

Performance and Profitability of Intercrops with Sugarcane in Some Non-Mill Zone Areas of Bangladesh

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ABSTRACT

An experiment with sugarcane and four intercrops (potato, onion, mustard and lentil) was conducted at Seraganj, Tangail and Madaripur during 1999-2000 planting season to assess the yield and profitability. The significantly highest cane yield of 114.50 t ha^{-1} was obtained from sugarcane + potato followed by sugarcane + onion (112.89 t ha^{-1}) than sole crop yield of 98.11 t ha^{-1} . These two combinations were significantly higher than the yield of the rest intercrop combinations. The later two combinations were identical. In case of adjusted yield, 152.18 ha^{-1} was received from sugarcane + potato, was followed by sugarcane + onion (146.13 ha^{-1}), sugarcane + lentil (115.71 ha^{-1}) and sugarcane + mustard (108.15 ha^{-1}). Yield per hectare of intercrops viz., potato, onion, lentil and mustard was 4.71 t ha^{-1} , 2.77 t ha^{-1} , 0.75 t ha^{-1} and 0.62 t ha^{-1} respectively. Maximum net return of Tk. 90,828 ha^{-1} was earned from sugarcane + potato and was followed by sugarcane + onion amounting Tk.80,405 ha^{-1} . Sugarcane + lentil and sugarcane + mustard combinations gave relatively low net return of Tk.74, 153 and Tk. 66,355 respectively, but was higher than the net return of Tk.60,303 earned from sole cane crop. The highest benefit cost ratio (2.78:1.00) was obtained from sugarcane + lentil combination followed by sole cane crop (2.59:1.00) and sugarcane + mustard (2.58:1.00) combination.

Key words: Sugarcane,intercrop, potato, onion, mustard, lentil, profitability.

INTRODUCTION

Sugarcane being a long duration crop occupies the land for 12-15 months, but during early period of growth in winter months do not require total available resources such as light, moisture and nutrients, as such there remain scope to grow some other crops in the cane fields in between two rows of cane. In Bangladesh a number of vegetables, spices and oil seed crops of short duration grow in winter. So, to intensify land use, increases yield and profitability of farmers, growing intercrop or mixed crop with sugarcane is in practice. Out of a good number of intercrops, mustard, potato and lentil occupy 88% (48% mixed, 40% methodical) of the total intercropped area. Around 1.00 lac ha of cane land is planted early in the season which is potential for growing intercrops. But only 20% of the cane planted area is covered by intercrops (Haque and Ali, 1984). During the first 3-4 months there is very slow growth of cane, whereas by that time the intercrops may reach at mature stage. Intercropping in vacant space of sugarcane crop in early stages of growth helps increased utilization of solar energy and at the end of 70 days period, proportion of diffused solar radiation was 82% in a crop of sugarcane alone while intercrop of mung, cowpea and castor reduced this value to 60, 57 and 48% respectively, indicating a better utilization of solar energy (Hossain, 1984). To achieve a good yield of

sugarcane, planting should be done within November (Hoey and Hossain, 1981). For intercropping cane should be planted early and intercrops must be grown in between two cane rows but the benefits of increased yield due to early planting was dissipated by mixture with broadcast mustard and pulse crops (Ali, 1983). Mustard occupies the highest intercropped area, because it involves minimum labour and inputs. The experiment was undertaken to study the performance of widely grown intercrops namely potato, mustard, onion, lentil in Serajganj, Tangail and Madaripur districts, the major cane growing areas of non-millzone.

MATERIALS AND METHODS

During the second week of November 1999, the experiment was set up in all the three locations i.e., Serajganj, Tangail and Madaripur in AEZ 4, 9 & 12 respectively covering non-mill zones where the cane is used for making gur. Each location was treated as a replication. The main plot measuring 1300 sq meter was divided into 5 sub-plots. The whole plot was planted with Isd 16 variety of sugarcane in the trenches of 1 meter distance by end to end method and in four sub-plots intercrops i.e., potato, mustard, onion and lentil was planted. Fertilizers were applied to cane as recommended for respective AEZ in full, but for intererops half of the dose recommended for sole crop was added. All recommended cultural practices and plant protection measures were undertaken. The cane was harvested during November 2000 and the intercrops at mature stages.

