BRAC

Verification and Refinement of the System of Rice Intensification (SRI) Project in Selected Areas of Bangladesh (SP: 36 02)

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Trial Monitoring Survey Report
On Chatkhil and Begumgonj in Noakhali District
By

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Glossary

Ave	Average	MP	Murate of Potash
BR	Bangladesh Rice	SRI	System of Rice Intensification
cm	Centimeter	t	Metric ton
dec	Decimal, One hundredth part of an acre	Tk	Taka
g	Gram	TSP	Triple Super Phosphate
ha	Hectare		
IPM	Integrated Pest Management		
Kg	Kilogram		
Maund	40 Kg		

Executive summary

We conducted SRI trial in two Upazilas of Noakhali district. The farmers practiced both SRI and conventional cultivation at the same time to compare the results regarding production cost, yield, and net return. Farmers applied less chemical fertilizers in SRI plots compared to conventional plots which is expected. They did not use pesticides but adopted IPM cultural method for both practices, indicating no attack of pests. Per hectare irrigation cost was more or less same for both practices though it was supposed to be less for SRI method. Water supplier might have counted frequency instead of water volume, or there might have been system loss of water in SRI plots. SRI farmers drastically saved seed cost (67%) compared to conventional farmers. Farmers weeded their conventional plot by hand while they used hand and also rotary weeder for SRI plots due to wider spacing. SRI practices permitted soil aeration, better root development, more effective tillering and more panicles, which ultimately increase the yield in SRI method. During the *Boro* season 2002-03, SRI farmers got 43% more yield than with conventional methods. Yield of straw was 39% higher in SRI compared to traditional methods. Per hectare production cost in SRI was 9% less than conventional method. So higher yield and lower cost of production in SRI increased their net return to around 109% over that of traditional practice. Benefit–cost ratio was, respectively, 2.87 and 1.84 for SRI and conventional methods.

1. Introduction

This report shows the results of trials with SRI in the period of December 2002 to June 2003, i.e., Boro season 2002-03. We conducted SRI trial in two upazilas of Noakhali district: Chatkhil and Begumgonj. Results of 40 farmers taking 20 from each upazila were monitored for analysis. Each farmer practiced both SRI and conventional methods for rice cultivation on adjacent plots. Average land allocated for conventional methods was more than that for SRI, 18.63 and 8.35 decimals, respectively. Farmers allocated more land for BR29 out of the five varieties used though most farmers used BR28 (Table A 1). Average seedling age was 15 days for SRI and 36 days for conventional practice, i.e., age was more than twice more for conventional cultivation. Farmers used wider spacing (25x25 cm) for SRI than with conventional methods (10x15 cm).

Table 1: General information of cultivation practices

Particulars			SRI method	Conventional method
Ave. cultivated area (decimals)			8.35	18.63
Plowing freq. of land	2		92 %	92 %
	3		8%	8%
Variety wise ave. cultivated land (N)	BR – 28		8.69 (16)	15.31 (16)
	BR – 16		5.33 (3)	11 (3)
	BR – 29		11.82 (11)	22.45 (11)
	BR – 14		4.50 (2)	17.50 (2)
	BR – 11		5 (8)	23.13 (8)
Age of seedlings (days)		Ave.	15	36
		Range	13-16	23-50
Hill to hill spacing (cm)	10 – 15		-	3
	12 – 14		-	3
	14 – 14		-	10
	15 – 15		-	85
	25 – 25		100	-

Source: Trial Monitoring Survey 2003

2. Input Use

2.1 Seed

Farmers cultivated four varieties, i. e., BR28, BR16, BR29 and BR11, in both upazilas. One more variety, i.e., BR14, was used in Begumgonj (Table A1). Farmers used less seeds in SRIs plot compare to conventional plots, which is expected because seed cost was 67% less for SRI plots (Table 11).

2.2 Irrigation

Irrigation management for SRI plot was a hard job because it was different from the conventional one. Instead of keeping fields flooded, the soil was supposed to be kept near saturation, or they had to go for alternate wetting and drying for SRI plots. Farmers irrigated SRI plots two to four times intermittently. Frequency of irrigation was more in case of SRI. Total irrigation hour should be counted for both methods. Most of the farmers irrigated their lands thrice under both methods while four times for SRI plots (Table 2)

Table 2: Irrigation management

Particulars	Irrigation frequency	SRI method	Conventional method
Irrigation	2	7 %	46 %
	3	72 %	54 %
	4	21 %	-

Source: Trial Monitoring Survey 2003

2.3 Fertilizer

Nutrient application is very crucial for SRI method, particularly organic fertilizers, though farmers actually used less fertilizer of all kinds for SRI method than compared to conventional method. Use of organic fertilizer helps in improving the quality of soil which leads to high and sustainable yield. Farmers applied urea and MP as top dressing in SRI. On the contrary, farmers used all fertilizers except gypsum as top dressing in conventional method (Table 3). Some farmers did not apply organic fertilizers for either SRI or conventional plots due to lack of knowledge or unavailability (Table 4).

