

Rice - Relay Sugarcane Cropping: Farmers' Response

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ABSTRACT

A preliminary survey was carried out during 2005-06 cropping year in different mills zone where farmers are cultivating rice-relay sugarcane cropping at their field in a small scale to know the response of farmers about the technology. Both primary data taking from 35 farmers and secondary data provided by respective mills were used. In the same mills zone planting time of rice and sugarcane varied from 20 to 25 days. For rice crop, 15% plantation was done early and 25% in late July, 35% in mid and 25% in late August. For sugarcane, 20% plantation was made before mid and 35% in late October, 30% in between early to mid November and the rest 25% in late November. According to farmers' opinion planting time gap between rice and sugarcane might have effects on allowing two intercrops. The most important fact was that most of the farmers were not able to grow second intercrop after harvesting of first intercrop and only 20% farmers grew vegetable and pulses as second intercrop. Equivalent yield of intercrops varied significantly. Mean yield of sugarcane cultivated as sole crop was 50.5 t ha⁻¹. On the other hand, equivalent yield in rice-relay sugarcane was 89.7 t ha⁻¹. Net return came from sole sugarcane was Tk. 31308 /ha whereas it was found Tk. 68548 /ha in the case of rice-relay sugarcane cropping systems with successive intercrops. The high benefit-cost ratio (2.33) also was found in rice- relay sugarcane cropping systems compared to sugarcane sole (1.86) cropping system. All farmers interviewed opined rice-relay sugarcane with successive intercropping as a good technology for increasing crops yield as well as economic benefit per unit area and time compared to sole cropping. However, majority of farmers didn't show much interest to adopt this technology due to some shortfalls that should be minimized for acceleration of the technology.

Key words: Intercropping, sugarcane, rice, relay cropping, technology, yield, response

INTRODUCTION

Bangladesh is a land of 14.8 million hectares of which 8.4 million hectares are arable land. The arable land is decreasing day by day for meeting the amenities of escalating population. In 2003-04 cropping year the area under rice cultivation was 76.26% and for sugarcane it was only 1.15% of the cultivated area (BBS, 2004). Based on the minimum requirement of sugar as recommended by FAO (13.0 kg sugar per person per annum) at present, Bangladesh requires 1.80 million ton of sugar for 140 million people. In 2005-06 crushing season, sugar and gur production was about 0.13 million ton and 0.45 million ton respectively and as such shortfall of sugar and gur is about 1.22 million ton. With the increase of population demand for cereals, vegetables, sugar and gur has increased. Due to increased demand rice production is gradually being increased but domestic sugar production is not increasing as required. Because due to increased demand/production of cereal and vegetables crops sugarcane cultivation is now gradually being pushed to low-lying marginal lands prone to water-log, flood, drought and salinity stresses. The sustainability of long duration sugarcane crop is now at threat. On the other hand, the farmers of Bangladesh have a long tradition of rice farming and they always try to ensure their food security by growing paddy in their own field without considering the comparative benefit of growing paddy and sugarcane.

Sugarcane is a long duration crop and requires 12-16 months to mature. So, it is difficult for the growers especially poor growers to wait such a long time to get economic return from sugarcane. Although, sugarcane is comparatively a high profitable crops but due to late plantation especially after Aman rice, farmers harvest very poor yield from sugarcane production. The situation may be improved by following modern production technologies of sugarcane cultivation. Particularly rice-relay sugarcane with successive intercropping of high value crops is one of the ways for increasing productivity as well as economic return

per unit area and time. It is reported that 50 to 80 per cent of rainfed crops are planted as intercrops with sugarcane in many developing countries (Norman, 1974). But the adoption of intercropping in Bangladesh is still low; it ranges 25-30% of the total sugarcane land. Sugarcane is a high and medium high land crop which mainly competes with cereal and winter crops (SRTI, Annual Report, 1983; 1986). As sugarcane is planted at adequate row spacing and this inter-rows space practically remains vacant in early growth stage which extends nearly four months where suitable short duration winter crops may be grown as intercrop that increase total yield, higher monetary return, and greater resource utilization and fulfills the diversified need of the farmers (Singh *et al.* 1986). The methodical intercropping, paired row intercropping and high value crops intercropping was developed by Agronomy division of BSRI and introduced in the early 1980s, 1990s and 2000s respectively. In recent times, the division developed rice-relay sugarcane cultivation system where rice is grown as a sole crop remaining space for sugarcane cultivation as relay crop. The system is giving an opportunity to grow two intercrops successively after harvesting rice. Most interesting intercropping practice in Taiwan is to cultivate sugarcane with rice. Successful intercropping of various crops with sugarcane has been reported by many researchers (Rithi *et al.* 1974, Iman *et al.* 1990). The rice- relay sugarcane growing system also ensure early cane plantation. Ali, (1986) reported that early planting (October-November) produced 25.35% higher cane yields over late planting (February-March). Recently, demonstration on Rice-relay sugarcane planting system is undertaken in different sugar mills zone with an objective to widely expand it in the country. The present study aimed at to know how and what extent the rice-relay sugarcane cropping technology is accepted by farmers and problems associated with the technology.