Data on yield of intercrops, germination, tillering, millable cane and yield of cane were recorded. Besides cultivation cost of intercrops and the cane crop were recorded. The cost incurred and the benefit derived from each intercrop and combinations were taken into consideration. The adjusted yield of sugarcane was calculated by adding sugarcane equivalent yield of the respective intercrop with the yield of cane of the sub plot. Statistical analysis was done to differentiate the yield and benefits from each intercrops. Farmers reaction regarding growing of the intercrops and the constraints encountered in practicing each crop combination were taken into consideration.

RESULTS AND DISCUSSION

The germination of cane ranged from 41-48% in different plots. The highest germination of cane was recorded in potato intercropped plots followed by onion and the lowest in mustard (Table 1).

Table 1. Effect of intererops on yield and yield components of sugarcane.

Treatments	Germination (%)	Tillers ($\times 10^3 \text{ha}^{-1}$)	Millable cane ($\times 10^3 \text{ha}^{-1}$)	Yield (t ha^{-1})	Yield increase/decrease over sole cane (%)
Sugarcane + Potato	48	112.12	86.25	114.50 a	16.70
Sugarcane + Mustard	41	73.25	72.00	92.65 b	-5.56
Sugarcane + Onion	44	110.08	85.45	112.89 a	15.06
Sugarcane + Lentil	43	95.83	78.95	99.21 b	1.12
Sugarcane sole crop	44	106.75	81.35	98.11 b	-

Figures with same letter do not differ significantly at 5% level as per L.S.D. test.

The sub-plot planted with potato and onion were given additional ploughing for a fine tilth might have added some positive effect on germination. The highest number of tillers was recorded from sugarcane intercropped with potato ($112.12 \times 103 \text{ ha}^{-1}$) followed by onion intercropped one ($110.08 \times 103 \text{ ha}^{-1}$), and the lowest in mustard intercropped plots. Harvested millable cane was the highest ($86.25 \times 103 \text{ ha}^{-1}$) in sugarcane intercropped with potato and was identical with onion (Table 1) followed by sole cane crop.

Significantly higher cane yield of 114.50 t ha^{-1} was obtained from sugarcane + potato combination followed by 112.89 t ha^{-1} in sugarcane + onion and these two combinations were statistically identical. Trenbath (1974) stated that competition for light is minimized when the crops have different canopy arrangement, particularly when the tall crop has more erect habit and the shorter crop more horizontal leaf angle. Sugarcane and potato combination provides the above situation, which might offer higher yield of cane. Minimum adverse effect of potato on sugarcane shoot, emergence, tiller formation, millable cane and yield has been reported by Mathur 1963; Bose 1976 and Anon 1979. Potato induced greatest intercrop yield (4.71 t ha^{-1}) followed by onion (2.77 t ha^{-1}) and lentil (0.75 t ha^{-1}). The lowest yield was harvested from intercropped mustard. Sugarcane + potato produced the highest sugarcane equivalent yield (37.68 t ha^{-1}) followed by onion. Sugarcane + lentil, pure stand sugarcane and sugarcane + mustard combinations produced significantly low yields and were statistically identical. Kanwar (1975) observed cane yield reduction due to mustard intercropping by 2.3%, whereas a maximum reduction was 64.41% as observed by Anon (1965). Among the varieties, planting dwarf variety Tori-7 and only one row in between two sugarcane rows exerted minimum effect (Anon 1979, 1983). Although the yield of onion was 2.77 t ha^{-1} the market price was higher as such equivalent yield was higher and identical with that of potato. Higher yield of cane due to intercropping onion and garlic has been reported by Anon (1979) and Parashar et.al (1979). Verma *et.al* (1982) reported that all portion of cane plants intercropped with onion and garlic received some amount of light at 136 days when intercrop were at full growth stage. A lower rate of pest incidence has been reported in intercropped cane with onion and garlic (Tewari and Singh, 1982).

