

Productivity of Sugarcane with Some Winter Crops in Single Row System

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ABSTRACT

An experiment was conducted in farmers' field at Ishurdi, Pabna, Bangladesh to study the productivity of sugarcane and some winter crops as intercrop with single row system during 2012-2013 cropping season. Six winter crops viz., Onion, Potato, Tomato, Lentil, Carrot and Mustard were tested as intercrop maintaining the control (single row cane only). The results revealed that the higher number of tiller ($135.3 \times 10^3 \text{ ha}^{-1}$), millable cane ($83.00 \times 10^3 \text{ ha}^{-1}$), cane yield (86.33 tha^{-1}) and adjusted cane yield (130.93 tha^{-1}) were found from potato followed by onion intercropped with single row sugarcane but reverse result was found from mustard intercropping combination due to negative effect on cane yield. In economic point of view, the highest gross return (2,81,500 Tk. ha^{-1}), gross margin (1,66,500 Tk. ha^{-1}) and BCR (2.44) was recorded in potato intercropped with sugarcane followed by onion (BCR 2.41). The lowest economic benefit (BCR 1.95) was recorded from mustard intercropped with sugarcane. So, potato and onion intercropped with single row sugarcane were found economically superior compare to other intercropping combinations. The result indicated that potato and onion intercropping with sugarcane might be recommended for large scale cultivation for obtaining better economic return.

Key words: Productivity, intercropping, single row system, tiller, sugarcane

INTRODUCTION

Intercropping is an excellent technique to increase total yield, higher monetary benefit, greater resource utilization and fulfill the diversified need of the farmers. As sugarcane is a long duration crop grown in considerable wide row spacing. So, intercropping with sugarcane is very economic (Kabir, 1988 and Ali *et al.*, 1989). Growth of sugarcane for the first 12 weeks is slow and this crop does not require first earthing up until 12-16 weeks after planting. To take the advantage of the slow initial growth and less lateral spread across the vacant space between rows of sugarcane, one or two crops can be grown simultaneously with sugarcane (Hossain *et al.*, 1995). In Bangladesh, only 15 to 20 percent areas are intercropped while in Mauritius, about 70-77 percent cane areas are intercropped with mainly potato and tomato (Imam, 1990 and Anon., 1986).

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Successful intercropping of various crops with sugarcane has been reported by many researchers (Rathi *et al.*, 1974; Behli and Narwal, 1977; Imam *et al.*, 1990; Alam *et al.*, 2007 and Alam *et al.*, 2008). Dwarf and semi dwarf types of crops could be grown as intercrop. In Bangladesh situation, potato, onion, garlic and cabbage were identified as most profitable intercrops with sugarcane under irrigated condition, which might help to get an interim benefit for the poor farmers (Matin *et al.*, 2001 and Alam, 1999). In an intercrop community, the individual plant of one crop exposed to both intra and inter-specific competition although causing a reduction in individual yield but total productivity per unit area increases (Gani and Paul, 2005). For sustainable sugarcane cultivation and obtaining maximum benefit from sugarcane field intercrops should be cultivated. In view of above consideration an experiment was designed to find out the performance of different winter crops as intercrop with single row sugarcane at farmers field.

MATERIALS AND METHODS

The experiment was conducted in farmers' field at Muladuli, Ishurdi, Pabna, Bangladesh during 2012-13 cropping season. The site represents High Ganges River Floodplain under Agro-Ecological Zone-11 with medium high land of typical sandy loam soil having pH 7.6. The experiment was laid out following randomized complete block design with three replications. The unit plot size was 10m × 8m. The treatments of the experiment were as follows:

- T₁: Single row cane (SRC) only
- T₂: SRC + Onion
- T₃: SRC + Potato
- T₄: SRC + Tomato
- T₅: SRC + Lentil
- T₆: SRC + Carrot
- T₇: SRC+ Mustard

