



ICAR CIAE-SBI Mechanization Package for Sustainable Sugarcane Initiative (SSI) through Bud Chip/ Single Bud Propagation

Ravindra Naik^{1*}, Annamalai SJK², Rajendra Prasad N³, Senthilkumar T⁴, Vijayan Nair N⁵, Viswanathan R⁶, Malathi P⁷, Govindaraj P⁸, Bakshi Ram⁹ and Dawn CP Ambrose¹⁰

^{1,10}Principal Scientist (AS& PE), ²Ex - Principal Scientist (FM&P), ⁴Principal Scientist (FM&P),
ICAR – CIAE Regional Centre, Coimbatore

³Ex- Principal Scientist (Seed Technology), ^{6,7}Principal Scientist (Plant Pathology),

^{5,9}Ex -Director, ⁸Principal Scientist (Plant Breeding),

ICAR-Sugarcane Breeding Institute, Coimbatore, Tamil Nadu, India

Corresponding author mail: *naikravindra@gmail.com

Abstract

Sustainable Sugarcane Initiative (SSI) is a method of sugarcane production which uses less seeds, less water and optimum utilization of fertilizers and land to achieve more yields. Sugarcane bud chip planting/ Sugarcane Single bud planting is the latest technique of sugarcane planting, wherein the bud along with a portion of the nodal region is chipped off and planted in portray with Farm Yard Manure (FYM), soil and sand. This technology is going to be in great demand for successful SSI method of sugarcane cultivation. Package of equipment for Bud chip/ single bud planting of sugarcane was developed by ICAR Central Institute of Agricultural Engineering- Regional Centre, Coimbatore, Tamil Nadu, India in collaboration with ICAR Sugarcane Breeding Institute, Coimbatore, Tamil Nadu, India. The package of equipment consists of equipment for removal or scooping of bud chip from sugarcane, equipment for single bud cutting, equipment for portray filling for sugarcane bud chips, Protocol for Storage and transportation of sugarcane bud chips, mechanization package for effective fungicidal treatment for sugarcane bud chips, mechanized Planting of sugarcane bud chip settlings grown in portrays and Elevated Hybridization Runways (EHR) Facility. The equipment can be adopted in total or selected equipment/protocol can be used based on the mechanization requirement for Sustainable Sugarcane Initiative (SSI). On an average, there is a savings of about Rs 15000 per ha if the developed mechanization package is used. Apart from this, there will be savings of about 90 percent of the cane material, which can be used for sugar/jaggery industry. Cost economic analysis revealed significant saving in cost and labour over traditional planting of Sustainable Sugarcane Initiative (SSI). The biometric parameters viz., diameter of the cane, cane height, single cane weight, juice content and yield of sugarcane settlings raised using Mechanization package were on par with the manually planted sugarcane settlings. Similarly, the juice quality of sugarcane from planted settling in terms of brix, CCS, sucrose and purity using mechanization package was on par with sugarcane from manual method at the time of harvest.

Key words: Sugarcane, Sustainable Sugarcane initiative, Bud chipping, Single Bud cutting, Low pressure Treatment, Mechanized planting, Elevated Hybridization Runways

Introduction

The conventional method of planting of sugarcane, using stalk cuttings (setts), is gradually becoming uneconomical as the cost of “Seed Cane” used for replanting accounts for about 20 per cent of the total cost of production. In the conventional system prevailing in India, about 10 tonnes seed cane / ha (nearly 10% of total produce) is used as planting material.

Of late, there has been a lot of emphasis on Sustainable Sugarcane Agriculture. Sustainable Sugarcane Initiative (SSI) now recommended in many states, aims at reducing the use of seed, water besides optimizing the use of fertilizers and land to achieve higher yields. SSI is an alternative to the conventional seed, water and space - intensive sugarcane cultivation. Use of single bud grown in portrays is the single major intervention for successful SSI.

This large quantity of planting material poses a great problem in pretreatment, transport, handling and storage of seed cane and can undergo rapid deterioration thus reducing the viability of the buds and subsequently their sprouting. In view of this, the scope for adoption of bud chip technology for large scale of propagation of sugarcane was realized and is becoming increasingly popular. Production of bud chips, effective treatment of budchips, raising of bud chip nurseries, transplanting of bud chip plants etc manually needs considerable time and resources and are serious deterrents in the popularization of the bud chip technology. The mechanization package for sugarcane bud chip planting been developed by Central Institute of Agricultural Engineering-Regional centre, Coimbatore, Tamil Nadu in collaboration with Sugarcane Breeding Institute, Coimbatore, Tamil Nadu. For effective large scale propagation of sugarcane bud chip technology, there was an urgent need for mechanization.

Methods

The following equipment / technology have been used. The conventional method of planting of sugarcane, using stalk cuttings (setts), is gradually becoming uneconomical as the cost of "Seed Cane" used for replanting accounts for about 20 per cent of the total cost of production. In the conventional system prevailing in India, about 10 tonnes seed cane / ha (nearly 10% of total produce) is used as planting material.

Of late, there has been a lot of emphasis on Sustainable Sugarcane Agriculture. Sustainable Sugarcane Initiative (SSI) now recommended in many states, aims at reducing the use of seed, water besides optimizing the use of fertilizers and land to achieve higher yields. SSI is an alternative to the conventional seed, water and space - intensive sugarcane cultivation. Use of single bud grown in protrays is the single major intervention for successful SSI.

