

Performance of Paired Row Sugarcane with Some High Valued Crops as First and Mungbean as Second Intercrop Under Madhupur Tracts soils

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ABSTRACT

A study was conducted at Sreepur, Gazipur under Madhupur Tracts soils during the cropping season 2007-2008 where sole paired row cane (PRC) and PRC with potato, onion, garlic and mustard as 1st intercrop and mungbean as 2nd intercrop were grown. PRC with potato-mungbean combination was recorded highest in respect of cane yield (122.8 t/ha), adjusted cane yield (210.74 t/ha), gross return (Tk 339291), gross margin (Tk 220500) and benefit cost ratio (1.86) followed by PRC with onion-mungbean and PRC with garlic-mungbean intercrop combination. Highest number of tiller ($134.3 \times 10^3 \text{ ha}^{-1}$) and millable cane stalks ($74.49 \times 10^3 \text{ ha}^{-1}$) were obtained in PRC with onion-mungbean intercrop combination. All of the four intercrop combination performed better over sole paired row sugarcane in respect of total adjusted cane yield. Cultivation of those intercrops with paired row sugarcane generated an additional income from the same field. Therefore, intercropping high valued rabi crops like potato, onion, garlic and mustard as 1st intercrop and summer mungbean as 2nd intercrop with paired row sugarcane was found profitable intercropping practice with sugarcane for Madhupur Tract areas.

Key words: Sugarcane, Intercrop, High valued crops, Paired row

INTRODUCTION

Sugarcane is one of the most important cash crops of Bangladesh. It is cultivated on an area about 0.17 million hectares annually with average cane yield of only 41 ton per hectare (BBS, 1998). It is a long duration crop; hence farmers have to wait 10-14 months to get the return of their investment from fields. Most of the farmers of Bangladesh are marginal and they can not wait such a long time to get return from a single crop and they are interested to grow short duration and high value crops. The economics of sugarcane is questioned when farmers earn more profit from other crops. Thus acreage of sugarcane decreases everyday. Intercropping with rabi crops followed by summer mungbean can ameliorate the decreasing trend of sugarcane. In early stage sugarcane grows slowly and can accommodate a number of short duration crops. It is planted by keeping adequate space in between the two rows. This space remains unused until full plant development and short duration crops can be grown in vacant space without affecting cane yield (Khushk and Mallah, 2006). The growth of sugarcane is slow in early stages and it takes about 3 to 5 months to establish the full canopy of the crop (Yadava, 1991).

Usually, farmers grow one line intercrop in between two single sugarcane rows (90-100 cm apart) and this system could not give satisfactory intercrop yield and

economic benefit in most of the cases. Paired row system of sugarcane planting has been designed to keep two rows of cane at 60 cm apart leaving 140 cm between such paired rows for growing two intercrops in sequence (Rahman, 2001). Ali *et al.* (1989) reported that there was no significant adverse effect of row arrangement on germination of cane and recoverable sucrose (%) of sugarcane. It has been reported that tiller, millable cane, cane yield and adjusted yield were significantly higher in paired row cane with potato-mungbean or onion-mungbean as sequential double intercrops with sugarcane than any other systems with single row cane (Rahman *et al.*, 2001). Major intercrops combination in sugarcane identified are: sugarcane + some short duration winter vegetables, sugarcane+ oilseed and sugarcane + pluses. The highest economic benefit observed in intercropping cane with potato and lowest from cane only. It was also found that sugarcane with potato intercropping was the most profitable combination, followed by sugarcane onion and sugarcane coriander inter-cropping. In addition, it was found that sugarcane + onion, sugarcane + potato were found to be best inter-crops combination (Khushk and Mallah, 2006). Considering the sustainability of sugarcane cultivation in Bangladesh and make crop cultivation profitable, the planting system of sugarcane has becomes manipulated to accommodate more than one intercrop for higher economic return. In view of the above circumstances, an experiment was conducted to find out the performance of some selected intercrops as first followed by summer mungbean as second intercrop in paired row planting system of sugarcane in Madhupur Tract areas.

