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Assessment of monetary advantage of intercropping in autumn planted sugarcane

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Abstract

Field experiment was conducted during rabi, 2017 at Regional Sugarcane and Rice Research Station- Rudrur, Nizamabad, Professor Jayashankar Telangana State Agricultural University, Telangana. Sugarcane variety 85R186 was intercropped with six different winter crops to identify most profitable intercrop. The experiment was conducted in randomized block design with three replications. The treatments comprised T1- sole sugarcane, T2 -SC + Coriander (leaf), T3- SC + Methi, T4 -SC + Cabbage, T5 -SC + Cauliflower, T6- SC + beetroot and T7 -Sugarcane + Wheat. Higher equivalent cane yield was recorded in Sugarcane + cauliflower (126.88) and Sugarcane + beetroot (126.26) & Sugarcane + cabbage (123.66) intercropping combination. Intercropping increased net returns significantly with Sugarcane + beetroot (Rs 2,60,695.00 ha-1), Sugarcane + cabbage (Rs 2,37,540.00 ha 1) & Sugarcane + cauliflower (Rs 2,29,820.00 ha-1) over sole sugarcane (Rs 144355.00 ha 1). Higher Monetary advantage index (MAI) value was obtained from sugarcane + beetroot (138171) & sugarcane + cabbage (136565) intercropping system.

Keywords: Number of millable canes, cane yield, cane equivalent yield, intercrops, economics

Introduction

India is the second largest producer of sugar after Brazil with a global share of 17% in 2014-15. Over five million farmers are involved in the cultivation of sugarcane in tropical and subtropical India, the two distinct agro-climatic regions of the crop in the country. Tropical region shares about 45% and 55% of the total sugarcane area and production in the country, respectively along with the average productivity of 70 t/ha (Anonymous 2015) [1]. Tropical India has even sunshine all through the year, well distributed rainfall and ideal conditions for good growth of the crop leading to high productivity. There had been considerable improvement in the productivity levels in the past, but they have more or less stagnated over the last two decades (Sundara 2011) [10]. Rapidly increasing population, increased demand for food, limited scope for extension of cultivation to new areas, diversified needs of small farmers for food and cash, etc. have necessitated the adoption of intercropping systems. In long duration crops like sugarcane, intercropping holds much promise. Due to slow establishment of sugarcane during the first 90-120 days, the greatest scope for complementary effect lies in the addition of annual intercrops to the temporal system to improve resource use efficiency in the early crop growth period (Gopaldasundaram and Kailasam 2003) [4]. The productivity of land could be enhanced substantially by growing intercrops in the space left between sugarcane rows. This uncovered area can be used for growing intercrops for efficient utilization of nutrients, moisture, space and solar energy, thereby increasing land use efficiency, reducing the production cost and making system more remunerative and sustainable. It is documented that intercropping in sugarcane with short duration crops is agronomically advantageous and could provide additional income (Khippal *et al.*, 2007) [5].

In Telangana state as against the normal area of 2,50,000 hectares during 2018 only 1,20,000 was grown (Department of Agriculture). The decline in area under cultivation of sugarcane is mainly due to low monetary benefit experienced by farmers for the past decade. Farmers of the state prefer to grow Eksali crop and sowing commences from December and extended upto February. There fore to attract farmers towards sugarcane cultivation present study was initiated to identify the profitable winter loving intercrops for autumn planted cane.

Materials and Methods

Field experiment was conducted rabi, 2017 at Regional Sugarcane and Rice Research Station- Rudrur, Nizamabad, Professor Jayashankar Telangana State Agricultural University, Telangana. Autumn planted sugarcane was evaluated for interim income and profit with six different winter crops as inter crops. The experiment was laid in randomized block design with three replications. The treatments comprised T1- sole sugarcane, T2 -SC + Coriander (leaf), T3- SC + Methi, T4 -SC + Cabbage, T5 -SC + Cauliflower, T6- SC + beetroot and T7 - Sugarcane + Wheat. Sugarcane variety 85R186 which is predominant in Telangana state was sown at wider spacing of 150 cm between the rows and intercrops were sown in between cane rows. Major objective of the study was to identify the suitable and efficient intercropping system for autumn planted sugarcane to realize higher monetary returns and to study the production potential of sugarcane as affected by intercropping system. Fertilizers were applied as per RDF separately to sugarcane and intercrops. Yields of different intercrops were recorded at harvest. Sugarcane growth, yield attributes, yield and sucrose percentage parameters were recorded. Gross income, cultivation cost, net return and B:C ratios were calculated for the different systems.