Table 3: Application of fertilizer

Particulars	SRI method		Conventional method	
	Basal dose (kg/ha)	Top dressing (kg/ha)	Basal dose (kg/ha)	Top dressing (kg/ha)
Organic fertilizer	1796	0	2931	148
Urea	55	81	82	185
TSP	81	0	180	181
MP	49	8	116	36
Gypsum	51	0	110	0

Source: Trial Monitoring Survey 2003

Table 4: Causes of not using organic fertilizer

Particulars	Count	Percentage
Multiple response: cause of not using organic fertilizer		
a. Unavailability	16	40
b. No need	-	-
c. Lack of knowledge	16	45

Source: Trial Monitoring Survey 2003

3. Weeding and Weed Management

Weed management is another crucial task for SRI because alternate drying and wetting permits higher growth of weeds. In SRI, weeding is necessary not only for removing weeds but for soil aeration, which helps in better development of roots and tillers. Farmers weeded their SRI paddy land by hand or by machine. Nobody used herbicide for weeding. Most farmers weeded twice by hand under both methods (Table 5). On the other hand, farmers used simple mechanical weeders only for their SRI plots due to the advantage of wider spacing.

Table 5: Weed management

Particulars	Frequency	SRI method	Conventional method
Weeding by herbicide	-	-	-
Weeding by hand	1	1	3
	2	38	31
	3	2	4
Weeding by machine	1	38	-
	2	1	

Source: Trial Monitoring Survey 2003

4. Agronomic Findings

4.1 Tillers

Number of tillers per hill and number of grains per panicle are very important for yield of rice. Average number of tillers (counted 40-45 days before harvest) and effective tillers (counted 10-15 days before harvest) per hill were nearly double in SRI method compared to conventional method. Average number of tiller per hill for SRI was 33 while it was 17 for conventional method. Effective tillers for SRI numbered 26 against 12 for conventional practice (Figure 1). Tables A3 and A4 show variety-wise the number of tillers per hill.

Average grains per panicle was also more in SRI method (Figure 1), 140 against 112 for conventional method.

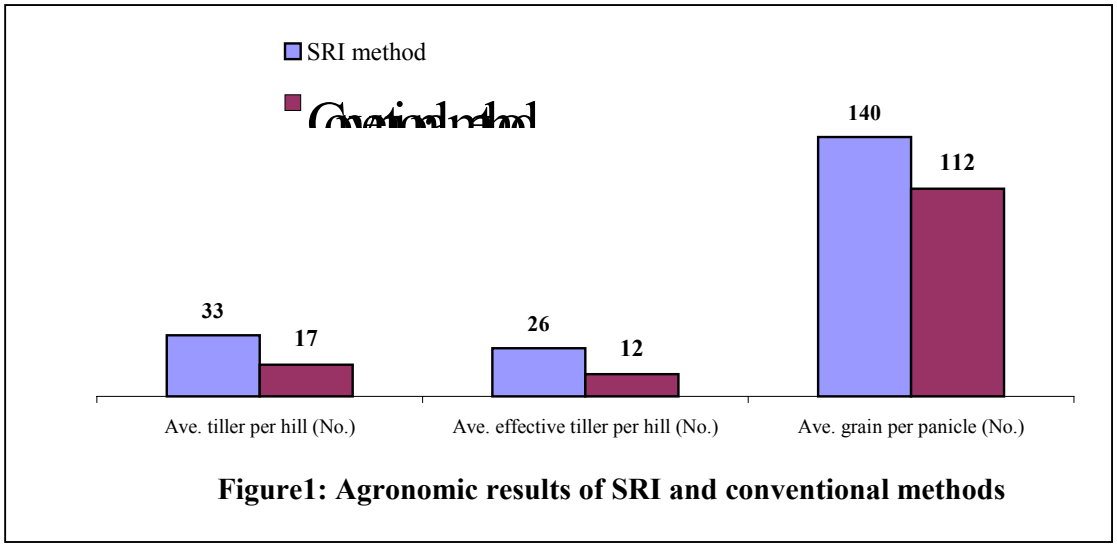

Figure1: Agronomic results of SRI and conventional methods

Source: Trial Monitoring Survey 2003

4.2 Yield

Average SRI yield rate was 7.7 tons/ha while that under farmers' practice was 5.4 tons/ha (Table 6). One farmer in Chatkhil obtained a yield of 9 tons per hectare (Table A 7). SRI yield was 43% higher than that under conventional method. Table 6 shows that average weight of grain and straw in SRI were also more compared to traditional practices (see Table A 7 for more details). Unfilled grains in SRI and conventional plots were 14% and 23%, respectively. Average number of paddy per panicle was 25% more in SRI compared to conventional method. Highest number of paddy per panicle was found in SRI plot of Chatkhil using the variety BR29 (Table A 6). As a result, SRI yield was the highest in Chatkhil for BR29 (Table A 7).

