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Economics of Intercropping Leguminous Crops with Sugarcane

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ABSTRACT

An experiment was conducted at the Sugarcane Research and Training Institute during 1980-81 season with Lentil, Gram, Kheshari, Sunhemp, Groundnut, Gardenpea and Matikalai as intercrops. The adjusted yield of cane + intercrop shows that sugarcane + sunhemp produced significantly highest yield (76.90 TCH) followed by sugarcane + kheshari (76.13 TCH) and sugarcane + lentil (74.53 TCH). The profit loss account of cane + leguminous intercrops shows an additional income of Tk. 3,116.77 earned by sugarcane + kheshari over sugarcane as a single crop. This was followed by sugarcane + sunhemp (Tk. 3,095.22) and sugarcane + lentil (Tk. 2,282.88). The results also showed that additional yield of cane was obtained with sunhemp, matikalai and kheshari intercropping indicating beneficial effect of the above legumes on sugarcane.

INTRODUCTION

The farmers of sugarcane growing regions of Bangladesh are confronted with the problem of choosing wintercrops including sugarcane that demands similar type of land and planting period. Generally the farmers grow wintercrops first, followed by sugarcane plantation resulting in poor yield of sugarcane (Razzaque *et. al.*, 1978). Kanwar (1975), suggested growing of intercrops with sugarcane to avoid competition between the crops.

Intercropping increases crop yield per unit area by intensifying the use of land. It does not only contribute to efforts in increasing the productivity but also increases the farmers income (Villarel, 1976). Crookston (1976) reported intercropping of peanuts, potato, rice and legumes with sugarcane. Ledesma and Villarico (1966) reports that, intercropping legumes with sugarcane was highly profitable and had no adverse effects on the growth and yield of sugarcane as long as the intercrops were fertilized. With the introduction of high yielding varieties of legumes and adoption of improved cultural practices, the intercropping of legumes has become even more profitable to day Inspite of the increases in cost of some inputs (Mercado *et. al.*

1976). Villarico and Ledesma (1969), reported that when legumes such as green gram, groundnut and soybean were intercropped, yield of sugarcane was not reduced and the investment on the inter crop was highly profitable.

Since almost all legumes are grown under rainfed condition in winter they may also be grown as intercrop with sugarcane in Bangladesh. The legume crops, if intercropped minimises labour cost for weed control (personal observation). A legume crop producing 8-25 tons G.M/ha adds about 60-90 kg of nitrogen when ploughed down (Anonymous, 1980).

The present work with the legumes was aimed at estimating and comparing the profitability of these crops grown as intercrop with sugarcane.

MATERIALS AND METHODS

The experiment was conducted at the Sugarcane Research and Training Institute (SRTI) during 1980-81 season. Isd-16 variety of sugarcane was planted following end to end method at a row spacing of one meter on 10th November, 1980. The experiment was laid out in RCB design with four replecations in 10 m x 10 m individual plot. The leguminous intercrops included in the treatments were : Lentil (*Lens esculenta L*), Gram (*Cicer arietinum L*), Kheshari (*Lathyrus sativus L*), Sunnhemp (*Crotoluria juncea L*), Groundnut (*Arachis hypogaea*) Gardenpea (*Pisum sativum* and Matikalai (*Phaseolus mungo* Var. *radiatus L*). Sugarcane as single crop was also grown and treated as control. One solid line of the above legume crop was sown in between two rows of sugarcane. The intercrops were sown immediately after planting sugarcane and additional fertilizers amounting to half the normal recommended doses of the individual crop were applied. All normal cultural practices were applied to both cane and intercrops and all intercrops were harvested in the last week of February except groundnut which was harvested in April, 1981. Sunnhemp and Matikalai were grown for green manuring and ploughed down with the soil in its flowering stage. Kheshari was used as fodder. A thorough spading was done after harvesting the intercrops and top dressing of fertilizers to cane were applied at the advent of 1st mansoon shower. The cane crop was harvested in January, 1982.

All relevent data were statistically analysed.

RESULTS AND DISCUSSION

The yield of cane, legume intercrops, converted yield, adjusted total yield and yield contributing parameters of sugarcane are shown in Table 1 and 2.

Among the crop combinations significantly highest yield of cane was obtained from cane + sunnhemp (76.90 TCH). This combination produced 10.73 ton higher cane per hectare (TCH) over only cane. The second highest yield of cane was obtained from cane + Matikalai (73.36 TCH). The legume crops which were ploughed down for green manuring and did not produce any direct yield (Sunnhemp, Matikalai) significantly increased yield of cane. These may be due to addition of sufficient organic matter to the soil which was immediately utilized by the growing cane plants apart from nitrogen supply

Table 1. Yield of cane and leguminous intercrops.