MATERIALS AND METHODS

The experiment was conducted at Sreepur, Gazipur belongs to Madhupur Tract soils of AEZ 28 under irrigated condition during the cropping season 2007-2008 following RCBD and replicated three times. The unit plot size was 8m×7m. After final land preparation, two budded setts of variety BSRI Akh 41 (BSRI Akh 41) were planted on 26 October, 2007 at 25cm distance in paired row of 60 cm apart while the distance between two paired rows of cane was 140 cm. All intercultural operations and fertilization were done as BSRI recommended packages. The treatments included in the experiments were as follows:

- T₀ - Paired row cane
- T₁ - PRC + Potato followed by Mungbean
- T₂ - PRC + Onion followed by Mungbean
- T₃ - PRC + Garlic Mungbean and
- T₄ - PRC + Mustard followed by Mungbean

Four winter crops viz. potato (*Solanum tuberosum*), onion (*Allium cepa*), garlic (*Allium sativum*) and mustard (*Brassica campestris*) were grown as first intercrop followed by a second intercrop summer mungbean (*Vigna radiate*). Collection of various data on yield and yield contributing characteristics for cane and intercrop were done. The adjusted cane yield for the intercropped plot was calculated by adding the cane yield. The average values of all parameters were analyzed statistically. Economic and statistical analysis on different parameters for sugarcane and intercrops were done following standard procedures.

RESULTS AND DISCUSSION

Tiller population

Tiller production has been influenced significantly by different intercrop combinations. The intercultural operations for intercrop at early stage of sugarcane helped to produce more number of tiller populations. So that all of the four intercrop combination showed higher tiller over sole paired row cane. The highest tiller produced from the PRC + onion-mungbean ($134.3 \times 10^3 \text{ ha}^{-1}$) followed by the PRC + potato-mungbean ($128.7 \times 10^3 \text{ ha}^{-1}$). Lowest tiller of $94.05 \times 10^3 \text{ ha}^{-1}$ was recorded from sole paired row sugarcane. Among intercrop combinations mustard produced the lowest number of tiller which may be the effect of higher canopy structure of mustard at the early growth stage of cane.

Millable cane

Yadava (1993) observed that number of millable cane (stalk) per unit area of land at harvest is the most significant related factor to obtained higher yield in sugarcane. The number of highest millable cane $74.49 \times 10^3 \text{ ha}^{-1}$ was recorded from the PRC+onion-mungbean followed by the PRC+potato-mungbean ($68.25 \times 10^3 \text{ ha}^{-1}$) and the lowest $58.99 \times 10^3 \text{ ha}^{-1}$ was found from PRC+mustard-mungbean. Adverse effects of intercropping mustard on tiller and millable cane production have also been observed by Nankar (1990) and Ahmed (2007).

Table 1: Yield and yield components of sugarcane with different intercrops

Treatments	No. of Tiller (10^3 ha^{-1})	Millable cane (10^3 ha^{-1})	Yield of cane (TCH)	Intercrops yield (tha^{-1})		Adjusted Cane yield (TCH)
				1 st Intercrop	2 nd Intercrop	
T ₀ = Paired row cane	94.05 e	63.74 bc	110.5 b	-	-	110.5
T ₁ = PRC+Potato- Mungbean	128.7 b	68.25 b	122.8 a	10.5	0.58	210.74
T ₂ = PRC+Onion- Mungbean	134.3 a	74.49 a	121.6 a	4.2	0.57	189.7
T ₃ = PRC+Garlic- Mungbean	122.1 c	64.53 bc	103.2 bc	1.2	0.57	140
T ₄ = PRC+ Mustard- Mungbean	110.2 d	58.99 c	98.16 c	0.44	0.59	120.11
CV%	1.86	4.28	4.12	-	-	-
LSD	4.13	5.32	8.62	-	-	-

Market price of different commodities

Name of Crop	Price (Tk/kg)	Name of Crop	Price (Tk/kg)
Sugarcane	1.61	Garlic	28
Potato	11	Mustard	20
Onion	20	Mungbean	45

Yield of cane

Highest cane yield obtained from PRC+potato-mungbean (122.8 t ha^{-1}) which was statistically similar with PRC+onion-mungbean (121.6 t ha^{-1}) and the lowest yield was found in PRC+mustard-mungbean (98.16 t ha^{-1}). Among all intercrops, potato was proven to be the ideal intercrop for sugarcane. Increased cane yield with potato intercropping has also been reported by Ahmed *et al.* (2007) and Imam *et al.* (1982).

Yield of intercrop

The overall yield performance of the first intercrops (potato, onion, garlic and mustard) was found moderately satisfactory (Table 1). Among all intercrops, potato gave the most satisfactory yield (10.50 t ha^{-1}). The summer mungbean also performed better yield response as second intercrop for all of the combinations.

