

Enhancement of Production, Productivity and farm employments of Sugarcane grower through cultivation of Sugarcane Intercropping

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Abstract

Intercropping provides an opportunity to avoid crop competition and advantage of increased production and greater profit or margin and gives higher resource use efficiency. Front Line Demonstrations were conducted at farmers' fields in KVK, Shahjahanpur jurisdiction area in 2010 to 2015 during both crop planting seasons. FLDs on inter crop Urdbean, Moongbean, Mentha (Mentha oil) and Groundnut were cultivated during spring seasons and Toria, Potato, Lentil and vegetable pea were cultivated during Autumn planting Sugarcane. The Technology gap, extension gap and technology index were estimated by formulae provided by Samui et.al. 2000. Highest technological index was found in 100% NPK(RDF) treatment followed by 100% NPK + 25 kg/ha S and RDF + FYM (10t/ha). Highest Net income from intercrop and Sugarcane achieved by mantha + Sugarcane 174750.00 Rs/ha followed by Sugarcane + potato 158375 Rs/ha, Sugarcane + Lentil 153650 Rs/ha, Sugarcane + Vegetable pea 151800 Rs/ha, Sugarcane + Groundnut 150075 Rs/ha, Sugarcane + Urdbean 146800 Rs/ha, Sugarcane 146175 Rs/ha and 139950 Rs/ha. Highest Family labour income was found in sugarcane + menthe in spring season and Sugarcane + potato in autumn season.

Keyword: Sugarcane, intercropping and family income

Introduction

Intercropping increases crop yield per unit area by intensifying the use of land. It does not only contribute to increase the productivity, but also increases the farmer's income. Inter cropping system is an important approach of cropping system for increasing crop yield. Plant competition is an inevitable phenomenon in intercropping system that reduces intercrop productivity. Greater productivity in intercropping system is commonly achieved by minimizing competition and minimizing complementary use of growth resources (Krishna and Raikhelker, 1997). Intercropping provides an opportunity to avoid crop competition and advantage of increased production and greater profit or margin (Gribines, 1963) and gives higher resource use efficiency (Hashem and Maniruzzaman, 1986). Intercropping refers to grow two or more crops simultaneously on the same piece of land with definite row-planting pattern to obtain higher productivity per unit area. 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 case of Sugarcane, much of the space between two rows of sugarcane remains unutilized for an initial period of 90-120 days, due to slow crop growth.

At present the area under sugarcane is 5.03 million hectare with production and productivity of 356.56 Mt and 70.8 t/ha, respectively (Anonymous 2015). India will need 27-29 million tonnes (t) of refined sugar by 2020 for its growing population (Anonymous, 1997) as well as 20-69 million tonnes of jaggery (a non-centrifugal form of sugar mainly produced in the Indian subcontinent) to fulfil its domestic demand. Intercropping is a multiple cropping practices involving growing two or more crops in proximity. The most common goal of intercropping is to produce a greater yield on a given piece of land by making use of resources that would otherwise not be utilized by a single crop. Sugarcane crop is a cash crop of western

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and Mid Plain of U.P. Sugarcane takes near about 14 months for maturing in northern plains. Sugarcane is grown mainly two seasons in north plains *i.e.* spring and autumn season. Sugarcane in early stage, the growth is very poor and it takes more time *i.e.* 30 to 41 days for germination. Shahjahanpur is sugarcane growing also one of the Districts. The area of Sugarcane increase from 45291 ha to 83156 ha by participatory approach with farmers of Sugarcane Growers of District Shahjahanpur. The Inter-imminent income of sugarcane growers' increase by cultivating intercrop with sugarcane and also increase the employment chances of sugarcane growers and fodder availability for cattle.