The soil of the experiment was sandy loam, low in nitrogen, medium in phosphorus content and higher in potassium availability. The data was analysed by adopting analysis of variance technique as per Panse and Sukatme (1967).

Results

Growth & Yield

Number of millable canes at harvest was not affected significantly by various intercrops. The highest millable cane was recorded in Sole Sugarcane (77 x 103 ha⁻¹). Significantly higher yield attributes in sole SC was due to availability of sufficient soil nutrients and there was no crop competition (Mallik *et al.*, 1993)^[6]. Among the intercrops highest number of millable cane was recorded from Sugarcane + wheat (74.19 x 103 ha⁻¹) followed by Sugarcane + coriander (73.48 x 103ha⁻¹) and Sugarcane + beetroot (73.33 x 103ha⁻¹). Higher number of millable canes is mainly attributed to optimum shoot population which eventually resulted in higher NMC. The difference in cane diameter among different intercrops was attributed to nature of intercrops and available size of spacing area (Cheema *et al.*, 2002)^[3]

Significantly higher cane yield was obtained from Sole Sugarcane (77.22 t/ha⁻¹). Among intercrops studied, cane yield from Sugarcane + Beetroot (74.69 t/ha⁻¹) & Sugarcane + wheat (74.52 t/ha⁻¹) was statistically superior over other intercropping systems and on par with Sole Sugarcane which may be attributed to less competition by these intercrops to cane and residual effect of additional fertilizers and cultural practices applied to intercrops enhancing cane yields. These results are in confirmation with Muhammed *et al.* (2000)^[7]

Cane yield decreased significantly when sugarcane was intercropped with cauliflower or cabbage or methi which recorded cane yield of 70.25, 70.88 & 71.65 t/ha⁻¹ respectively. This may be due to the interfering of these crops with sugarcane at various growth stages offering competition for moisture, nutrients and sunlight mostly at tillering and grand growth period of the sugarcane crop. Cane yield reduction with these crops was 9.92%, 8.94% and 7.77% respectively.

Economics

The economics of different inter crops with Sugarcane was worked out and presented in Table 2. The equivalent cane yield of different inter cropping systems varied significantly with sole sugarcane. Significantly higher equivalent cane yield was recorded in Sugarcane + cauliflower (126.88) and Sugarcane + beetroot (126.26) & Sugarcane + cabbage (123.66) intercropping combination. Rahman *et al.* (1994)^[8] found similar results with sugarcane+ onion, sugarcane + potato and other crop combination. This is mainly due to higher cane yield coupled with intercropped yield. Similar findings were reported by Biradar *et al.* (1995)^[12] This intercrop combination did not effect growth and yield of sugarcane. Similar opinion was expressed by Srinivas. (1996)^[9]. These intercrops also increased net returns significantly over sole sugarcane and other intercrops. The net returns recorded was Sugarcane + beetroot (Rs 2,60,695.00 ha⁻¹), Sugarcane + cabbage (Rs 2,37,540.00 ha⁻¹) & Sugarcane + cauliflower (Rs 2,29,820.00 ha⁻¹). Among the intercrops lowest net returns were recorded with Sugarcane + wheat (Rs 1,64,092.50 ha⁻¹) this may be attributed to lower equivalent yield recorded with this system. Benefit cost ratio of all the intercrops was worked out and it was revealed that Sugarcane + beetroot and Sugarcane + cabbage inter cropping combination recorded significantly higher BC ratio of 2.49 & 2.32 respectively. Lowest BC ratio was recorded with sugarcane + wheat (2.21) followed by sugarcane + methi (2.24) and sugarcane + coriander (2.25) intercropping combination which is attributed less equivalent yield and lower net returns recorded with these intercropping combinations Land equivalent ratio (LER): LER of different intercrops were in range between 1.19 and 1.66 indicating that the intercrops yield advantages varied from 10% to 66% respectively. It could be inferred, that advantage due to intercrops per hectare yields were equal to sole SC yields obtained from 1.19 to 1.66 hectares. The highest LER of 1.66 was recorded for sugarcane + cabbage followed by sugarcane+beetroot (1.64) and sugarcane+cauliflower (1.60) while the lowest LER of 1.19 and 1.21 was observed in sugarcane + coriander/methi and sugarcane +wheat intercrops, however in all intercropping systems LER was greater than unity, thus demonstrating yield advantage for the intercropping over sole sugarcane.