This large quantity of planting material poses a great problem in pretreatment, transport, handling and storage of seed cane and can undergo rapid deterioration thus reducing the viability of the buds and subsequently their sprouting. In view of this, the scope for adoption of bud chip technology for large scale of propagation of sugarcane was realized and is becoming increasingly popular. Production of bud chips, effective treatment of budchips, raising of bud chip nurseries, transplanting of bud chip plants etc.

manually needs considerable time and resources and are serious deterrents in the popularization of the bud chip technology. The mechanization package for sugarcane bud chip planting been developed by ICAR Central Institute of Agricultural Engineering-Regional centre, Coimbatore, Tamil Nadu in collaboration with ICAR Sugarcane Breeding Institute, Coimbatore, Tamil Nadu. For effective large scale propagation of sugarcane bud chip technology, there was an urgent need for mechanization.

Results

The following equipment / technology have been developed, evaluated, popularized in collaboration with the agricultural machinery manufacturers.

- a. Removal or scooping of bud chip from sugarcane: Three models of sugarcane bud chipping viz., pedal operated, pneumatic and motorized models
- b. Equipment for single bud cutting
- c. Equipment for portray filling for sugarcane bud chips
- d. Protocol for Storage and transportation of sugarcane bud chips
- e. Mechanization package for effective fungicidal treatment for sugarcane bud chips
- f. Mechanized Planting of sugarcane bud chip settlings grown in protrays
- g. Elevated Hybridization Runways (EHR) Facility

On an average, there is a savings of about Rs 15000 per ha if the developed mechanization package is used. Apart from this, there will be savings of about 90 percent of the cane material, which can be used for sugar/jaggery industry. The indirect benefit of development of industries involved in fabrication of agricultural equipment is going to add to the overall impact seen from the production, productivity and profitability by adopting the sugarcane bud chip technology.

The package of equipment has become popular and widely accepted by various sugarcane mills, farmers and entrepreneurs. Four patents have been filed by the team. Based on the success of the package of equipment technology developed by the interdisciplinary team for propagation of sugarcane bud chip technology, the technology is being adopted for sugarcane single bud, which is also fast catching up.



Figure 1: Mechanization package for Bud chip propagation in Sugarcane for SSI



Figure 2: Mechanization package for single bud propagation in Sugarcane for SSI

Conclusions

Sustainable Sugarcane Initiative (SSI) is a technology which is being adopted by large farming community in India which uses less seeds, less water and optimum use of input resources with higher economic returns. Use of sugarcane bud chip/ Single bud technology is a revolutionary step towards successful adoption of SSI. To mechanize various operations, package of equipment has been developed, evaluated and commercialized. The cost economic studies revealed that this equipment were more economic in operation, leading to significant saving in cost and time. This equipment is a boon to entrepreneurs who are involved in large scale production of the sugarcane bud chip nursery with an aim to undertake the Sustainable Sugarcane initiative programme in Indian Scenario.

References

Annamalai SJK, N Vijayan Nair, N Rajendra Prasad and Ravindra Naik. 2011. Final project report on Development of bud chipping machine for and mechanical planter

for seedlings in polybags raised from sugarcane bud chips, Central Institute of Agricultural Engineering, Nabibagh, Bhopal, India. pp.125

Annamalai SJK, Ravindra Naik, N Vijayan Nair and Rajendra Prasad. 2012. Development of row mechanical planter for settling in ploy bags/ protrays raised from sugarcane chid chips. At the International Symposium on New Paradigms in Sugarcane Research organized by Society for Sugarcane research and Development (SSRD) and SBI Coimbatore from the 15th to 18th of October 2012. Published by SSRD, Coimbatore, India. Edited by Viswanathan et. al. pp 143-144.

Malathi P, R Vishwanathan, Ravindra Naik, A Ramesh Sundar, T Rajula Shanthly, A Vennila and T Ramasubramanian. 2022a. Sett treatment Device. An effective way to deliver agro inputs for planting materials of Sugarcane. Extension Publication No 301(2022). Pubshised by Director, ICAR Sugarcane Breeding Institute, Coimbatore

Malathi P, R Vishwanathan, Ravindra Naik, A Ramesh Sundar, T Rajula Shanthly, A Vennila and T Ramasubramanian. 2022b. Sett treatment Device. Extension Publication No 326(2022). Published by Director, ICAR Sugarcane Breeding Institute, Coimbatore

Ravindra Naik, SJK Annamalai, N Vijayan Nair and Rajendra Prasad. 2012. Mechanization devices for chipping sugarcane bud chips from sugarcane – A step ahead for entrepreneurship in sustainable sugar initiatives. At the International Symposium on New Paradigms in Sugarcane Research organized by Society for Sugarcane research and Development (SSRD) and SBI Coimbatore, India from the 15th to 18th of October 2012. Published by SSRD, Coimbatore. Edited by Viswanathan et al., pp 156-157.

Ravindra Naik, SJK Annamalai, N Vijayan Nair and Rajendra Prasad. 2013. Studies on Mechanisation of Planting of Sugarcane Bud Chip Settlings Raised in Protrays. *Sugar Tech.* 15(1):27-35.

Ravindra Naik, Annamalai SJK, Vijayan Nair N and Rajendra Prasad. 2015. Mechanization Package for Chipping and Planting of Sugarcane Bud Chips Grown in Protrays for Sustainable Sugarcane Initiative in India. *Agricultural Mechanization in Asia, Africa and Latin America*, 46 (4):14-21

Vijayan Nair N, Govindaraj P, Annamalai SJK and Ravindra Naik. 2013. Elevated Hybridization runway: An improved method for sugarcane hybridization programme. *Journal of Sugarcane Research*, 3(1): 41-46