Methodology

Farmres' operational area of Krishi Vigyan Kendra, Shahajahanpur was selected as per guide lines of front line demonstrations by KVK Zonal Project directorate, Kanpur Zone III. Accordingly FLDs under Sugarcane intercropping laid out villages Girgicha, Parajharsa, Gulamkhera, Seharamau Daxini, Shahbajnagar, Mukarampur and Benipur. The Knowledge levels of farmers in these eight villages were also estimated by taking random sample of 25 farmers each village. Thereby sample included 200 numbers of farmers in the study. The farmers were asked to reply questions about the improved agro techniques including the high yielding varieties of conducted front line demonstration on various crop as inter crops with sugarcane during 2010 to 2015 in both planting seasons in selected villages. The score so obtained under various question were summed up. On the total score obtained, respondents were categorised in three class *i.e.* low, medium and high level knowledge.

The participating farmers were provided with all advance technical know how about advanced cultivation of sugarcane intercropping. KVK scientist also visited regularly to the demonstrations fields and continuously guides the farmers. These intercrops were also utilized for collection of feedback information for more improvements in technology transfer programme. Field days and group meeting were also organised at demonstration sites to provide the opportunities for other farmers to witness the benefits of demonstrated technologies. The data on Sugarcane and intercrop productivity (q/ha) were collected from the demonstration and control plots (Farmers Practice) for further analysis. The critical inputs were duly supplied to the farmers by KVK. Data were collected from

the field of FLDs farmers and analysed to compare the yield of farmers' field and FLDs field. The Technology gap, extension gap and technology index were estimated by formulae provided by Samui *et.al.* 2000.

$$\begin{aligned} \text{Technology gap} &= \text{Potential yield-demonstration yield} \\ \text{Extension gap} &= \text{demonstration yield-farmers practice yield (control)} \\ &= \frac{\text{Potential Yield} - \text{Demonstration Yield}}{\text{Potential Yield}} \times 100 \end{aligned}$$

The soils of FLDs field were sandy loam to clay loams having 0.4 to 0.6 per cent available organic carbon, 31 to 53 kg/ha available P₂O₅ and 60 to 120 kg/ha available potassium, 250 to 300 kg/ha nitrogen with pH range from 7.5 to 8.1. FLDs on inter crop Urdbean, Moongbean, Mentha (Mentha oil) Groundnut were cultivated during spring seasons and Toria, Potato, Lentil and vegetable pea were cultivated during Autumn planting Sugarcane. Main crop sugarcane was planted at 90 to 120 cm row spacing and intercrops were sowed in between to two rows of sugarcane. Number of Intercrops rows based on their geometry *i.e.* 03, 02, 02, 02, 02, 03 & 03 Urdbean, Moongbean, Mentha (Mentha oil) Groundnut, Toria, Potato, Lentil and vegetable pea, respectively. A common dose of N: P: K @ 180:80:60 in spring and 200:80:60 in autumn applied to main crop and supplement dose of fertiliser supplied to intercrop based their needs. Data were interpreted on five years average bases.

Results and Discussion

1. Knowledge level of advanced agronomic practice of Sugarcane Intercrop

To know the need of the technological intervention the knowledge level of the farmers in eight villages were estimated from 200 farmers 25 from each village. Over all maximum number of farmers fall in medium category knowledge level. While very few were with high knowledge level (Table 1). Thus need

Table 1: Overall knowledge level of farmers in respect of cultivation of sugarcane intercropping, N=200

Category of knowledge level	Score range	No. of Farmers	%age of respondents
Low	30-35	70	35
Medium	36-54	102	51
High	55-75	28	14

Table 2: Demonstration on improved nutrient management of Sugarcane + Inter crops at eight villages during Rabi 2012-13 and 2013-14

Component of FLD	Variety	No. of Demonstration	Area (ha)	Productivity (q/ha) ±SE	Increase in Productivity (%)	Technology gap (q/ha)	Communication/ Extension Gap (q/ha)	Technology Index
RDF(100%NPK)	Co 0238	20	8	755 (2)	7.90	445	148	37.08
100% NPK+S (25kg/ha)	Co 0238	25	10	815(3)	17.79	385	208	32.08
RDF + FYM (10t/ha)	Co 0238	30	12	905 (1)	32.62	295	298	24.58
Control	Co 0238	30	12	607(3)	-	593	-	49.42
Potential Yield with all inputs	Co 0238	10	4	1200	-	-	593	-