Monetary advantage index (MAI): Monetary advantage index (MAI) values were positive which showed a definite yield advantage in all intercropping systems compared to sole cropping. The minimum MAI value was obtained from sugarcane + wheat (28170) intercropping system. Whereas, the highest MAI value was obtained from sugarcane + beetroot (138171) & sugarcane + cabbage (136565) intercropping system.

Relative production efficiency (RPE): Positive relative production efficiency values indicate superiority of intercrops over sole sugarcane. Intercropping combination of, Sugarcane + cabbage, Sugarcane + beetroot & Sugarcane + cauliflower recorded higher RPE values of 64.3, 63.5 & 60.2 respectively. These intercrops recorded RPE values of more than 20% which prove their worth for recommending in autumn planted sugarcane for Telangana state.

Conclusion

From the above study it can be concluded that farmers in Northern Telangana Zone of Telangana State can grow profitable inter crops like cabbage, beetroot and cauliflower in autumn planted sugarcane which are non exhaustive in nature

complementing the sugarcane crop by enhancing cane yield over sole sugarcane. Farmers can realize additional income by these crops in addition to Sugarcane yield which is an added advantage and midseason income generation and this mat

attract sugarcane growers and sugarcane area can be increased in Telangana state. Hence by choosing profitable intercrops the productivity per unit area and unit time can be increased in long duration crops like sugarcane.

Table 1: Effect of intercropping on number of millable canes and cane yield of autumn planted sugarcane

S No	Treatment	NMC (*000/ha)	Cane Yield (t/ha)
T1	Sole Sugarcane	79.00	77.22
T2	Sugarcane+Coriander(seed)	73.48	73.84
T3	Sugarcane+Methi(seed)	72.21	71.65
T4	Sugarcane+Cabbage	71.18	70.88
T5	Sugarcane+Cauliflower	71.53	70.25
T7	Sugarcane+Beetroot	73.33	74.69
T8	Sugarcane+Wheat	74.19	74.52
	C.D.	NS	3.317
	SE(m)	2.711	1.065

Table 2: Intercrop yield, sugarcane equivalent yield, net returns and BC ratio as influenced by different intercrops in autumn planted sugarcane crop

Treatment	Intercrop yield (q/ha)	Sugarcane equivalent yield (t/ha)	Net returns (Rs./ha)	BC ratio	Land equivalent ratio (LER)	Monetary advantage index (MAI)	Relative production efficiency (%)
Sole Sugarcane		77.22	144355.00	1.93	1.0	0	-
Sugarcane+Coriander	0.80	91.02	173305.00	2.25	1.19	40258	17.9
Sugarcane+Methi	1.10	91.65	174232.50	2.24	1.19	39683	18.7
Sugarcane+Cabbage	10.52	123.68	237540.00	2.32	1.66	136565	64.3
Sugarcane+Cauliflower	6.23	126.88	229820.00	2.28	1.60	127765	60.2
Sugarcane+Beetroot	9.24	126.26	260695.00	2.49	1.64	138171	63.5
Sugarcane+Wheat	2.21	86.67	164092.50	2.21	1.21	28170	12.2
C.D.		6.412	17,631.81	0.196			
SE(m)		2.058	5,659.51	0.063			

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