.98
Wheat	Bogra	0.4	-	Agrani : 3.61
				Akbar: 4.44
				Kanchan: 4.86
				Sourav: 4.72
				Gourav: 3.75
				Provati: 4.86
				Balaka: 4.02
				Kallyansona: 4.16
				Inia: 4.02
				Sonalika: 3.47
				Triticaly: 3.75
				Khari: 3.61
				Duram : 3.70
				Ananda: 4.30
China	Bogra	0.4	-	Tushar: 1.22
Kaon	Bogra	0.4	-	Titash: 1.10
Barley	Bogra	0.4	-	BARI Barley-1: 1.80
Sweet potato	Bogra	0.4	-	Tripti : 35.92
				Kamalasunduri: 32.02
				Dualatpuri: 18.28
				BARI Sweet potato 4: 28.88
				BARI Sweet potato-5: 25.88

g. Plantation crop

Title	Location	Area (ha/ plant)	Farmers involved (no.)	Yield/Impact
Guava-1, 2	Faridpur	30	12	Growth stage
	Rajshahi	200	80	Plantation in 1987–000
Lemon (Seedless Kagazi)	Rajshahi	90	40	do
	Faridpur	24	12	Growth stage
Amrapali	Rajshahi	145	75	Planted in 1987-2000
	Faridpur	12	12	Growth stage
Mohananda	Faridpur	24	12	do
Mollika	Faridpur	24	12	do
Safeda-1	Faridpur	6	6	do
Coconut-1, 2	Faridpur	24	12	do
	Rajshahi	5	5	Planted in 1987-2000
BARI litchi-1,2,3	Faridpur	6	6	Growth stage
	Rajshahi	15	7	Planted in 1988-2000
Drumstick (Laizna baramashi)	Rajshahi	2000	110	Planted in 1988-2000
Sissoo	Rajshahi	500	24	do
Lemon	Rajshahi	90	40	do
Rose apple	Rajshahi	20	20	do
Coconut	Rajshahi	5	5	do
Neem	Rajshahi	80	45	do
Ipil-ipil	Rajshahi	6000	110	do
Controlling mango hopper	Pabna	3000	-	125 kg/plant
BARI Guava 2 & Polly peayra	Patuakhali	75	22	8-10/plant

h. Livestock

Technology	Location	Area (ha/ no.)	Farmers involved (no.)	Yield/Impact
Beef fattening with UMS	Faridpur	50	20	Treated cattle gained body weight 450 g/day against untreated cattle 95 g/day
	Tangail	10	20	Treated cattle gained body wt. 440 g/day against untreated cattle 178 g/day
	Rajshahi	24	12	Treated cattle gained body wt. 680 g/day against untreated cattle 232 g/day
	Jamalpur	24	9	Treated cattle gained body wt. 230 g/day against untreated cattle 99 g/day. Milk production 2.70 g/day against control 2.40 g/day.
	Sylhet	10	27	Treated 275 g/day. Non Treated 95 g/day
	Pabna	30	24	Treated 380 g/day. Untreated 90 g/day.
Deworming on live wt. gain and milk production	Jamalpur	46	9	Deworming cattle gained 196 g/day against control 94 g/day. Milk production 2.25 g/day against control 1.13 g/day.
Milk cow management	Faridpur	30	10	Treated cattle gave yield 3.50 liter/day against control 1.50 liter/day
Deworming of cattle	Faridpur	80	60	Treated cattle gained body wt. 130 g/day against untreated cattle 70 g/day.
	Sylhet	73	536	Treated cattle gained body wt. 120.5 g/day against untreated cattle 92 g/day.
Rearing of Broiler	Rajshahi	1000	5	Body wt. against 51.85 g/day. Mortality 2%.
	Jamalpur	90	9	Egg production 55.84%.

Technology	Location	Area (ha/ no.)	Farmers involved (no.)	Yield/Impact
	Pabna	300	1	Average wt. 758 g/5 th week.
	Patuakhali	830	10	
Vaccination program poultry production	Sylhet	660	72	Mortality % was decreased
Rearing of Fayomi chicken under semi-scavenging systems	Sylhet	400	12	Good impact for the regularities of laying
Broiler rearing at farmers level	Sylhet	9200	7	Av. body wt. at 6 weeks 1.7 kg. Good impact for higher growth rate and market demand
Vaccination of poultry birds	Patuakhali	200	250	Farmers were not interested for vaccination for high cost
Performance of different Broiler strain under farmers management conditions	Tangail	100	4	The final live wt. of starbro, Hybroarbora cores and van cob. Strain were 1700, 150 g, 1628 and 1622 g per bird
Vaccination of cattle and Buffalo	Rajshahi	156	48	The villagers should keen interested with vaccinations program
Deworming of cattle	Rajshahi	156	48	Av. body wt. gain 141.66 g/day cattle
Rearing of Black-Bengal goats with supplementary feeds	Rajshahi	24	8	Av. body wt. gain 29 g/day and milk production 240 ml/day
Vaccination to poultry	Rajshahi	2750	48	Farmers were trained and motivated to vaccination of poultry.
Rearing of common Broiler	Rajshahi	1000	5	BCR 1.51. Av. body wt. gain 51.85 g after seven week
Rearing of layer duck	Faridpur	75	15	Egg production/year 325/duck
Utilization of Algae as cattle feed	Faridpur	20	8	190 g final body weight
Vaccination to poultry	Tangail	2230	389	Decreases the mortality of poultry
	Faridpur	4000	350	Farmers satisfied with vaccination program
Rearing of layer hen	Faridpur	110	18	Av. egg wt. 58g
Deworming of cattle	Faridpur	120	90	Av. body wt. gained 130 g/day
Vaccination program on cattle health	Tangail	241	105	Keen interested with vaccination
	Faridpur	25	70	The villagers showed interested to vaccination
Production program of Broiler chicken	Faridpur	7000	20	2.0 kg/bird after 7 weeks
Comparative performance of different breeds of laying duck	Tangail	40	4	Egg production 85%. Lower mortality (31%)

j. Fisheries

Technology	Location	Area (ha/no.)	Farmers involved (no.)	Yield/Impact
Rajpunti culture in seasonal pond	Faridpur	0.104	6	Farmers should be motivated after 5 months Rajpunti gain wt. of 104.0 gm.
	Sylhet	0.008	2	1.59 t/ha. Interested to cultivate for low cost
	Rajshahi	10	5	The yield per hectare was 1728 gkg. BCR: 3.82
Study on semi-intensive carp poly culture in perennial pond	Sylhet	1.6	12	Body wt. of fish have increased
Monoculture of pangas	Sylhet	0.35	4	Farmers showed mixed reaction on monoculture of Thai pangas. cost of feed is very high.
Raising productivity of pond through Duck cum-fish culture	Sylhet	1	1000	BCR: 4.72. Good impact about technology 25 Duck reared.
Poly culture technique of carp fish in perennial ponds under low cost management of High Barind Tract	Rajshahi	5	5	The yield was 2.6 t/ha. BCR: 3.22
Agro-Fishery Minipond	Patuakhali	0.036	1	Yield obtained 1800 kg vegetable, 684 kg Banana, 17 kg fish amounting to a gross margin of Tk. 7181 against Tk. 647.
Fish culture in T.Aman rice Field	Rajshahi	0.048	-	The fish yield was 210 kg/ha in 3 moths.