Table 6: Yield from SRI and conventional practices

Particulars	SRI method	Conventional method
Ave. weight (g/1000 grain)	24	21
Unfilled grain (no/100 grain)	14	23
Ave. yield (t/ha)	**7.7**	**5.4**
Ave. weight of straw (t/ha)	6.4	4.6

Source: Trial Monitoring Survey 2003

4.3 Physical constraints

Opinions of the farmers were sought on the constraints to production of rice that affected yield. These are growth of excess weeds in the field, infestation of rodents like mice and birds in the paddy field, and excess fog (Table 7). Some other reasons were application of less fertilizer, lack of balanced fertilizer and irrigation, untimely rain, and disease. It may be noted that no one mentioned pest infestation as a factor contributing to poor yield. Farmers controlled pests by integrated pest management (IPM) method (Table 8), and that was why they did not need pesticides (Table 9). Due to the fact that the plots belong to a single cropped area, pest infestation was relatively less in the area.

Table 7: Causes of poor yield

Particulars	Count	Percentage
Multiple response: Cause of poor yield		
a. Pests	-	-
b. Excess weeds	19	25
c. Rats/birds	23	30
d. Flood	-	-
e. Drought	1	1.3
f. Torrential rain	1	1.3
g. Excess fog	24	31
h. Lack of irrigation	1	1.3
i. Applying less fertilizer	2	3
j. Lack of balanced fertilizer	4	5
k. Diseases	1	1.3

Source: Trial Monitoring Survey 2003

Table 8: Pest management

Particulars	Count	Percentage
Multiple responses: IPM method used for controlling pests		
a. Biological methods	1	2.5
b. Cultural methods	38	95
c. Chemical methods	-	-
d. Crop cycle methods	-	-

Source: Trial Monitoring Survey 2003

Table 9 : Causes of not using pesticide

Particulars	Count	Percentage
Multiple responses: cause of not using pesticide		
a. No need	35	88
b. High price	-	-
c. Lack of money	-	-

Source: Trial Monitoring Survey 2003

5. Profitability

5.1 Gross cost

Total cost of per hectare for production of rice through SRI method was 9% less than that of conventional practice. Because seed, weeding and hired labor cost were lower in SRI method (Table. 11). In SRI method, per hectare cost of production of rice is 16% less and 3% more than that of conventional method in Begumgonj and Chatkhil respectively (Table A 3). In Begumgonj per hectare cost by SRI method decreased 29% compared to conventional method due to cultivation of BR29 variety. In Chatkhil, per hectare cost under SRI method increased 21% compared to conventional method for cultivation of BR16 variety (Table A 3). Irrigation cost was 0.14% higher for SRI plot compared to conventional method which is unexpected. The reason might be due to fact that irrigation charges were based on frequency of irrigation and not by volume of water used or hours of tubewell operation.

Table 10: Per hectare Production cost (Tk)

Cost item	SRI method	Conventional method
land preparation	3229	2892
Seed	363	1114
fertilizer	3077	2980
irrigation	3496	3491
weeding	4848	5888
hired labor	3343	5025
own labor	3932	2998
Total	**22,288**	**24,387**

Source: Trial Monitoring Survey 2003

5.2 Gross return

Per hectare gross return was 43% higher in SRI method than per hectare return from conventional method. Prices of paddy and straw were estimated at Taka 300 per maund and Taka 1 per kilogram respectively. SRI returns from paddy and straw were 43% and 42% more respectively compared to conventional return (Table 12). Per hectare SRI gross return was 38% higher than return from conventional method in Begumgonj while 48% higher in Chatkhil (Table A 8).

Table 11: Per hectare gross return (Tk)

Particulars	SRI Method	Conventional Method
Return from paddy (A)	57569	40361

Return from straw (B)	6443	4551
Gross Return (A + B)	64012	44912

Source: Trial Monitoring Survey 2003

5.3 Net return

It may be noted here that in calculating net return certain costs such as land rent and interest on operating capital were not estimated. Per hectare SRI net return was 109% higher than net return from conventional method (Table12). Per hectare SRI net return was 83% higher than net return from conventional method in Begumgonj while 123% higher in Chatkhil (Table A 8) indicating that the former Upazila was comparatively more favorable for SRI method compared to the latter.

