

Trash Management and Green Manuring on Sugarcane Yield

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ABSTRACT

An experiment was conducted to study the effect of sugarcane trash removal, burning and incorporation of trashes followed by green manuring with cowpea on the yield of next sugarcane crop (Isd. 16) at SRTI farm during harvesting season 1984-85. Trash burying followed by green manuring (G.M.) prior to cane planting produced highest yield of cane (97.21 TCH) and sugar (10.01 TSH) which were indential to trash plough down. The increase in yield was significant to rest of the treatments. Green manuring with cowpea and trash burning contributed 11.34 TCH and 4.98 TSH respectively. Trash burning and green manuring together contributed 16.32 TCH and 1.35 TSH respectively over trash removal and without green manuring.

INTRODUCTION

The sugarcane growing soils of Bangladesh are low in organic matter by origin and are being constantly depleted due to exhaustive continuous cropping in one hand and apothetic attitude towards addition of organic matter (Anon, 1976). Continuous cropping with the use of unbalanced fertilizer, the organic matter content of the crop land is depleted to a considerable extent resulting hardening of the soil, acute shortage of nitrogen, sulphur and zinc (Anon, 1984).

With the introduction of mineral fertilizers and their quick effect on plant growth the farmers reduced the use of organic manures (Rote *et. al.*, 1981). In the scarcity of fertilizer and rise in prices, maximum possible use of plant waste is inevitable. Nutrients present in crop residues and organic materials can be recycled either by composting or direct incorporation in soils (Gaur and Mukherjee, 1979). There is an immense potentiality to supply plant nutrients through incorporation of sugarcane trashes for crop production.

Cane trash at harvest is estimated to be 8-12 % of cane. The cane trash and roots left behind in soil are 3-5 tons/acre (Parthasarathi, 1972). The trashes available per hectare of land are about 4 tons and such huge quantity potentially available for composting as manure is wasted probably because of difficulty in decomposition as it takes more than 10 months to decompose (Dewan, M.L. and Dongale, J.H. 1974). The sugarcane trash is either burnt in situ or used for other purposes viz. thatching of huts, as fuel in jaggery and for house holds (Shinde and Rote, 1982).

Liming followed by green manuring along with the application of chemical fertilizer increased cane yield significantly in sugar mills farm. The fertilizer policy of Bangladesh 1974, suggested to undertake Government supported programme for green manuring

and liming to improve the fertility status by increasing organic matter content and nutrient holding capacity of the soils (Anon, 1974). The Agro Service International of USA (Anon, 1983) analysed the SRTI farm soil and recorded the soil PH 7.8 and 1.1 % organic matter. The N & P contents were 12 and 5 mg/100 mg respectively which are very low compared to their requirement for satisfactory sugarcane production. This study was therefore, undertaken to estimate the effect of trash removal, trash burning and trash ploughed down and subsequent green manuring on the yield of sugarcane in the following season.

MATERIALS AND METHODS

The experiment was set-up at SRTI farm during cropping season 1983-84 in RCB design with six treatments and four replications. The treatments were :

Trash burning — sugarcane trashes were burned after harvest of cane.

Trash removal — all trashes were collected and removed from the field after harvest of cane (control plot).

Trash ploughed down — sugarcane trashes were ploughed down by tractor plough.

Trash burning + G.M. (cowpea) — green manuring crops were grown after burning of trashes.

Trash removal + G.M. — after harvesting of sugarcane all trashes were collected & removed from the field and then green manuring crop was grown and ploughed down at an optimum stage.

Trash ploughed down + G.M. — sugarcane trashes were ploughed down and green manuring was practised.

Cowpea (*Vigna unguiculata*) was grown as green manuring crop. The crop was broadcasted in April and was ploughed down at its 50 days of age. Three eye budded sets of the variety Isd. 16 were planted following end to end method with 1.0 m row spacing at the plot size of 18m x 14m. Fertilizers were applied at the rate of 125 kg N, 125 kg P_2O_5 and 110 kg K_2O /ha. Full doses of TSP, $\frac{1}{3}$ MP and $\frac{1}{3}$ urea were applied in trenches at planting time. The rest of MP and urea were applied in two equal split at early growth stage and tillering of sugarcane. Intercultural operations were done as and when required.

The crop was grown under rainfed condition and harvested in mid January, 1985 (15 month crop). Data on germination, tillering, number of millable canes, yield of cane and sugar and recovery per cent were recorded and statistically analysed.

RESULTS AND DISCUSSION

The Table 1 shows the yield and yield contributing factors of sugarcane as influenced by various treatments. Significantly higher germination was obtained in the treatment where trash was removed after harvesting of sugarcane. This indicates that the incorporation of trashes into soil and green manuring have some adverse effect on germination which however needs further investigation.

There was no significant difference in tiller production among different treatments in the present investigation. Higher number of tillers were produced in trash ploughed down + green manuring treatment (137.22 thousand/ha).

Table 1. Yield contributing factors as influenced by different trash treatments and green manuring.