Treatments	Yield of intercrop (Mt/ha)	Yield of cane (TCH)	% of cane yield increase + /decrease (−) over control	Convertion of intercrops into cane yield (TCH)	Total adjusted yield cane+ Intercrop	(+) Increase or (−) decrease of combined yield ove control %
Sugarcane+lentil	0.44	66.17abc*	equal	8.36	74.53	12.63
,, +Gram	0.15	65.31ab	(—) 1.30	2.77	68.08	2.88
,, +Kheshari	11.64 (fodder)	71.44bc	(+) 7.96	4.69	76.13	15.05
,, +Sunhemp	9.74 (G.M.)	76.90c	(+)16.22	—	76.90	16.21
,, +Groundnut	0.20	63.68ab	(—) 3.77	10.25	73.93	11.72
,, +Gardenpea	0.54	58.71a	(—)11.28	3.56	62.27	(—) 5.90
,, +Matikalai	3.25 (G.M.)	73.36bc	(+)10.86	—	73.36	10.86
Sugarcane Alone (control)	—	66.17abc	—	—	66.17	—

* Figures in column bearing same letters do not differ significantly at 5% level of probability.

through the nodules of these crops. *Crotolaria* when sown in between two rows of newly planted sugarcane and incorporated to the soil in its 5-6 weeks age, sugarcane was claimed to be benefited (Anonymous, 1980).

Table 2. Cane production parameters as influenced by legume intercrops.

Treatments	Yield of cane (TCH)	Recoverable sucrose %	Ton sugar/ha (TSH)
Cane +Lentil	66.17 abc	12.32 a	3.30 abc
,, +Gram	65.31 ab	12.45 a	3.29 abc
,, +Kheshari	71.44 bc	12.53 a	3.62 bc
,, +Sunhemp	76.90 c	12.40 a	3.85 c
,, +G. Nut	63.68 ab	12.43 a	3.21 ab
,, +Garden Pea	58.71 a	12.51 a	2.98 a
,, +Matikalai	73.36 bc	12.32 a	3.44 bc
only cane (control)	66.17 abc	12.57 a	3.37 abc

* Figures in column bearing the same letters do not differ significantly at 5% level of probability.

The yield of cane was adversely affected when gardenpea, gram or groundnut was grown as intercrop (Table 2). This result agrees with that of Rathi and singh (1980) who explained smothering effect of intercrops to be the cause of reduced cane yield. The above intercrops remained in the field until April. The long duration of the crop in the field might have competed with sugarcane for moisture and mutrients that ultimately affected the cane yield.

It is evident from table 1 that, the combined adjusted yield of cane + legume crops were higher compared to only cane except gardenpea in varying proportions. Highest yield increases over only cane was obtained from cane + sunhemp (16.21%) which was followed by cane + kheshari (15.05%), groundnut (11.72%) and cane+ lentil (12.63%). This may be due to the fact that roots and stubbles of pulse legumes return to soil small quantities of organic matter rich in nitrogen. The pulse legumes leave the soil in a better physical condition and richer in nitrogen (Anonymous, 1981).

Regarding economics, highest net return (Tk. 20430.97/ha) and net profit (Tk. 3116.77/ha) was obtained from cane + kheshari (fooder) and cane + sunhemp (g.m.) was very close to it (Table 3). The combined income from cane + gram and cane + gardenpea were less than that of only cane causing a loss of Tk· 251.28 and Tk. 402.48 respectively. All other combinations earned profit in varying proportions.

Table 3. Economic analysis of legume intercropping in sugarcane.

Treatment	Total adjusted yield (cane+ Intercrop) (TCH)	Total cost of cultivation (Cane+Inter-crop) Tk./ha	Total return Tk./ha.	Net return over investment Tk./ha	Profit (+) Loss (—) over only cane Tk./ha.
Cane+Lentil	74.53	10,342.25	29,939.33	19,597.08	(+) 2,282.88
,, +Gram	68.08	10,303.65	27,366.57	17,062.92	(—) 251.28
,, +Kheshari	76.13	10,358.01	30,588.95	20,430.97	(+) 3,116.77
,, +Sunhemp	76.90	10,502.79	30,912.21	20,409.42	(+) 3,095.22
,, +Groundnut	73.93	10,698.66	29,717.55	19,018.89	(+) 1,704.69
,, +Gardenpea	62.27	10,186.65	27,098.37	16,911.72	(—) 402.48
,, +Matikali	73.37	10,361.97	29,492.32	19,130.36	(+) 1,816.16
,, Sugarcane alone (Control)	66.17	9,312.21	26,601.77	17,314.20	—

* Value of cane and legume crops calculated on the basis of prevailing market rate during 1981.

** Value of sugarcane Tk. 402/M ton.

The smothering effect of gram and gardenpea resulted in poor tillering, less millable cane production and ultimately less yield of cane compared to cane grown as pure stand (Table 3). On the other hand the yield of gram and gardenpea were very poor. Unexpected rainfall during flowering stage of gram and application of nitrogenous

fertilizers to cane may be the factors which caused heavy vegetative growth of the crops influencing smothering effect on cane and poor yield of the intercrops. Similar reasons were explained by Rathi and Singh (1980).

From the study it appears that intercroping of leguminous crops was found highly profitable compared to growing cane as pure stand except gardenpea and gram, Highest profit may be obtained if kheshari (fodder) or sunhemp (G.M.) are grown with sugarcane. Lentil, matikalai or groundnut are also profitable.

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