Table 12: Per hectare net return (Tk)

Particulars	SRI Method	Conventional Method
Gross Return (A)	64012	44912
Gross Cost (B)	22288	24387
Net Return (A – B)	41724	20000
Benefit-Cost Ratio (A/B)	2.87	1.84

Source: Trial Monitoring Survey 2003

6. Farmers' perception on different aspect of SRI

6.1 Farmers' feelings before cultivation

- feared/worried about yield/ crop failure by planting single seedling
- neighbors made laughter/fun/jokes after hearing such production method
- astonished to hear about SRI method
- hardly believed that it would be more profitable
- some showed disinterest toward SRI discussion and advice at very beginning and even some treated the BRAC researchers as 'mad'

6.2 Motivation and present feelings of farmers

- Motivated by NGO personnel, specially from BRAC
- Never thought that single seedling cultivation could give stunning yield
- Got more than expected yield
- SRI method is more effective than conventional method to get more yield

- More yields with less seed
- Farmers are very happy
- Could be practiced in small plot by marginal farmers
- Easy to compare with conventional method, because both methods are practiced in adjacent plots
- Less costly

6.3 Future plans of farmers

- More land will be brought under cultivation in next *Boro* season
- Some new farmers were motivated by their neighbor farmers
- Farmers became more conscious about SRI method
- They overcame their fears about crop failure

6.4 Bottlenecks of SRI practices

- Hard to pick up and plant 10-15 day old seedling without root damage
- Some farmers cannot follow this new method due to need for good management skills
- Need intensive care at initial stage
- Hard to maintain alternate irrigation and drying

7. Field Workers' Opinion

1. Hard to make the farmer understand SRI method at the very beginning. Single seedling method is very confusing to the farmers, they were even afraid about it.
2. Workers themselves had doubts about the benefits of this method
3. If some farmers can be motivated at first then other neighboring farmers would accept this method.
4. Food deficiency might be solved if all farmers follow this method and even we can export rice
5. This method should be disseminated throughout the country; it is a very appropriate method for Bangladesh. Besides ours is a agro based country and it has huge contribution in GDP
6. SRI can eliminate poverty
7. It was well accepted by farmers after strong motivation
8. Field workers learned a lot about SRI through practical experience
9. Farmers are satisfied to have encouraging result pursuing SRI production method
10. According to field workers, farmers are very happy to cultivate rice through SRI method.
11. Farmers gave a good response towards SRI

Discussion

The findings show that the participating farmers of Noakhali who adopted SRI practice for the first time achieved considerable success in increasing their yield and profitability. However, the results could be much better than that attained. The main problems identified through monitoring their production management practices appear to be the following:

1. Lack of proper understanding of the concept of SRI.

The field staff and the farmers had not understood the concept of SRI very well. Particularly they were not very clear about the real implication of some of the SRI practices. For example, alternate wetting and drying of the plots were to be followed. Frequent weeding was recommended while the plots become dry. It was thought that weeding was for removing weeds only. However, one special purpose of weeding was to help aeration of the soil that has significant impact on the growth of the plant and yield. This was not duly understood. So adequate measures were not taken in this respect.

Again, SRI requires relatively much less water than that required under farmer practices. Since only very small isolated plots were put under SRI within the irrigated areas for farmer practices where more water is supplied. The SRI farmers did not gain any financial benefit. Moreover, cost of water was realised based on the frequency of irrigation, not on the volume supplied. So, the farmers did not receive any benefit in terms of cost for irrigation. During the *Boro* crop season 2003-2004 a community approach has been recommended for adoption by farmers which is expected to reduce irrigation cost and improve efficiency of water use.

Thirdly, SRI puts emphasis on use of organic manure. Unfortunately there is serious scarcity of organic manure in the area, as in other areas in Bangladesh. Attempts are being made to motivate the farmers to go for preparing compost manure and other available sources of organic manure which will hopefully have positive impact on soil quality and yield.

Thirdly, transplantation of very young seedlings needs special care and skill. If transplantation is not done properly, it will increase mortality, increase labour cost and also adversely affect the growth of cycle of the plant. It is expected that improvement in skill in subsequent trials will solve these problems

Realizing the shortcomings in the SRI trials during the first *Boro* season (2002-03), a training workshop has been organized for the field staff of all the partners of the sub-project (SP 3602) so that during the SRI trials (2003-04 *Boro* season), the farmers can improve their understanding of the SRI methods and attain better results.

8. Conclusion

SRI is quite a new practice of rice cultivation. In spite of various shortcomings and weaknesses the farmers got encouraging result following this method. If production management can be improved and community awareness about SRI can be developed, SRI coverage may be increased in near future in Bangladesh. It is a great opportunity especially for the resource poor farmers because it needs lower amount of chemical fertilizers, irrigation water and seeds, which are crucial for rice production. It needs intensive care regarding seedling age, transplantation, spacing, and irrigation and weed management. In most of these areas there were shortcomings in conducting the SRI trials during the first season. Results can be improved by removing these shortcomings. We also hope that community awareness and group cultivation of rice through SRI method would be able to considerably reduce such problems.

The SRI calls for an integrated crop production management system where all the operations are done and procedures followed carefully. It is expected that with increased experience, the farmers will gain in their management skills and will be able to derive much better results in terms of reducing cost, raising yield and increasing their profitability. This will also contribute to evolving a more environment friendly rice cultivation practice and help in improving food security.

