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STT TECHNIQUE WITH INTERCROPPING FOR ENHANCING SUSTAINABLE PRODUCTION: A SUCCESS STORY OF FARMER IN DISTRICT WEST CHAMPARAN, BIHAR

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Agriculture plays a significant role in most of the developing countries including India. But due to the increased population and development of urban clusters along with industrial growth, the shrinkage in the availability of land for farming because of its non-agricultural uses. Among these, intercropping ensures multiple benefits like enhancement of yield, environmental security, diversification, labour distribution, maintenance of soil fertility, suppression of weeds, to combat the crop failure under the situation of climate change and helps in improving productivity and profitability through efficient utilization of natural resources, two major advantages are higher productivity and greater stability through utilization of solar energy, moisture and nutrients. Intercropping is growing of two or more crops simultaneously on the same piece of land with a definite row pattern. The main concept of intercropping is to get increased total productivity per unit area and time, besides equitable and judicious utilization of land resources and farming inputs including labour. Many successful intercropping systems have been evaluated through out of the world, to get maximum production from the small land holdings. Monocropping is less economical to meet the farmers need. The intercropping produces two crops in a year, but it also influences the yield and yield components of sugarcane by competing for nutrients and other environmental factors. Intercropping one or more crops with sugarcane is an appropriate approach of getting additional farm income besides the principal sugarcane crop. As sugarcane is planted at adequate row spacing and this inter-row space practically remains

vacant in early growth stage which extends nearly four months where suitable short duration winter crops may be grown as intercrop that increase total yield, higher monetary return, and greater resource utilization and fulfils the diversified needs of the farmers. Intercropping in sugarcane with various short duration crops like cabbage, potato, mungbean etc. has been proven profitable in comparison to growing sugarcane as sole crop (Alam *et al.*, 2000, Singh *et al.*, 2018, Ishita and Vaidya, 2020).

Sugarcane is a clonally propagated crop with the planting of sugarcane setts traditionally. In this traditional method, the issues like requirement of high seed cane, low germination rate, difficulty in seed cane transportation, seed quality, etc. are affecting the cost of cultivation as well as sugarcane production. Doubling of farmers' income, the flagship programme of the present government, can be achieved by increasing the productivity and reducing the cost of cultivation. Transplanting sugarcane single-bud/ bud-chip seedlings can save seed cane requirement up to 80 per cent besides providing healthy plants and good field establishment. It is less expensive and labour saving in comparison with conventional sett planting. This method also reduces the initial water requirement of the crop and reduces crop duration in main field. Transplanting sugarcane seedlings in wider row spacing provides more space and sunlight for a longer duration which increases cane productivity, and also facilitates intercropping and mechanization of sugarcane agriculture from transplanting to harvesting (Bakshi Ram, 2019).

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Plan, implement, support and linkage with Krishi Vigyan Kendra, West Champaran-II:

Mr. Sachin Kumar Singh had heard about the importance of sugarcane settling transplanting technique (STT) through Harinagar Sugar Mill (HSM) officials, Scientists of RPCAU, Pusa and newspaper etc. He also exposed his keen interest to HSM officials and KVK scientists for adoption of settling transplanting technique for sugarcane production in their farm. He started their work on said technology with intercropping of potato, field pea, lentil and wheat since 2017-18. He also adopted drip irrigation system for irrigation in STT methodology. By taking the technical knowledge from KVK scientists and HSM officials. Now, he is doing sugarcane production technology through settling transplanting technique with intercropping in an area of 15 acre with other recommended package of practices. All the necessary arrangement made by Harinagar Sugar Mill officials and KVK, technocrats regarding scientific cultivation of sugarcane settling transplanting technique with intercropping during 2020-21.

METHODOLOGY ADOPTED BY THE FARMERS

Major steps involved in raising single bud or bud-chip settlings and intercropping are given below.

- Preparation of single-bud setts or bud-chips for one acre, 6–8-month-old plant crop (6-7 qt. seed cane), protray (50 cavity-200 no.), cocopeat (25 kg), vermicompost/FYM (7 qt.), jaivik shakti compost manure (1 qt.), sand (25 kg), fungicide (100 g), insecticide (500 ml), NPK powder 100g, humic acid 30 ml, use single bud sett cutter or bud chip machines available locally are required. Mr. Singh collected the all materials for settling production as per norms.
- Single bud setts cut by single bud cutter machine and treated with nutrients and pesticides (0.1% each of Urea, FeSO₄ and ZnSO₄; and 0.04% Propiconazole fungicide) manually.
- Planted single budded setts vertically/bud-chips with buds facing upwards in protrays/ cavity trays using above mentioned ratio potting mixture of sand: soil: decomposed FYM/cocopeat/vermicompost etc.

- Stacked the sett filled protray vertically one over others and cover the trays with polythene sheet and leave it for 5-6 days.
- After 5 days unpacked the trays, spread it horizontally. Watering followed in the settlings regularly. The settlings will be ready for transplanting by 30-35 days.
- He transplanted 30-35 days old settlings in the main field using the sugarcane settling transplanting technique manually with normal planting spacing of 5 x 2 feet (row x plant) distance in a paired row and zig-zag (5000 settling/acre) and also at 4 x 1.5 feet (row x plant) distance in a single line (8000 settling/acre). He irrigates the field immediately after transplanting and also used settlings as in gap filling in their field for maintaining the plant populations. He used drip irrigation and fertigation system in their sugarcane plots for proper delivery of water and fertilizers at active root zone resulting in higher water and fertilizer use efficiency.
- In wider row spacing, planted sugarcane + potato, sugarcane + field pea, sugarcane + lentil and sugarcane + wheat in their farm field.