Table 3: Sugarcane and Inter crop Yields and Net Income (Five Years data average based per ha)

Name of income without	Line IC	Av Yield of IC (Rs)	Net Income of IC (Rs.)	Sugarcane Yield (q/ha)	Sugarcane yield without IC (Rs)	Sugarcane net income with IC (Rs)	Sugarcane net income without IC (Rs)	Sugarcane net income including IC(Rs)
Urdbean	03	8.50	25000	720	590	121800	90850	146800
Moongbean	02	6.60	25000	718	590	121170	90850	146170
Mantha								
(Mantha Oil)	02	0.78	75000	650	520	99750	68800	174750
Groundnut	02	6.55	35000	705	515	115075	67225	150075
Toria	02	8.60	25000	730	510	114950	50650	139950
Potato	02	225	45000	725	530	113375	56950	158375
Lentil	03	8.60	45000	710	520	113650	53800	153650
Veg. Pea	03	225	40000	720	540	111800	60100	151800

IC= Inter cropping

management in front line demonstration programme in eight villages. FLD is good extension medium to demonstrated impact of new agro technique to farmers.

Under front line demonstration sugarcane variety Co 0238 was tested at all intercrop demonstration locations, highest productivity of sugarcane variety Co 0238 was recorded RDF + FYM (10t/ha) 905 q/ha followed by 100% NPK + S (25kg/ha) 815 q/ha and increase in productivity also observed in same respective manners. Technological gap was found higher in RDF (100% NPK) and minimum gap was found in RDF + FYM (10t/ha). The communication/extension higher gap was observed in RDF + 10t/ha FYM followed by 100% NPK + 25 kg/ha Sulphur and 100% NPK (RDF) treatment. Highest technological index was found in 100% NPK(RDF) treatment followed by 100% NPK + 25 kg/ha S and

RDF + FYM (10t/ha). In all over RDF + 10t/ha FYM treatment was found superior in all respects.

In table 3 Mentha as intercrop highest net return Rs 75000 followed by potato, Lentil, Vegetable pea, Groundnut and Urdbean/Moongbean Rs 45000, 45000, 40000, 35000 and 25000, respectively. Yield of Sugarcane with potato observed highest 725 q/ha and lowest yield 650 q/ha with mentha intercrop. Highest Net income from intercrop and Sugarcane achieved by mantha + Sugarcane 174750.00 Rs/ha followed by Sugarcane + potato 158375 Rs/ha, Sugarcane + Lentil 153650 Rs/ha, Sugarcane + Vegetable pea 151800 Rs/ha, Sugarcane + Groundnut 150075 Rs/ha, Sugarcane + Urdbean 146800 Rs/ha, Sugarcane 146175 Rs/ha and 139950 Rs/ha.

Table 4 showed that mentha cultivation as intercrop created more additional 78 mandays and increasing family income Rs 23400 in spring season.

Table 4: Employment generation during cultivation of Sugarcane Intercrops

S.No.	Name of Intercrop	Total Labour engagement in Sugarcane cultivation (Mandays)	Additional Labour engagement in Sugarcane Inter crop (Mandays)	Additional income from employment family labour (Rs)
1.	Sugarcane + Urdbean	210	35	10500
2.	Sugarcane + Moongbean	210	35	10500
3.	Sugarcane+Mantha (Mantha Oil)	253	78	23400
4.	Sugarcane + Groundnut	221	46	13800
5.	Sugarcane + Toria	207	32	9600
6.	Sugarcane + Potato	231	56	16800
7.	Sugarcane + Lentil	217	42	12600
8.	Sugarcane + Veg. Pea	237	52	15600
9.	Sole Sugarcane cultivation	175	00	00

*Wage labour per day @ Rs 300

Potato cultivation with sugarcane found highest family labour income Rs 16800 followed by vegetable pea (Rs 15600), lentil (Rs 12600) and toria (Rs 9600) in autumn season.

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