Table A1: Variety wise average cultivated land (dec.)

Upazila/Dist.	Method	Variety	Land	N
Begumgonj	SRI	BR28	6.6	8.0
		BR16	6.5	2.0
		BR29	12.9	7.0
		BR14	4.5	2.0
		BR11	7.0	1.0
	Total		8.6	20.0
	Farmers' method	BR28	10.3	8.0
		BR16	12.0	2.0
		BR29	12.4	7.0
		BR14	17.5	2.0
		BR11	10.0	1.0
	Total		11.9	20.0
Chatkhil	SRI	BR28	10.8	8.0
		BR16	3.0	1.0
		BR29	10.0	4.0
		BR11	4.7	7.0
	Total		8.1	20.0
	Farmers' method	BR28	20.4	8.0
		BR16	9.0	1.0
		BR29	40.0	4.0
		BR11	25.0	7.0
	Total		25.4	20.0
Noakhali	SRI	BR28	8.7	16.0
		BR16	5.3	3.0
		BR29	11.8	11.0
		BR14	4.5	2.0
		BR11	5.0	8.0
	Total		8.4	40.0
	Farmers' method	BR28	15.3	16.0
		BR16	11.0	3.0
		BR29	22.5	11.0
		BR14	17.5	2.0
		BR11	23.1	8.0
	Total		18.6	40.0

Table A2:Fertilizer dose (kg/ha)

Name of Fertilizer	SRI							
	Basal Dose				Top Dressing			
	N	Total Fertilizer(Kg)	Total land(dec)	Kg/ha	N	Total Fertilizer(Kg)	Total land(dec)	Kg/ha
Organic	9	480	66	1796	0	0	0	0
Urea	2	2	9	55	40	243	745	81
TSP	38	106	321	81	0	0	0	0
MP	24	42	211	49	8	9	280	8
Zipsam	18	31	151	51	0	0	0	0

Continued

Name of Fertilizer	Farmers' method							
	Basal Dose				Top Dressing			
	N	Total Fertilizer (Kg)	Total land (dec)	Kg/ha	N	Total Fertilizer (Kg)	Total land (dec)	Kg/ha
Organic	8	700	59	2931	1	6	10	148
Urea	2	4	12	82	37	512	684	185
TSP	36	221	302	180	1	11	15	181
MP	23	92	196	116	4	12	82	36
Zipsam	16	43	97	109	0	0	0	0

Table A3:Per hectare production cost (Tk.)

Upazila/Dist.	Method	Variety	Land preperation	Seed	Fertilizer	Irrigation	Weed	Hire labor	Own labor	Total
Begumgonj	SRI	BR28	5210	387	1804	3402	5173	1572	4241	21789
		BR16	5244	342	2755	3667	2090	2660	2850	19608
		BR29	2854	244	1622	2758	4226	2499	1921	16126
		BR14	2882	357	3101	5214	5214	3458	5489	25715
		BR11	3952	353	1976	4411	7410	2470	4940	25512
	Total		**3807**	**306**	**1855**	**3221**	**4538**	**2331**	**3016**	**19074**
	Farmers' method	BR28	4810	1181	1630	4301	6838	3144	1898	23801
		BR16	4817	1081	2532	2573	5043	2161	2779	20985
		BR29	4293	1326	1681	3308	6161	3776	2186	22730
		BR14	3952	1235	1567	4093	5363	2258	2117	20586
		BR11	3952	1235	2001	4940	6916	1729	3458	24231
	Total		**4459**	**1234**	**1746**	**3760**	**6196**	**3085**	**2190**	**22669**
Chatkhil	SRI	BR28	3116	356	4478	3676	5112	5097	3463	25298
		BR16	2058	412	12021	5763	5763	0	10703	36721
		BR29	2192	543	3236	3859	5558	3342	4631	23361
		BR11	1871	457	4790	3817	4828	4940	7971	28674
	Total		**2615**	**424**	**4374**	**3789**	**5176**	**4571**	**5173**	**26122**
	Farmers' method	BR28	2409	1223	3202	2894	5846	5240	2427	23242
		BR16	2058	686	8014	3842	5214	0	10429	30244
		BR29	2177	568	3682	3236	5326	6731	1991	23710
		BR11	1905	1372	3550	3896	6055	6059	5011	27848
	Total		**2156**	**1058**	**3559**	**3364**	**5743**	**6003**	**3417**	**25300**
	SRI	BR28	3915	368	3458	3572	5135	3978	3859	24285
		BR16	4647	355	4492	4060	2779	2660	4323	23315
		BR29	2651	336	2119	3097	4636	2742	2755	18335
		BR14	2882	357	3101	5214	5214	3458	5489	25715

