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Sustainable Sugarcane Initiative- The Saviour of Sugarcane Sector

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Abstract: *Sugarcane, a crop that has a huge impact on the livelihood of many farmers and sugar industries in the world. In India, about 50 million farmers depend on sugarcane yield which is about 7.5% of the village population. India has more than 538 sugar mills produces 32.93 million tons of sugar, jaggery, and its by products like Molasses, Bagasse etc. But due to the various issues like erosion in flooded soil which leads to the nutrients leaching, declining water table due to the erratic monsoon and increase in cultivation cost and steady yield (productivity stable as about 65-70 tons/hectare), a new technology is essential to meet future demands. Sustainable Sugarcane Initiative (SSI) is a method of sugarcane cultivation whose main purpose is to enhance sugarcane production by greater input use efficiency. SSI involves the use of less seeds, less water and optimum usage of fertilizers and manures with wider spacing thus leads to more productivity(more than 40% than present), efficient water usage (more than 40% than present) ,more profit (more than 30% than present).*

Keywords: Chip buds, wide spacing, drip fertigation, IPM and INM

I. INTRODUCTION

Saccharumofficinarum is an important commercial crop grown by the farmers for its valuable uses in an area of about 24.5 mha, with a production of 1850 million tons and a par productivity of about 75.5 t/ha. According to USDA, India stands in 2nd place among the sugarcane producing countries next to Brazil with an average cultivation area of 5 mha, with the peak production of about 500 milliontons in 2022 with a productivity of about 69.1 t/ha from which about 35.9million tons sugar is produced. India comes up with the production of about 19.98% sugarcane to the world. Similar to cultivation, India also stands high as the largest consumer of sugar by consuming more than 15.5 million tons of sugar, 2nd position in exporting countries by shipping about 10.9 million tons of sugar to other nations by earning a foreign currency of about Rs. 40000 crores.

In India it is cultivated in North in Uttar Pradesh, Maharashtra, Haryana and in South in Karnataka, Andhra Pradesh, Tamil Nadu. The tropical climate in Southern states is much favorable for the rise in sucrose content in sugarcane. Sugar industry in India is the 2nd largest agro processing sector next to textiles which involves cotton. By 2050, for the estimated population of about 1.65 billion people, an average of 51 milliontons of white sugar should be produced from around 630 million tons of sugarcane. Products like ethanol used instead of fossil fuels, Bagasse for the co-generation of electricity in sugar mills as green technological measures, its productivity has to be over 105t/ha but only in an area of only 6mha. For this aspect, the necessity of new technology is made which is the SSI. SSI is the new renovation in sugarcane production by using lesser inputs and wider spacing along with intercropping to produce higher yield and earn more profit by using proper management strategies.

1.1 SSI – Sustainable Sugarcane Initiative

SSI sugarcane growing method was developed from the SRI(System of Rice Intensification) principles of "More with less". It is a brain child of WWF-ICRISAT collaborative project. It was launched in 2009, and also came to be known as Bud Chip Technology.

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A. Principles of SSI

- Seedling production in nursery using protrays by using single bud chips.
- Transplanting young seedlings at 25-35 days of planting.
- Wider spacing of about 5×2 feet in main field along with intercropping.
- Optimum water use efficiency using drip fertigation.
- Organic nutrient and plant protection measures.

B. Selection of Canes and Bud Chips

- Healthy canes of about 7-9 months old having internode length about 7-8 inches are to be chosen wisely.
- Generate bud chips by using an implement called Bud Chipper which chips about 1200 shoots/hour.

7-9 months old sugarcane


Bud Chipping

C. Bud Treatment

Bud treatment is essential for preventing infestation of pests and diseases during growth stages and quicker germination of buds.

- **Chemical treatment**: A solution made of 1kg Urea, 50g Carbendazim and 200 ml Malathion and dissolved in 100 litres of water.
- **Biological treatment**: In 100 litres water about 2kg *Trichodermaviridae* is dissolved.

In chemical/ biological treatment, seeds are soaked in for 15 minutes and shade dried for 15 minutes and then treated with 1 percent lime solution and packed in air tight gunny or cloth bags for 3-4 days. At 4th day, the bags can be opened and healthy sprouted seedlings can be used for raising nursery.

Chip buds


Chemical Bud Treatment

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D. Nursery

Seedlings are raised in protrays inside a shade net.In a protray half of each cone is filled with coco-pith. The chipped buds are placed at a flat/slightly slanting position in each cone ,in such a way that the bud side faces up. Then buds are covered with coco-pith completely. Trays are placed one above the other with an empty tray at top.100 trays(4 sets with 25 trays each) are tightly bundled with polythene sheet. Small weights are placed at the top of the bundles and kept on the same position for 5-8 days. This creates high temperature and humidity. The trays are placed in shade net so that no water, air, sunlight makes contact with the trays. After 3-5 days, white roots emerge,with the shoot emerging in the next 2-3 days. On the 5th or 8th day after all the buds are sprouted, the trays are removed from the bundles and placed side by side. Watering with rose cane is done for the next 15 days. At the 2 leaf stage watering can be increased based on the moisture levels in the coco-pith. At the 6 leaf stage , grading of seedlings based on age(height) is carried out. Seedlings of same height are placed in the same tray.


Placing buds in half filled tray


Covering the buds with coco-pith

II. MAIN FIELD PREPARATION

Primary and secondary tillage is done by using disc plough and harrow or rotovator respectively. Deep ploughing is necessary for the removal of clouds, weeds and crop residues. A gentle slope can be maintained for easy movement of irrigation water.