Two budded setts of sugarcane variety Isd 39 were planted on November, 2012 following end to end method in single row system i.e. 100 cm distance between two rows. Pest management and necessary intercultural operations like weeding, mulching, gap filling, irrigation, earthing up, tying etc. were done as and when required. Fertilizers for sugarcane and intercrops were applied separately according to the recommendation of Bangladesh Sugarcane Research Institute. Data were recorded on tiller population, millable cane, yield, brix%, intercrops yield. Cane equivalent yield of intercrops and the adjusted cane yield were also calculated. Total production cost, gross return, gross margin and benefit cost ratio were calculated for economic analysis of different intercropping with single row cane. The collected data were analyzed by using Statistic-10 software and the significance of the mean differences was adjudged by Duncan's Multiple Range Test with 5% level of probability.



A



B

Figure 1. Pictures showing potato (A) and onion (B) intercropped with single row sugarcane.

RESULTS AND DISCUSSION

Number of tiller ('000 ha⁻¹)

The results shown in Table 1 revealed that the highest ($136.0 \times 10^3 \text{ ha}^{-1}$) number of tillers was found in treatment T₁ (single row cane only) followed by T₃ ($135.3 \times 10^3 \text{ ha}^{-1}$) where potato was intercropped with sugarcane. The lowest ($115.7 \times 10^3 \text{ ha}^{-1}$) number of tillers was found in the treatment T₇ where mustard was intercropped with single row sugarcane.

Number of Millable cane ('000 ha⁻¹)

The millable cane was higher in the treatment T₃ ($83.00 \times 10^3 \text{ ha}^{-1}$) where potato was intercropped with single row sugarcane which was statistically similar with the treatment T₁ (SRC only) and T₄ (SRC + tomato). The lowest number of millable cane ($74.33 \times 10^3 \text{ ha}^{-1}$) was found in the treatment T₇ where mustard was intercropped with single row sugarcane (Table 1). Mustard intercropped with single row sugarcane negatively affected on tiller as well as millable cane production of sugarcane. Ahmed *et al.* (2007) reported the adverse effects of mustard intercrop on tiller, millable cane and cane yield with single row sugarcane.

Cane and intercrops yield (tha⁻¹)

The highest (86.33 tha⁻¹) cane yield was found in potato intercropping with sugarcane combination which was statistically similar with tomato (85.33 tha⁻¹), SRC only (83.67 tha⁻¹) and onion (82.67 tha⁻¹) intercropping combination with single row sugarcane (Table 1). The lowest yield was found in T₇ (76.67 tha⁻¹) where mustard was intercropped with sugarcane. Similar results were reported by Gani *et al.* (2000); Al Azad and Alam (2004). The overall yield performance of the intercrops (onion, potato, lentil, carrot and mustard) was found satisfactory. Among the intercrops tomato gave the highest yield (10.99 tha⁻¹) followed by potato (10.16 tha⁻¹). This may be due to better resource utilization by the intercrops.

Adjusted cane yield (tha⁻¹)

From the table 1 by adjusting intercrop yield with sugarcane the highest (130.93 tha⁻¹) adjusted cane yield was found in potato intercropping combination which was statistically similar with onion intercropping combination (129.02 tha⁻¹) with single row sugarcane. Among all intercropping combinations the lowest (97.62 tha⁻¹) was found in the treatment where mustard was intercropped with sugarcane. Mustard badly affects the yield of sugarcane by exhausting the soil moisture and nutrients. Al Azad and Alam (2004) reported that adjusted yield was higher when potato and onion intercropped with sugarcane and reverse result was found in case of mustard intercropping.

Brix percent

The brix % of cane among different intercrops combinations was found non-significant in this experiment (Table 1). Intercropping has no adverse effect on sugar content (brix %). The highest (22.0 %) brix % was found in T₁ (single row cane only) followed by T₆ (SRC + carrot) treatment (21.43 %). Islam *et al.* (2013) noted that there is no significant effect of intercropping on brix % of sugarcane.