Continued

Upazila/Dist.	Method	Variety	Land preperation	Seed	Fertilizer	Irrigation	Weed	Hire labor	Own labor	Total
Noakhali		BR11	2235	438	4298	3921	5280	4030	7441	27643
	Total		**3229**	**363**	**3077**	**3496**	**4848**	**3343**	**3932**	**22288**
		BR28	3213	1209	2676	3365	6178	4567	2207	23415
		BR16	4064	973	4027	2919	5090	2161	4865	24099
	Farmers' method	BR29	2922	835	2977	3261	5620	5690	2060	23365
		BR14	3952	1235	1567	4093	5363	2258	2117	20586
		BR11	2016	1365	3466	3952	6102	5769	4927	27596
	Total		**2892**	**1114**	**2980**	**3491**	**5888**	**5025**	**2998**	**24387**

Table A4: Average no. of tiller per hill (within 40-45 day)

Upazila/Dist.	Method	Variety	Hill										Total average
			1	2	3	4	5	6	7	8	9	10	
Begumgonj	SRI	BR28	36	36	38	35	35	36	36	36	36	36	36
		BR16	36	38	37	37	37	31	36	31	31	39	36
		BR29	38	35	34	34	38	35	36	34	35	34	35
		BR14	32	36	30	27	37	28	32	30	24	31	31
		BR11	36	38	40	37	41	32	42	36	33	35	37
	Total		36	36	36	34	37	34	36	34	34	35	35
	Farmers' method	BR28	14	16	14	17	16	17	14	15	14	16	15
		BR16	11	13	11	11	14	15	11	10	12	12	12
		BR29	14	14	17	14	13	16	13	12	15	14	14
		BR14	19	20	16	17	17	15	26	17	16	16	18
		BR11	12	11	9	10	13	14	10	12	10	15	12
	Total		14	15	15	15	14	16	14	13	14	15	15
Chatkhil	SRI	BR28	35	32	30	29	30	31	31	30	29	29	30
		BR16	22	25	21	28	20	22	20	19	17	15	20
		BR29	37	37	37	36	36	36	35	33	36	37	35

Continued

Upazila/Dist.	Method	Variety	Hill										Total average
			1	2	3	4	5	6	7	8	9	10	
		BR11	35	33	35	32	29	32	33	33	30	30	32
	Total		35	33	33	31	30	32	32	31	30	30	31
	Farmers' method	BR28	20	20	19	20	19	21	22	20	20	20	20
		BR16	14	12	9	8	15	11	14	16	13	10	12
		BR29	26	26	25	26	24	24	23	25	23	23	24
		BR11	20	18	19	19	20	21	20	19	16	17	18
	Total		21	20	20	20	20	21	21	20	19	19	20
Total	SRI	BR28	36	34	34	32	33	34	33	33	33	32	33
		BR16	31	33	32	34	31	28	30	27	26	31	30
		BR29	38	36	35	35	37	36	36	34	35	35	35
		BR14	32	36	30	27	37	28	32	30	24	31	31
		BR11	35	34	35	32	31	32	34	34	31	31	32
	Total		36	34	34	33	34	33	34	33	32	33	33
	Farmers' method	BR28	17	18	17	18	17	19	18	17	17	18	18
		BR16	12	12	10	10	14	13	12	12	12	11	12
		BR29	18	18	20	18	17	18	16	17	18	17	18
		BR14	19	20	16	17	17	15	26	17	16	16	18
		BR11	19	18	18	18	19	20	19	18	15	17	18
	Total		17	18	17	18	17	18	18	17	16	17	17

Table A5: Average no. of tiller per hill (before 5-10 day of harvest)

Upazila/Dist.	Method	Variety	Hill										Total average
			1	2	3	4	5	6	7	8	9	10	
Begumgonj	SRI	BR28	27	28	28	28	27	27	28	27	29	27	28
		BR16	30	29	27	28	31	27	30	28	28	24	28
		BR29	28	29	27	30	27	28	29	29	28	28	28
		BR14	35	27	26	28	28	31	29	29	28	31	29
		BR11	30	28	25	27	29	25	30	24	25	30	28
	Total		29	28	27	28	28	28	29	28	28	28	28
	Farmers' method	BR28	11	11	11	10	11	10	10	11	9	10	11
		BR16	10	10	8	9	12	11	9	10	12	10	11
		BR29	10	9	10	10	10	9	11	10	10	10	10
		BR14	12	12	12	9	12	10	9	11	13	13	12
		BR11	11	13	10	9	7	10	8	10	9	12	10
	Total		10	11	10	10	11	10	10	10	10	10	10
Chatkhil	SRI	BR28	25	27	26	24	27	23	23	24	21	23	24
		BR16	14	16	13	11	15	13	12	10	13	14	13
		BR29	30	29	28	32	28	29	30	27	26	26	28
		BR11	26	26	24	25	26	25	23	23	23	25	24
	Total		26	27	25	25	26	24	24	24	23	23	25
	Farmers' method	BR28	16	14	14	14	13	12	12	13	13	15	13
		BR16	8	10	9	11	13	7	12	9	8	11	9
		BR29	19	19	19	18	21	21	22	21	17	16	19
		BR11	16	13	13	13	11	13	15	16	13	14	13
	Total		16	15	14	14	14	14	15	16	13	15	14
Total	SRI	BR28	26	28	27	26	27	25	26	25	25	25	26
		BR16	24	25	22	22	25	22	24	22	23	20	23
		BR29	29	29	27	31	28	28	29	28	28	27	28
		BR14	35	27	26	28	28	31	29	29	28	31	29
		BR11	27	27	24	25	26	25	24	23	24	25	25
	Total		27	28	26	27	27	26	26	26	25	26	26
	Farmers' method	BR28	13	13	13	12	12	11	11	12	11	12	12
		BR16	9	10	8	10	12	10	10	10	11	10	10
		BR29	13	13	14	13	14	13	15	14	12	12	13
		BR14	12	12	12	9	12	10	9	11	13	13	12
		BR11	16	13	12	13	11	12	14	16	13	14	13
	Total		13	13	12	12	12	12	13	13	12	12	12