Treatments	Germination (%)	No. of tillers in May ($\times 10^3/\text{ha}$)	No. of millable cane/($\times 10^3/\text{ha}$)	Yield TCH	Recoverable sucrose (%)	Yield TSH
Trash burying	41.52 a*	131.12 a	78.67 ab	86.87. ab	10.40 a	8.93 b
Trash removal	46.70 c	120.65 a	74.79 a	80.89 a	10.71 a	8.65 b
Trash ploughed down.	44.25 b	128.7 a	77.22 a	81.47 a	10.81 a	8.81 b
Mean	44.15	126.8	76.98	82.74		
Trash burning +	42.37 ab	130.72 a	78.43 ab	97.21 c	10.30 a	10.01 a
Trash removal + GM	42.77 ab	132.0 a	79.20 ab	89.77 b	10.40 a	9.33 ab
Trash Ploughed down + GM	42.72 ab	137.22 a	82.33 b	91.03 bc	10.94 a	9.96 a
Mean	42.62	133.3	79.99	92.67		

*Figures in columns accompanied by similar letters do not differ significantly at 0.05 level of probability.

Green manuring with cowpea before planting cane produced 6,500 higher tiller/ha compared to trash treatments (only trash burying, trash ploughed down or trash removal.) Among the trash treatments trash burning produced 10,470 and 2,420 numbers higher tiller/ha over trash removal and trash ploughed down treatments respectively (Table 1).

Significantly higher millable canes were obtained when trash was ploughed down followed by green manuring (G.M.) treatment (82.33 thousand/ha). Trash burning, trash burning + G.M. and trash removal + G.M. produced identical number of millable canes and were superior to rest of the treatments (Table 1). Green manuring produced 3000 number higher millable canes/ha over trash treatments.

The yield of cane in trash burning + G.M. was identical to trash ploughed down + G.M. Among trash treatments, trash burning produced higher yield of 4.98 TCH over trash ploughed down and trash removal respectively (Table 2).

This finding is similar to that of Shaw & McConnel (1974). They suggested that, for areas receiving heavy rain from mid May onward, the trash should be removed by burning.

Trash ploughed down could not show any appreciable yield increase over other treatments, rather it produced 4.4 tons less yield/ha compared to trash burying (Table 1). This result is in agreement with that of Parthasarathy (1972). He noted that when trash is incorporated in soil there is a possibility of soil N being utilized by decomposing bacteria resulting possible deficiencies in N supply to the growing crops. Trash burning may also be advantageous in destroying weed seed, pest and disease organisms above soil and also under the soil to a considerable depth.

Table 2. Comparative performance of trash management and green manuring on cane and sugar yield

Trash Treatment	Tillers ($\times 10^3/\text{ha}$)			Millable cane ($\times 10^3/\text{ha}$)					
	GM ₀	GM ₁	Mean	GM ₀	GM ₁	Mean			
Trash burning	131.12	130.72	130.92	78.67	78.43	78.55			
Trash removal	120.65	132.00	126.33	74.79	79.20	77.0			
Trash ploughed down.	128.70	137.22	132.96	77.22	82.33	79.78			
Mean	-	-	-	76.89	79.99	-			
LSD	For green manure			1.75					
values	For Trash			3.06					
Yield/TCH						Yield TSH			
GM ₀	Additional yield due to trash management over trash removal	GM ₁	Additional yield due to G.M.	Mean	Additional Yield due to trash & G.M.	GM ₀	GM ₁	Additional yield due to G.M.	Mean
85.87	4.48	97.21	11.34	91.54	16.32	8.96	10.0	1.04	9.48
80.89	-	89.77	8.88	85.33	8.88	8.65	9.33	0.68	8.99
81.74	0.58	91.03	9.56	86.25	10.14	9.81	9.96	0.15	9.39
82.74	-	92.62	9.93	-	-	8.80	9.77	1.17	-
2.67						0.53			
4.63									

Table 1 and 2 show that green manuring by cowpea before sugarcane planting had pronounced effect on cane yield compared to trash treatments. About 11.34 TCH was obtained due to the effect of green manuring. The combined benefit of cane trash burning and green manuring prior to sugarcane planting was 16.32 TCH compared to trash removal treatment (table 2).

Different trash treatments and green manuring did not show significant effect on sugar recovery. However, highest percentage of recoverable sucrose was obtained from trash ploughed down+G.M. (10.94 %) followed by trash ploughed down treatment (10.81 %) indicating that trash incorporation with the soil has some beneficial effect on the recovery % of sugarcane. The results are in partial agreement with Gosnell and Lonsdale (1977) who reported that retaning of trash produced increased yield of cane and sugar/ha because of moisture conservation.

Highest yield of sugar was obtained from trash burning+G.M. and was indential to trash ploughed down+G.M. The increased yield was significant to rest of the treatments.

Green manuring alone contributed 1.17 ton more sugar than that of trash management (Table 2).

Green manuring with cowpea prior to cane planting may give benefit equivalent to 9.93 TCH. Trash burning of the preceeding cane may have advantageous effect on the following sugarcane equivalent to 4.98 ton additional cane yield. Incorporation of sugarcane trash have shown very little positive effect on cane possibly because of utilization of soil N by decomposing bacteria.

Trash burning of preceding cane followed by green manuring with cowpea prior to cane planting may be recommended for obtaining high yield of sugarcane and sugar.

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