METHODOLOGY

A preliminary survey was carried out during 2005-06 cropping year in Kustia Sugar Mills, Carew & Co., Mobarakgonj Sugar Mills, Natore Sugar Mills, Rajshahi Sugar Mills and Shyampur Sugar Mills zones where farmers are trialing this technology (Rice- relay sugarcane cropping) at their field in a small scale. All the farmers trialing sugarcane following this technology in the respective mills zone were selected for interview. A total of 35 farmers were interviewed through structured and open-ended questionnaire. Field conditions of farmers were observed and secondary data were collected from the respective mills. Descriptive statistics were employed to analyze the data of the study.

RESULTS AND DISCUSSION

Among selected farmers 25 were large farmers (above 7.5 acres) and 10 were medium farmers (above 2.5 & below 7.5 acres) according to farm size category. The average size of the plot was 0.45 acre and maximum and minimum sizes of the plot were 0.80 and 0.30 acres respectively. Some salient features of the technology are as follows:

Time of plantation

It is revealed from the study that farmers in different study sugar mills zone planted sugarcane and rice in various times while in the same mills zone it was varied from 20 to 25 days (Table 1). For rice crop, 15% plantation was done early and 25% in late July, 35% in mid and 25% in late August. For sugarcane, 20% plantation was made before mid and 35% in late October, 30% in between early to mid November and the rest 25% in late November. It was observed that farmers generally planted sugarcane after harvesting of rice crop which delays sugarcane plantation resulting lower yield and recovery. This plantation pattern did not allow intercropping with sugarcane.

Table 1. Planting time of rice and sugarcane in different mills zone.

Rice plantain time	Farmers' Practice (%)	Sugarcane plantation time	Farmers' Practice (%)
Early July	15	Before mid October	20
Late July	25	Late October	35
Mid August	35	Early to mid November	30
Late August	25	Late November	15

Crop Varieties

Selection of appropriate varieties of crops might have contribution on increasing yield and thus farmers' income. Collected data on varieties of rice and sugarcane in the study areas shows that the most common variety of rice were BR 11 and Shorna, and a total area of 45% and 40% was occupied by these two varieties respectively; only 15% rice land was under other varieties like BR 28, BR 30, BR 33 etc. In the case of sugarcane, major varieties were Isd 34 (35%), Isd 2/54 (25%) and Isd 16 (20%). Rest sugarcane land (20%) was occupied by other varieties like Isd 21, Isd 26, Isd 29, Isd 32, Isd 33, Isd 36 etc. Farmers opined that long duration rice like BR 11 and Shoma and sugarcane variety Isd 34 were found suitable for relay cropping system.

Table 2. Varieties of sugarcane and rice in different mills zone.

Crops	Variety	Farmers' Practiced (%)
Rice	BR11	45
	Shoma	40
	Others (BR28, 30, 33)	15
Sugarcane	Isd 34	35
	Isd 2/54	25
	Isd 16	20
	Others (Isd 21, 26, 29, 36, 32, 33)	20

Source: Field Survey, 2006

Intercropping under relay cropping system

The main objective of rice-relay sugarcane system is not only increasing sugarcane yield by early planting but also make sugarcane cultivation more economic through multiple intercropping. But the most important fact was that most of the farmers were not able to grow second intercrop after harvesting of first one. It might be due to lack of recommended row arrangement with proper spacing and long plant life of first intercrop. It was found that 20% farmers grew vegetable and pulses as second intercrop. The most common first intercrops were potato (34%), onion (25%), pulses like lentil and gram (25%) and others (12%). It is noted that two intercrops might be cultivated if the rice-relay sugarcane system is laid out under paired row system. According to the opinion of the farmers, the following problems were found as the limiting factors for second intercropping: (i) shadow for quick growth of sugarcane; (ii) lack of appropriate knowledge about suitable intercrops; (iii) hardening of soil after first intercrop; (iv) lack of irrigation and (v) lack of intercultural operation (nursing) needed for intercropping. Respond of mentioned problems were 100; 85; 80 65 and 40% respectively (Table 3).

Table 3. Problems of cultivating second intercrop.