Tillage operation

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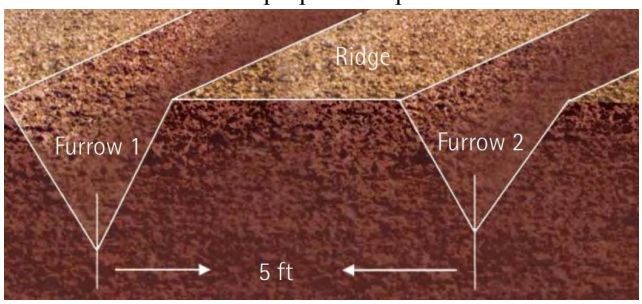
2.1 Addition of Organic Manures

FYM or compost or well decomposed presumed is applied at a rate of 8-10 ton/acre,before the last plough. *Trichoderma* and *Pseudomonas* ,each 1kg/acre can be also mixed with organic manures.

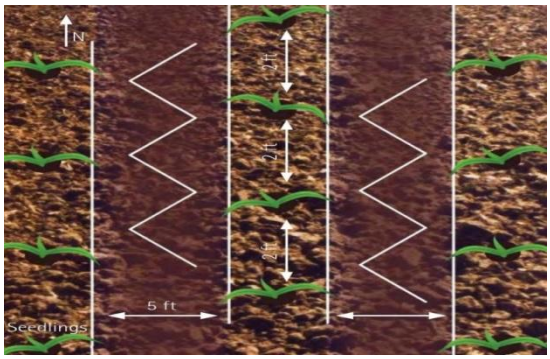
2.2 Furrows & Ridges

Furrows are made at a distance of 5 ft in the main field for planting. A subsoiler attached to a ridge can be used to run through the furrow which loosens the soil.It facilitates proper incorporation of manures.



2.3 Transplanting

25 to 35 days old seedlings are transplanted. Seedlings are transplanted in a zigzag manner to utilize more space and achieve maximum tillers. Wide spacing is implemented because it reduces the bud requirement from 48000 per acre to 5000 per acre. (Shilpa *et al.,*2017).Higher cane weight recorded in row spacing of 120 cm may be due to the fact that wider spacinghad improved the efficiency of plants to use the nutrients, space and light(Rehman *et al.,* 2013).



2.4 Irrigation

Irrigation is done immediately after transplanting. The water is supplied based on the growth stages through drip irrigation or furrow irrigation or subsurface irrigation, with drip irrigation being the most efficient.

- Once in 10 days during tillering stage (36-100 days).
- Once in 7 days during the grand growth period (101 - 270 days)
- Once in 15 days during the maturity period (271th day to till harvest).

In SSI upto 5 irrigation are saved because the germination period (35 days) is spent in the nursery

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Subsurface irrigation

Furrow irrigation

2.5 Fertilizer Application

NPK is applied in the ratio of 112:25:48 kg/acre,in 2 or 3 split doses or through drip fertigation.

Application of bio-fertilizers like *Azospirillum*and Phosphobacteria 2kg each mixed with FYM (200kg) at 30th and 60th day of planting along the sides is also a good practice.

Along the sides applied

Drip fertigation

2.6 Weeding

Hand and Mechanical weeding are done at 30,60,90 days after transplanting.

2.7 Mulching

Mulching using sugarcane Trash @ 1.5 ton/acre is used prevent the growth of weeds. Trash Mulching also encourages earthworm growth which improves soil aeration and water infiltration rate.

2.8 Earthing Up

Partial earthing up is done at 1st top dressing. Full earthing up is done at 2nd top dressing which coincides with peak tillering

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2.9 Detrashing

Detrashing is done at 5th and 7th month of planting for effective photosynthesis to occur.

2.10 Propping

A fence like wooden structure is given at one side of the field to support the lodging crops.

2.11 Intercrop

Cowpea, Chickpea, Green gram are used as inter crops Intercrops controls weeds upto 60% in the initial stage. The pooled data of 3 years revealed that the highest number of millable canes inplant (131000 ha-1) and ratoon (99300 ha-1) crops were recorded with the application of recommended N through organics + bio-fertilizers + inter cropping of legumes.

2.12 Plant Protection

Pests and Diseases are major causes for yield loss in sugarcane. Appropriate protection and management measure must be carried out for effective cultivation. Some of the major pests and diseases and their management practices are

A. Early Shoot borer

Trash mulching and light earthing up are done at 35 DAS. *Sturmiopsis* parasite can be released at a rate of 50/acre as biological pest control measure.

B. Internode Borer

Trichogrammachilonis cards @ 10/acre are distributed in the field with 20m distance between them. Pheromone traps can also be used.

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C. Top Borer

Isotemajavensisrohn parasite is used to control Top Borer.

D. Red Rot

Disease free buds and resistant varieties are used to prevent red rot infection. If diseased the affected clumps are destroyed.

E. Wilt

Healthy buds are selected and crop rotation is done to prevent wilt.

F. Harvest

Desirable levels of sucrose content is observed in the plants during the 10^{th} month of one year crop duration. The canes are harvested within the next 2 months.

III. ROLE IN UPLIFTING ECONOMICS

Under SSI technology of sugarcane planting recorded higher gross return and net return (Rs.2,36,250 and 84,300, respectively) as compared to conventional method of sugarcane planting (Rs. 2,00,250and 30, 950, respectively) (Mohanty *et al.,*2014).

IV. CONCLUSION

Thus SSI method gives the solution for most of the problems faced by the conventional method of cultivation through improved ideas like drip fertigation, Integrated pest management and Integrated nutrient management. It also gives high yield using less inputs. It alleviates the cost strain on farmers and facilitates efficient cultivation, thereby increasing the efficiency of the sugarcane industry as a whole

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