

## **Site- Specific Nutrient Management in sugarcane through soil health card recommendation in Muzaffarnagar District**

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### **Abstract**

*The On-Farm Testing were conducted at 30 farmers' fields in District Muzaffarnagar Uttar Pradesh having loam to clay loam soil conditions in five consecutive Zaid seasons from 2017 to 2021. All the farmers adopted trench method for planting of sugarcane during Zaid seasons and were also used site- specific nutrient management (SSNM) recommended fertilizers. This method shows improved germination from 38 to 64 percent. Average productivity was 946 q/ha from demonstration fields as compared to 837 q/ha from farmers practice which was 109 q/ha enhance in productivity average of five years. All the demonstrations at farmers' fields shows increase in yield from 12.73 to 13.29 percent, which is averaged increase 13.02 percent compare to farmers practice.*

**Key words:** trench method planting, SSNM, Sugarcane, Productivity, nutrient

### **Introduction**

Sugar is the main house hold essential commodity of India. At National level Uttar Pradesh contributing 28 percent in sugar production from 47 percent cropped area, which is very less compare to Maharashtra (area 17.5 percent and contribution 34 percent), which having potential of sugarcane productivity from 1000 to 1250 q/ha. The Productivity is low mainly due to planting of sugarcane by old furrow method and also use of imbalance fertilizers. In view of harness this productivity potential of sugarcane Krishi Vigyan Kendra Baghra, Muzaffarnagar organized large scale demonstrations at farmer's fields. In this context, sugarcane planted by trench method along with site- specific nutrient management (SSNM) techniques to achieve the target yield 1000q/ha.

Farmers who used the site-specific nutrient management while there was a loss by the farmers who did not use this technology. The current recommended fertilizer for sugarcane is higher than the requirement. Moreover, most of the farmers in irrigated area even apply too much of fertilizer especially nitrogen fertilizer of about 250-300 kg N/ha

which is higher than the recommendation. Sugarcane is increasing in popularity for the farmers due to the potential of the crop for energy production in addition to sugar manufacturing. District Muzaffarnagar has 8 sugar mill and area under sugarcane cultivation is about 1.6 million hectares, with the average yield of 850q/ha. The site-specific nutrient management (SSNM) recommendation which includes the soil testing is a new practice for sugarcane farmers. The lack of farmer's knowledge, insufficient laboratories and limited supportive research are constraints to the practice of site-specific nutrient management in sugarcane production. Therefore, we attempted to adopt and transfer the work on site-specific nutrient management in sugarcane. The screening of the farmers is very important before the training/demonstration of the technology is given. The empowerment technique is the powerful concept to screen the farmers to accept, practice and disseminate the developed technology to the other farmers (Attanandana et al., 2005). Trench methods of planting were used where tall varieties were grown and strong wind blow areas, Yadav (2009) and Singh (2010) also used micronutrient in production of sugarcane.

### **Materials and methods**

The On-Farm Testing was conducted during 5

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consecutive years from 2017 to 2021 at 30 farmerø fields of Muzaffarnagar District in Zaid (February sowing) sugarcane. Trenches were made U shape with the help of trenchers, 30 cm wide and 30 cm depth at a distance of 90 cm between two trenches. SSNM formula were decided on the basis of nutrient uptake by crop from target yield 1000q/ha as under

The ensure supply of above nutrients, arranged fertilizers from local market. These fertilizers were used at farmersø fields on systemic distribution whole crop season. Bokhtiar *et al* (2003) was also used NPK, S, Zinc sugarcane production 82.44 t/ha yields.

*Time and method of fertilizers application:*

1. All NPK, Sulphur granular, Boron granular, Ferrous sulphate were applied as basal application and mixed with soil just before plantation of sets in trench. Zinc sulphate mixed with FYM just before application in the trench.
2. 87.5 kg Urea applied at 30-35 days after sowing (DAS)
3. 100 kg Urea, 100 kg MOP and 12.5 kg Mono zinc applied at 50-60 DAS
4. 112.5 kg Urea and 75 kg MOP applied at 90-100 DAS

It shows from above data that trench method was costly compare to furrow method. In this method increased seed rate and fertilizer cost and doses.

Table 1: Nutrient uptake by sugarcane crop to produce target yield 1000 q/ha.

Nutrient	Nitrogen	Phosphorus	Potash	Boron	Sulphur	Iron	Zinc
Kg ha <sup>-1</sup>	207.5	52.5	280	0.0625	40	4.0	1.25

Table 2: Nutrients supplied per hectare through following fertilizers were available in the market on soil health card recommendation.