Problems	Per cent of Respondents (%)
1. Shadow for quick growth of sugarcane	100
2. Lack of appropriate knowledge about suitable intercrops	85
3. Hardening of soil after first intercrop	80
4. Lack of irrigation	65
5. Lack of intercultural operation (nursing) needed for intercropping	40

Source: Field Survey, 2006

Economics of rice-relay sugarcane cropping

For economic analysis of sole cropping and rice-relay sugarcane cropping with intercrops all crops yields were converted into sugarcane as equivalent yield and aggregated for comparing each with other. It is revealed that calculate data on equitant yield in different systems varied significantly (Table 4). Mean yield of sugarcane cultivated as sole crop was 50.5 t ha⁻¹. On the other hand, equivalent yield in rice-relay sugarcane was 89.7 t ha⁻¹. Mean cost of production for sole sugarcane and rice-relay sugarcane were Tk. 36308/ha and Tk. 51623 /ha respectively. Net return came from sole sugarcane was Tk. 31308 /ha whereas it was found Tk. 68548 /ha in the case of rice-relay sugarcane cropping systems with successive intercrops. The higher benefit-cost ratio (2.33) also was found in rice-relay sugarcane cropping systems compared to sole sugarcane (1.86) cropping system (Table 4).

Table 4. Mean yield and return of sole sugarcane and rice-relay sugarcane cropping in different mills zone.

Location	Technology/Treatment	Yield(t ha ⁻¹)	Cost(t ha ⁻¹)	Gross return(Tk.ha-1)	Net return(Tk.ha-1)	BCR
KSM	T ₁	48.3	35823	64668	28845	1.81
	T ₂	85.5	49920	114503	64583	2.29
Carew & Co.	T ₁	53.5	35180	71744	36564	2.04
	T ₂	88.0	51247	117880	66633	2.30
MSM	T ₁	51.5	36525	69050	32525	1.89
	T ₂	90.7	52632	121511	68879	2.31
NSM	T ₁	49.6	37102	66437	29335	1.79
	T ₂	90.7	53212	121511	68299	2.28
RSM	T ₁	47.6	35765	63730	27965	1.78
	T ₂	87.6	50458	117411	66953	2.33
SSM	T ₁	52.3	37452	70109	32657	1.87
	T ₂	95.7	52268	128211	75943	2.45
Mean	T ₁	50.5	36308	67616	31308	1.86
	T ₂	89.7	51623	120171	68548	2.33

Source: Field Survey, 2006 T₁ = Sole SugarcaneT₂ = Rice-relay sugarcane cropping

Farmers' reaction

All the respondents opined that rice-relay sugarcane with successive intercropping is a good technology for increasing crops yield as well as economic benefit per unit area and time compared to sole cropping. However, majority of farmers didn't show much interest to adopt this technology. According to their opinion, main reasons were as: (i) technology is much more complex than sugarcane cultivation as sole crop (100%); (ii) cost is high (100%); (iii) inadequate soil moisture needed for intercropping (85%); (iv) land preparation for intercropping is very difficult (85%); (v) insufficient seeds of recommended intercrops (80%); (vi) insufficient labour required for technology (75%); (vii) reducing sugarcane yield (50%); (viii) intercultural operation for intercrops is very difficult (60%); (ix) labourers are not properly accustomed with the technology due to lack of knowledge about the system and show reluctance (90%) and finally (x) profit is less in proportion of cost and hazard (100%) (Table 5). But our previous economic analysis shows the contrary results of farmers' opinion.

Table 5. Problems associated with the technology.

Problems	Farmers Reaction (%)
1. The technology is much more complex than sugarcane cultivation as sole crop	100
2. Cost is high	100
3. Inadequate soil moisture needed for intercropping	85
4. Insufficient seeds of recommended intercrops	80
5. Land preparation for intercrops is very difficult	85
6. Shortage of labourers	75
7. Reducing sugarcane yield	50
8. Intercultural operation for intercrops is very difficult	60
9. Labourers are not properly accustomed with the technology due to lack of knowledge about the system and show reluctance	90
10. Profit is less in proportion of cost and hazard	100

Source: Field Survey, 2006

CONCLUSIONS

The technology package rice-relay sugarcane with successive intercropping was found effective for total crop production with increased economic benefit but at the same not accepted by majority farmers due to some problems associated with the technology. The following recommendations might contribute enough to make the technology widespread among the farmers. Firstly, the technology should be fine tuned through more agronomic trial considering problems found in the farmers' fields, especially proper guideline for planting time, row arrangement, intercultural operations, fertilizers and crop management, harvesting method, land preparation technique for intercrops etc should be clearly mentioned for every crops. High value and profitable crops compatible as intercrop with rice-relay sugarcane system for different land types and farm category should be introduced. Secondly, necessary training should be given to farmers as well as arrange large-scale demonstration in farmers' field for adoption the technology properly.

The interviewed farmers opined as rice farming is a long tradition of Bangladesh agriculture besides farmers are now shifting towards some profitable enterprises like vegetables, pulses, spice crops, oil seed etc so to sustain sugarcane cultivation in Bangladesh for domestic sugar and gur production as well as other uses, rice-relay sugarcane could be apt endeavor. But to make it wide accepted among sugarcane and rice farmers more financial supports as subsidies should be provided to the farmers and high value successive intercropping package should be developed.

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