Adjusted cane yield

Adjusted cane yield is an important parameter for determining the total yield potentials of intercropped plot over the sole cane plot (Alam *et al.* 2000). From the table 1, the highest significant adjusted cane yield of 210.74 t ha^{-1} was obtained from the PRC + Potato- Mungbean combination followed by 189.7 t ha^{-1} from the PRC + Onion- Mungbean while the lowest of 110.5 t ha^{-1} was from the sole paired row sugarcane. Ahmed *et al.* (2007) reported that the highest adjusted cane yield was recorded from Paired row cane + Potato- Mungbean combination. Maximum increase of adjusted yield over only planted cane was 90.7% obtained from PRC + Potato- Mungbean combination.

Brix (%)

Higher brix % of any variety is an indication to produce higher goor or sugar. There was a statistically insignificant among the treatment combinations about brix percentages. However, the highest brix 19.33% was recorded from PRC+Mustard+ Mungbean followed by sole sugarcane (19.0%) while the lowest (18.33%) was obtained from PRC+Potato+Mungbean (Figure 1). It reveals that intercropping does not or least affects the brix% as well as sugar and goor production. Intercropping showed no significant effect on brix% of cane also found by Kashem *et al.* (2007) and Hossain *et al.* (2004).

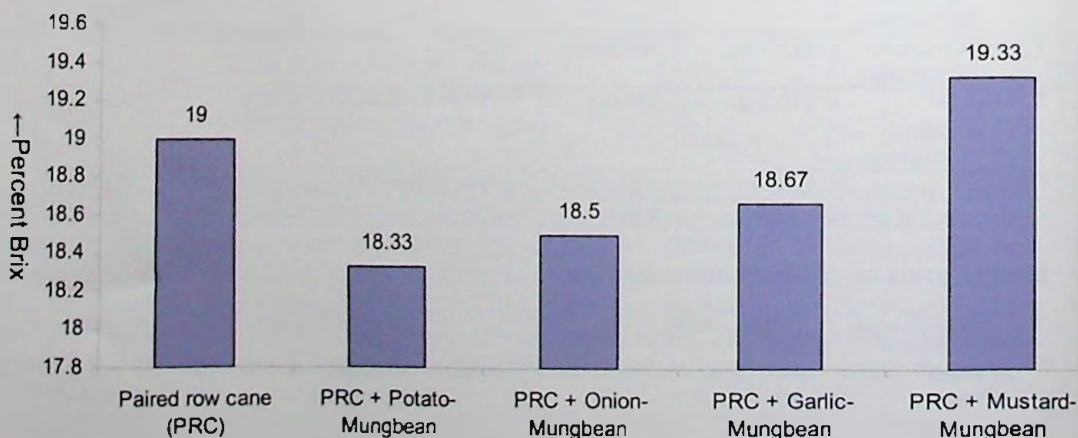


Figure 1. Brix (%) of sugarcane and different intercrop combination

Table 2. Cost and return for sugarcane with different intercrop combination

Treatments	Total Cost of Production (Tk)	Gross Return (Tk)	Gross Margin (Tk)	BCR
T ₀ = Paired row cane	89291	177905	88614	0.99
T ₁ = PRC + Potato-Mungbean	118791	339291	220500	1.86
T ₂ = PRC + Onion-Mungbean	114886	305417	190531	1.66
T ₃ = PRC + Garlic-Mungbean	113286	225400	112114	0.99
T ₄ = PRC + Mustard-Mungbean	100291	193377	93086	0.93

Economics

Table 2 shows the economic analysis of the experiment for paired row sugarcane together with different intercrop combinations. The highest (Tk. 339291) gross return per hectare was recorded from PRC+potato+mungbean followed by PRC+onion+mungbean (Tk. 305417) and the lowest (Tk. 177905) was from sole sugarcane. In case of gross margin same trend was observed. The highest benefit cost ratio (BCR) of 1.86 was recorded from PRC+potato+mungbean followed by PRC+onion+mungbean (1.66), while the lowest BCR of 0.93 was from PRC+mustard+mungbean. PRC+potato+mungbean showed the highest adjusted cane yield, gross return, gross margin and maximum benefit cost ratio followed by PRC+onion+mungbean and PRC+garlic+mungbean. Ahmed *et al.* (2007) also found Paired row cane + Potato- Mungbean combination as best intercrop combination.

From the present findings it might be concluded that substantial yield improvement and higher economic return may be achieved by replacing the local traditional practices of sugarcane cultivation in Madhupur Tract soils of Bangladesh. PRC+potato+mungbean be the most profitable intercrop combination followed by PRC+onion+mungbean and PRC+garlic+mungbean for this area.

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