OUTPUT

Mr. Sachin Singh adopted sugarcane settling transplanting technique with intercropping of sugarcane + potato, sugarcane + field pea, sugarcane + lentil and sugarcane + wheat for higher production, income and their livelihood security. He also adopted other package and practices with proper insect-pest and disease management as per suggestion of KVK scientists. He harvested 5250 qt production of sugarcane including intercropped yield from 15-acre lands during 2020-21. He also harvested 79 qt. produce (paddy and wheat) during 2020-21. He is producing about 3600 litre milks from their 4 cows and receiving net income about Rs. 76000/- annually from their livestock's, which is 74.71 per cent more over previous baseline period. He got net returns of Rs. 978750/- and Rs. 80700/- from sugarcane STT with intercropping and paddy and wheat, respectively during 2020-21. It was 312.11 and 54.60 per cent more over previous baseline period. He received total net income of Rs. 1135450/- during 2020-21, which was 240.77 per cent more over previous baseline period (Rs. 333200/- during 2016-17).

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OUTCOME

Sugarcane paddy, wheat and rabi vegetable are important crop of the district. The sugarcane variety Co 0238, Rajendra ganna-1, CoP 9301, Co 0118 and Co 15023 are most prominent in the district. The outcome of these new technology for higher sugarcane production inspired the farming communities to replace their conventional method of transplanting/sowing technique with resistance high yielding varieties which are being cultivated. They also aware about other package and practices of intercropping with sugarcane. Favourable higher net returns are explanatory for economic viability of the technology and convinced the farmers for adoption of intervention imparted. Mr. Singh is very happy due to improvement in their farm income and set forth example for others.

IMPACT

The partner farmers and neighboring farmers were fully convinced about sugarcane settling transplanting technique (STT) with intercropping of short duration and short statured crop like potato, field pea, lentil and wheat. Farmers becoming aware that saving of water and cost of fertilizers through use of drip and fertigation system in sugarcane crop, saving of power consumption and irrigation labour costs, wider row spacing and intercropping is one of the most important cultural practices for decreases insect-pests and diseases as well as increases doubling farmers income, nutritional and livelihood security. Intercropping in sugarcane crop has indicated more benefits in terms of net profits

mainly resulting reduces cost of cultivation, reduction of incidence of insect pests and diseases and greater resource utilization and fulfils the diversified needs of the farmers. Farmer's confidence improved with KVK scientist and sugar mill officials to have face to face discussion and facilitated sharing of knowledge with experiences. Intercropping with sugarcane STT encouraged the partner and neighboring farmers to act their farm work in a more systemic and specific manner and also reducing plant protection input/other input costs and providing various environmental benefits.

REFERENCES

- Alam MJ, Rahman MM, Zaman AKMM (2000). Impact of paired row sugarcane with double intercrops. *Bangladesh Journal of Sugarcane*, **22**: 1-9.
- Bakshi Ram (2019). Sugarcane settling transplanting technique (STT): Future of sugarcane agriculture. ICAR-Sugarcane Breeding Institute, Coimbatore, Tamil Nadu, 32p
- Ishita and Vaidya, P. (2020). A review on intercropping effects on growth and yield of sugarcane. *Journal of Pharmacognosy and Phytochemistry*, **9(5)**: 2992-2995
- Singh SN, Singh P, Rai RK, Pathak AD (2018). Vegetables intercropping with autumn planted sugarcane: A step toward doubling farmers' income in Indian sub-tropics. *Indian Farming*, **68(1)**: 65-68.

Table 1: Income generation before adoption of technological interventions

SN	Components	Names	Area (acre/no.)	Benchmark (Baseline period 2016-17)		
				Production (qt./lit./no.)	Gross Income (Rs)	Net Income (Rs)
1.	Field crop 1	Sugarcane	5	1500 qt.	397500	237500
2.	Field crop 2	Paddy-Wheat	5	64 qt.	82200	52200
3.	Livestock 1	Cow	2	3000 lit./year	60000	43500
Total income per year					539700	333200

Table 2: Impact of adoption of sugarcane STT with intercropping and other enterprises

SN	Component s	Names	Area (acre/no.)	Period (2020-21)			% Increase over base year	
				Production (qt./lit./no.)	Gross Income (Rs)	Net Income (Rs)	Production	Income
1.	Field crop 1	Sugarcane + Potato / Field pea /Lenti /Wheat	15	5250 qt.	1653750	978750	250.00	312.11
2.	Field crop 2	Paddy-Wheat	5	79 qt.	143700	80700	23.44	54.60
3.	Livestock 1	Cow	4	3600 lit.	108000	76000	20.00	74.71
Total income per year					1905450	1135450	253.06	240.77



Single bud cutter



Bud cutting by farmer through single bud cutter



Sett treatment



Prepared compost



Placement of single bud Setts by farmer



Stacking trays with vertically and covering with polythene sheet



Unpacked trays spread horizontally

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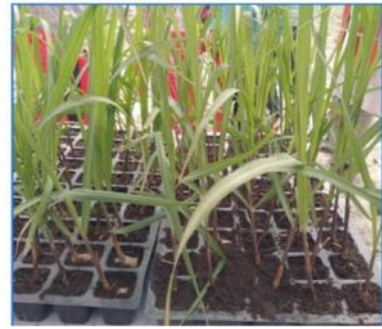
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Settling germination started



Grown up settlings in protrays on farmer's field



Settling transplanting



Drip irrigation & fertigation



Sugarcane + Potato



Sugarcane + Field pea



Sugarcane + Wheat



KVK, technocrats and HSM officials with farmer's