Table A6: Average No of paddy per panicle

Upazila/Dist.	Method	Variety	1st hill			2nd hill			3rd hill			Total average
			1st panicle	2nd panicle	3rd panicle	1st panicle	2nd panicle	3rd panicle	1st panicle	2nd panicle	3rd panicle	
Begumgonj	SRI	BR28	141	134	129	138	133	127	139	131	127	133
		BR16	133	128	128	133	131	129	130	133	133	130
		BR29	147	141	135	143	138	136	144	137	135	139
		BR14	143	140	135	140	134	129	139	132	126	135
		BR11	149	141	138	148	142	139	147	140	136	142
	Total		143	136	132	140	135	131	140	134	130	135
	Farmers' method	BR28	110	104	98	110	103	96	105	86	90	101
		BR16	97	93	95	90	90	90	90	84	82	90
		BR29	108	103	94	103	98	95	105	100	99	100
		BR14	115	106	99	112	106	97	110	101	94	104
		BR11	118	115	112	112	103	100	99	91	85	103
	Total		109	103	97	106	100	95	104	92	92	100
Chatkhil	SRI	BR28	140	136	133	140	135	130	136	130	125	134
		BR16	143	137	135	138	138	133	137	129	126	135
		BR29	153	147	145	147	143	139	146	140	138	167
		BR11	150	144	140	146	141	137	145	141	137	143
	Total		146	141	138	143	139	134	141	136	132	144
	Farmers' method	BR28	121	117	111	118	116	112	117	112	108	114
		BR16	128	123	118	129	124	121	128	126	123	124
		BR29	133	129	125	135	132	128	138	132	127	131
		BR11	139	133	130	138	133	129	137	133	129	132
	Total		130	125	121	129	126	122	130	125	120	125
Total	SRI	BR28	141	135	131	139	134	129	137	131	126	133
		BR16	136	131	130	134	133	130	132	131	130	132
		BR29	149	143	139	145	140	137	145	138	136	149
		BR14	143	140	135	140	134	129	139	132	126	135
		BR11	150	144	140	146	141	137	146	141	137	143
	Total		145	139	135	142	137	133	141	135	131	140

Continued

Upazila/Dist.	Method	Variety	1st hill			2nd hill			3rd hill			Total average
			1st panicle	2nd panicle	3rd panicle	1st panicle	2nd panicle	3rd panicle	1st panicle	2nd panicle	3rd panicle	
	Farmers' method	BR28	115	111	104	114	109	104	111	98	99	107
		BR16	107	103	102	103	101	100	103	98	96	101
		BR29	117	112	105	114	111	107	117	111	109	111
		BR14	115	106	99	112	106	97	110	101	94	104
		BR11	136	131	128	134	129	126	133	128	124	129
	Total		119	114	109	117	113	108	116	108	106	112

Table A7: Average weight of paddy (g/1000 paddy), yield (t/ha) and hay (t/ha) of paddy

Upazila/Dist.	Method	Variety	weight of paddy	weight of hay	yield of paddy				yield of hay			
					1	2	3	Average	1	2	3	Average
Begumgonj	SRI	BR28	24	17	8	8	8	7.8	6	6	6	6.4
		BR16	24	18	9	9	9	8.6	7	7	8	7.6
		BR29	23	17	9	9	8	8.6	7	8	8	7.5
		BR14	25	15	8	7	7	7.2	6	6	6	6.0
		BR11	25	15	8	7	8	7.5	6	6	6	6.1
	Total		24	17	8	8	8	8.1	7	7	7	6.8
	Farmers' method	BR28	22	29	6	6	6	5.8	5	5	5	5.0
		BR16	21	30	6	6	6	6.3	5	5	5	4.7
		BR29	21	28	6	6	6	6.0	5	5	5	5.1
		BR14	23	25	6	5	5	5.4	5	5	6	5.2
		BR11	22	23	6	5	6	5.5	5	5	5	4.8
	Total		21	28	6	6	6	5.9	5	5	5	5.0
Chatkhil	SRI	BR28	24	11	7	7	7	7.0	6	6	6	5.8
		BR16	22	10	5	5	5	4.8	5	4	4	4.3
		BR29	24	9	9	9	9	9.0	7	8	7	7.4
		BR11	26	10	7	7	7	6.9	6	6	6	5.8
	Total		25	10	7	7	7	7.3	6	6	6	6.1
	Farmers' method	BR28	21	20	4	4	5	4.5	4	4	4	3.7
		BR16	19	17	3	4	3	3.4	3	4	3	3.3
		BR29	21	17	6	7	6	6.4	5	5	5	5.3