Regarding adjusted cane yield (Table 2) which led to ultimate higher income derived from sugarcane + potato intercrop combination was $152.18 \text{ (t ha}^{-1}\text{)}$ followed by onion $146.13 \text{ (t ha}^{-1}\text{)}$. Adjusted yield of lentil and mustard was 115.71 t ha^{-1} and $108.15 \text{ (t ha}^{-1}\text{)}$ respectively, which were higher than sole cane. Sugarcane + potato combination earned highest gross income of Tk. 1,52,180 followed by sugarcane + onion (Tk. 1,46,130), lentil and mustard. Sole sugarcane although yielded higher than mustard and very close to lentil the income due to combined harvest of these intercrops were higher than sole cane. One line of mustard increased a profit of 14% over sole cane (Anon., 1982). Rathe and Singh (1979) found that out of 17 places intercropping mustard was profitable in 13 places and net profit ranged from 1.64%-66.33%, single row mustard (Tori-7) between two rows of cane (90 cm) produced highest combined yield followed by pure stand cane.

Table 2. Yield of different Intercrops, their sugarcane equivalent yield and adjusted yield.

Treatments	Yields of intercrops (t ha ⁻¹)	Sugarcane equivalent yield (t ha ⁻¹)	Yield of cane (t ha ⁻¹)	Adjusted sugarcane yield (t ha ⁻¹)	Percent increase/decrease over sole cane
Sugarcane+Potato	4.71	37.68	114.50	15218	55.11
Sugarcane+Mustard	0.62	15.50	92.65	108.15	10.23
Sugarcane+Onion	2.77	33.24	112.89	146.13	48.94
Sugarcane+Lentil	0.75	16.50	99.21	115.71	17.94
Sugarcane sole crop	0.00	0.00	98.11	98.11	-

The cultivation cost for intercropped onion ranked highest incurring Tk 27,297 followed by potato. The high cost of onion seed might increase the cost of production. Lentil required less cultivation cost than mustard or any other crops tested. The highest net return of Tk.90,828 was earned from sugarcane + potato crops followed by sugarcane + onion (Tk. 80,405 ha⁻¹). Mustard intercropped sugarcane although yielded lower the net return was higher than sole cane crop. Sugarcane and lentil gave net return higher than mustard and sugarcane. Sugarcane + lentil produced benefit cost ratio of 2.78:1.00 being the highest among the combinations and was followed by sole cane crop and mustard intercropped cane. Onion although earned higher net return per unit area but it was the lowest in respect of benefit cost ratio (Table 3).

Table 3. Cost benefits of different Intercrops and sugarcane.

Treatments	Income (Tk.) Cane + Intercrop	Coist (Tk.) Cane + Intercrop	Net return (Tk.)	Profit over sole cane (Tk.)	Benefit cost ratio
Sugarcane + Potato	114500+37680 = 152180	38352+23000 = 61352	90828	30525	2.48:1.00
Sugarcane + Mustard	92650+15500 = 108150	37120+4675 = 41795	66355	6052	2.58:1.00
Sugarcane + Onion	112890+33240 = 146130	38428+27297 = 65725	80405	20102	2.22:1.00
Sugarcane + Lentil	99210+16500 = 115710	37676+3881 = 41557	74153	13850	2.78:1.00
Sugarcane sole crop	98110+0 = 98110	37807.45+0 = 37807.45	60303	-	2.59:1.00

From this experiment it can be concluded that potato intercropped appeared to be profitable in terms of net return and highest cane yield although it involved the second highest cost. Onion may be of second choice but again the cost of production is the highest. In cases of limited investment either lentil or dwarf type of mustard (Tori -7) can be selected.

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