Table 1. Number of tillers and millable cane, cane yield, brix%, intercrops yield, cane equivalent yield of intercrops and adjusted cane yield of different intercropping practices with single row sugarcane at farmer's field

Treatment combinations	Tillers ($\times 10^3 \text{ ha}^{-1}$)	Millable cane ($\times 10^3 \text{ ha}^{-1}$)	Cane yield (tha^{-1})	Brix %	Intercrop yield (tha^{-1})	Cane equivalent yield of intercrops (tha^{-1})	Adjusted cane yield (tha^{-1})
T ₁ : Single row cane (SRC) only	136.0 a	81.67 ab	83.67 ab	22.0	-	-	83.67 f
T ₂ : SRC + Onion	130.3 c	80.00 bc	82.67 ab	20.33	6.50	45.35	129.02 a
T ₃ : SRC + Potato	135.3 ab	83.00 a	86.33 a	20.50	10.16	47.26	130.93 a
T ₄ : SRC + Tomato	131.0 c	80.67 a-c	85.33 ab	19.25	10.99	40.89	124.56 b
T ₅ : SRC + Lentil	127.0 c	79.33 bc	81.00 b	20.45	0.76	24.75	108.41 d
T ₆ : SRC + Carrot	131.0 bc	78.67 c	81.33 b	21.43	8.63	32.11	115.78 c
T ₇ : SRC + Mustard	115.7 d	74.33 d	76.67 c	20.28	1.00	13.95	97.62 e
LSD (0.05)	4.214	2.580	4.340	NS	-	-	6.682

Figures accompanied by the same letters are not significantly different at 5% level

Price: Sugarcane: 2150 Tk.t⁻¹; Onion: 15 Tk.kg⁻¹; Potato: 10 Tk.kg⁻¹; Tomato: 8 Tk.kg⁻¹; Lentil: 70 Tk.kg⁻¹; Carrot: 8 Tk.kg⁻¹ and Mustard: 30 Tk.kg⁻¹.

Economic analysis

Economic performance of different intercropping combination is presented in table 2. Results revealed that the highest gross return (2,81,500 Tk. ha⁻¹), gross margin (1,66,500 Tk. ha⁻¹) and BCR (2.44) was recorded from T₃ (SRC + Potato) followed by the treatment T₂ (SRC + Onion) where gross return (2,77,393 Tk. ha⁻¹), gross margin (1,62,393 Tk. ha⁻¹) and BCR (2.41). The lowest economic return (BCR 1.95) was recorded from T₇ (SRC + Mustard) followed (BCR 2.04) by T₁ (single row cane only). So, potato and onion intercropped with single row sugarcane were found economically superior to other intercropping combinations. All intercropping combinations were found economically profitable compare to control (single row cane only) except mustard intercropped with single row sugarcane. Khatun (1999) reported that production of sugarcane with intercrops is more profitable than sole sugarcane production and sugarcane with potato is the most profitable intercropping practice. Al Azad and Alam (2004) also stated that sugarcane with potato and onion combinations were profitable in respect of economic profitability.

Table 2. Economic analysis of different intercropping combinations with single row sugarcane

Treatments	Total cost (Tk. ha ⁻¹)	Gross return (Tk. ha ⁻¹)	Gross margin (Tk. ha ⁻¹)	Benefit cost ratio (BCR)
T ₁ : Single row cane (SRC) only	88,000	1,79,890	91,890	2.04
T ₂ : SRC + Onion	1,15,000	2,77,393	1,62,393	2.41
T ₃ : SRC + Potato	1,15,000	2,81,500	1,66,500	2.44
T ₄ : SRC + Tomato	1,15,000	2,67,805	1,52,805	2.33
T ₅ : SRC + Lentil	1,10,000	2,33,082	1,23,082	2.11
T ₆ : SRC + Carrot	1,12,000	2,48,927	1,36,927	2.22
T ₇ : SRC + Mustard	1,08,000	2,09,883	1,01,883	1.95

The overall results suggest that growing of different winter crops like potato, onion, tomato, carrot as intercrop with single row sugarcane make more profit from same unit of land and time than sole sugarcane cultivation except mustard. Among all intercropping combinations potato and onion showed better performance compare to others in respect of adjusted cane yield and economic return.

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