Continued

Upazila/Dist.	Method	Variety	weight of paddy	weight of hay	yield of paddy				yield of hay			
					1	2	3	Average	1	2	3	Average
		BR11	22	18	5	5	5	4.7	4	4	4	4.0
	Total		22	18	5	5	5	4.9	4	4	4	4.1
Noakhali	SRI	BR28	24	14	8	7	7	7.4	6	6	6	6.1
		BR16	23	15	7	7	7	7.4	6	6	7	6.5
		BR29	24	14	9	9	9	8.7	7	8	7	7.5
		BR14	25	15	8	7	7	7.2	6	6	6	6.0
		BR11	26	11	7	7	7	7.0	6	6	6	5.9
	Total		24	14	8	8	8	7.7	6	6	6	6.4
	Farmers' method l	BR28	22	24	5	5	5	5.1	4	4	4	4.3
		BR16	20	25	5	5	5	5.3	4	4	4	4.2
		BR29	21	24	6	6	6	6.2	5	5	5	5.2
		BR14	23	25	6	5	5	5.4	5	5	6	5.2
		BR11	22	18	5	5	5	4.8	4	4	4	4.1
	Total		21	23	5	5	5	5.4	5	5	5	4.6

Table A8: Gross and Net return (Tk/ha)

Method	Variety	Quantity		Value		Gross Return (Tk/ha)	Gross cost (Tk/ha)	Net Return (Tk/ha)
		Yield of paddy (t/h)	Yield of hay(t/h)	Paddy (Tk/ha)	Hay (Tk/ha)			
SRI	BR28	7.8	6.4	58797	6379	65176	21789	43388
	BR16	8.6	7.6	64688	7562	72249	19608	52641
	BR29	8.6	7.5	64339	7495	71835	16126	55709
	BR14	7.2	6.0	53875	5958	59833	25715	34118
	BR11	7.5	6.1	56250	6067	62317	25512	36805
Total		8.1	6.8	60706	6830	67537	**19074**	**48463**
Farmers' method	BR28	5.8	5.0	43431	4958	48390	23801	24588
	BR16	6.3	4.7	47125	4695	51820	20985	30835
	BR29	6.0	5.1	45321	5126	50448	22730	27718
	BR14	5.4	5.2	40750	5150	45900	20586	25314
	BR11	5.5	4.8	41250	4833	46083	24231	21853
Total		5.9	5.0	44085	5004	49089	**22669**	**26419**
SRI	BR28	7.0	5.8	52406	5792	58198	25298	32900
	BR16	4.8	4.3	36250	4267	40517	36721	3796
	BR29	9.0	7.4	67719	7413	75131	23361	51770
	BR11	6.9	5.8	51750	5838	57588	28674	28914
Total		7.3	6.1	54431	6056	60487	**26122**	**34365**
Farmers' method	BR28	4.5	3.7	33578	3700	37278	23242	14036
	BR16	3.4	3.3	25250	3283	28533	30244	-1710
	BR29	6.4	5.3	48219	5333	53552	23710	29842
	BR11	4.7	4.0	35143	3964	39107	27848	11259
Total		4.9	4.1	36638	4098	40736	**25300**	**15436**
SRI	BR28	7.4	6.1	55602	6085	61687	24285	37402
	BR16	7.4	6.5	55208	6463	61672	23315	38356
	BR29	8.7	7.5	65568	7465	73033	18335	54698
	BR14	7.2	6.0	53875	5958	59833	25715	34118
	BR11	7.0	5.9	52313	5867	58179	27643	30536
Total		7.7	6.4	57569	6443	64012	**22288**	**41724**
Farmers' method l	BR28	5.1	4.3	38505	4329	42834	23415	19419
	BR16	5.3	4.2	39833	4224	44058	24099	19958
	BR29	6.2	5.2	46375	5202	51577	23365	28212
	BR14	5.4	5.2	40750	5150	45900	20586	25314
	BR11	4.8	4.1	35906	4073	39979	27596	12384
Total		5.4	4.6	40361	4551	44912	**24387**	**20526**