Fertilizer	NPK 12:32:16	Urea 46% N	MOP 60% K	Sulphur granular DP 90% S	Boron Granular 15% B	Ferrous sulphate 15% Fe	Zinc sulphate 21% Zn	Mono zinc 33% Zn	Sulphur 80 WP
Kg ha <sup>-1</sup>	315	300	175	50	5	37.5	37.5	12.5	5

Table 3: Trench method v/s farmers practice comparison

Particulars	Farmers practices	Trench method	Results
Seed rate (q/ha)	62.5	80	Increase in seed rate
Germination %	38	64	Increase in germination
Mother shoots/ha	450000	870000	Increased tillers
Input Rs./ha	13000	25000	Increased cost
Expenses on irrigation	2750	2200	reduced
Logging	more	less	Reduced
Possibility of inter-cropping	Less	more	increased

Trench method increased germination from 38 to 64 percent and also number of tillers due to which fertilizer doses has been increased to support plant population for better growth. This save 30 % percent of irrigation water; we irrigate only trenches rather than flooding whole field.

Soaking of two budded sets in carbendazim solution up to 15-20 minutes just before sowing. Seeds were sown in trenches as end to end method (stair type manner) in 10 cm distance between two sets. After placement, covered these sets with 8-10 cm soil with the help of spade manually.

**Results and discussion**

On-Farm Testing demonstrations/ trials were conducted in five consecutive years at 30 farmerø fields during Zaid sugarcane planting season from 2017 to 2021 in District Muzaffarnagar, where soil is loamy to clay loam. The Economics of the district shows, slow increase in productivity with a sale price Rs. 325/ q of sugarcane. The results were calculated on yearly averaged input expenditure and economics on per hectare area basis. SSNM increases 13.02 percent averaged 5-year productivity of sugarcane (Table 4).

The maximum yield (980 q/ha) were recorded from demonstration plot as well as farmers practice

Table 4: Productivity and economics of sugarcane production by using SSNM system

S. No.	Year	Yield (q/ha)		Cost of Cultivation (Rs/ha)		Gross return (Rs./ha)		Net return (Rs/ha)		% increase In yield over F.P.	B: C ratio	
		F.P.	Demo.	F.P.	Demo	F.P.	Demo	F.P.	Demo		F.P.	Demo
1	2017	815	920	65700	69200	264875	299000	199175	229800	12.88	4.03	4.32
2	2018	825	930	66000	69500	268125	302250	202125	232750	12.73	4.06	4.35
3	2019	830	940	65000	68500	269750	305500	204750	237000	13.25	4.15	4.46
4	2020	850	960	66200	69700	276250	312000	210050	242300	12.94	4.17	4.48
5	2021	865	980	65500	69000	281125	318500	215625	249500	13.29	4.29	4.62
	Avg.	837	946	65680	69180	272025	307450	206345	238270	13.02	4.14	4.44

field as 865 q/ha in the year Zaid 2021. Average productivity was 946 q/ha from demonstration fields as compared to 837 q/ha from farmers practice which was 109 q/ha enhance in productivity average of five years. Singh *et al* (2012) also revealed that trench planting produced significantly higher cane yield 118.7 and 121.7 tons/ha compared with other planting methods. Singh *et al* (2008) also recorded 86.2 t/ha from trench planting.

All the demonstrations at farmers' fields shows increase in yield from 12.73 percent to 13.29, which is averaged increase 13.02 percent compare to farmers practice. The concern of cost of cultivation which was higher at demonstration fields due-to excess use of fertilizers were calculated on the basis of soil test at farmers' fields. Expenditure on demonstration fields was more Rs 35000/ha as compared to farmers practice, which was used in the demonstration fields to purchase recommended fertilizers. Gross return per hectare was Rs 307450/- from demonstration fields compared to farmers practice Rs 272025/- which was more Rs 35425/- average per hectare from demonstration fields.

The net return was maximum Rs 249500/- from demonstration field and maximum Rs 215625/- from farmers practice in Zaid 2021. The average of net return was Rs 238270/- from demonstration field compared to Rs 206345/- from farmers practice fields which was increase Rs 31925/- average per hectare.

Benefit cost ratio was maximum 4.62 from demonstration field and maximum B: C ratio 4.29 from farmers practice in Zaid 2021. The average Benefit cost ratio was 4.44 from demonstration fields compared to 4.14 from farmers practice fields.

This trench method of planting sugarcane along with SSNM techniques increased in agriculture input but adopted by the farmers due to more beneficial as per unit area of crop production. Tasneet *et al* (2008)

also said that farmer leader learned to implement site specific nutrient management and to disseminate the technology to other farmers in their community. This technology initially developed for maize production but was extended to rice sugarcane farmers.

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