SORF: A Multi-purpose Machine for Ratoon Sugarcane

BOON FOR FARMERS AND ENVIRONMENTAL PROTECTION

Developed by

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Boon for farmers and environmental protection

The Stubble shaver, Off-bar, Root pruner cum Fertilizer drill (SORF) machine up-graded by the National Institute of Abiotic Stress Management (NIASM), Baramati, has the potential to generate additional net profit of Rs. 6.75-12.50 thousand crore per annum from ratoon sugarcane cultivation in the country in addition to improving soil health and reducing emission of GHGs and environmental pollution, would bring livelihood security and prosperity to millions of sugarcane growers and sugarcane based industries.

Preamble

Sugarcane is one of the important cash crops in India, contributing around 10% of gross value of the agricultural GDP and provides livelihood to 7.5 million cane growers, occupies around 5.0 million hectare area. Its average productivity is about 70 t ha^{-1} and its ratoon crop that is cultivated on half the total sugarcane area, yields 20–25 % less than the plant crop mainly due to lack of machinery for proper placement of fertilizers, and poor acquisition and utilization of nutrients by the older roots and higher mortality of tillers. Therefore, practices should aim at inducing fresh finer roots and healthier tillers, in addition to surface retention of trash to act as mulch for better hydro-thermal regimes and placement of fertilizers closer to newer roots. However, farmers usually burn the trash because of constraints in fertilizer placement and other intercultural operations (Fig. 1), results in loss of organic carbon, plant nutrients, soil biota besides the environmental and health hazards due to release of soot particles, smoke and green-house gases. *In-situ* retention of sugarcane trash can play an important role in replenishing soil quality and reducing environmental pollution, but there is a lack of suitable machine for placement of fertilizers. To address these issues, a machine developed by ICAR-IISR, Lucknow, has been up-graded with the inclusion of robust power transmission system, larger capacity fertilizer box and root pruning mechanisms to perform multiple operations like stubble shaving, off-barring, root pruning and placement of basal dose of fertilizers in one go while retaining the trash at the soil surface. The machine is nicknamed as “SORF”.

Fig 1. Trash burning- a common practice

Important Features of SORF Machine

The SORF Machine is suitable to perform four major operations in a single run which are as follows (Fig. 2):

1. **Placement of fertilizers:** A fertilizer drill attachment is utilized for band placement of fertilizer near the root zone of ratoon sugarcane while retaining the trash at the surface.
2. **Stubble shaving:** Un-even stubbles which are left in the field after manual harvesting of sugarcane are cut very sharply at a uniform height close to the soil surface with a stubble shaver.
3. **Off-barring:** Adjustable vertical off-barring discs cut the raised bed partially from outer sides and spread the cut soil over the chopped trash to accelerate its decomposition.
4. **Root pruning:** The side older roots of ratoon sugarcane are pruned to stimulate in fresh root growth. The slush of newly developed roots promotes the uptake of water and nutrients for boosting initial growth of ratoon sugarcane.

Fig 2. Ratoon management by SORF machine

Impact of SORF Machine

With the use of SORF machine, ratoon cane yield improved by 10-38% (Fig. 3 & 4) while net profit of farmers improved by Rs. 27,000 to 50,000 per hectare. Keeping in mind around 2.5 million hectare area under ratoon crop, it is estimated that approximately Rs. 6.75-12.50 thousand crore per annum could be earned as an additional net profit by the farmers. Similarly, in the era of water scarcity and higher input costs, 6-21% irrigation water and 20-25 % fertilizers could be saved with the use of SORF machine. This machine can perform the ratoon management operations under surface trash retained field conditions, thus trash burning which creates environmental pollution could be avoided. *In-situ* retention of trash in the field sequestered the carbon and improved the soil health in long run. Band placement of fertilizer-N not only improved the NUE (13 %) but also reduced the ammonia volatilization losses and N_2O emission 15-20%, later is 310 times more potent green-house gas than the CO_2.

Ratoon crop managed by SORF machine Ratoon crop managed by conventional practice

Fig 3. Crop performances (plant height and greenness) under SORF machine and conventional practices of ratoon management at farmers' field.

Considering the benefits of the SORF machine, it was imperative to reach the technology at sugarcane growers. Therefore, in order to make farmers aware about this technology, many on-farm demonstrations were performed at farmers' fields (Fig. 5). The technology not only benefited the sugarcane growers but also the machinery manufacturers and sugar industries.

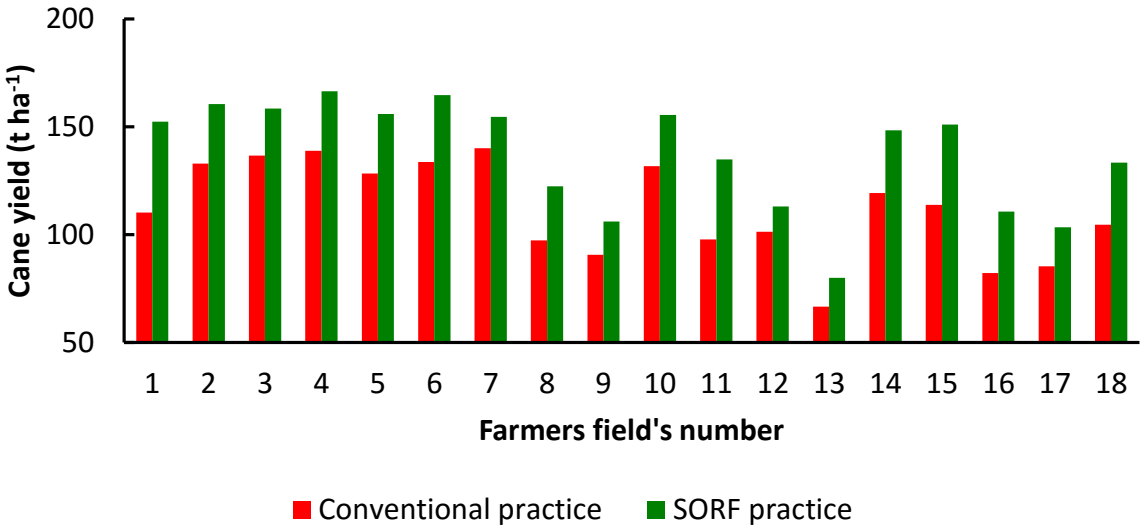

Fig 4. Cane yield improved with SORF machine as compared to conventional practices of ratoon management at farmers' fields.

Fig 5. Demonstration of SORF Machine at Farmer's Fields.

Conclusion

The Stubble shaver, Off-bar, Root pruner cum Fertilizer drill (SORF) machine, is one of the revolutionary development for ratoon sugarcane which enhanced the input-use efficiency, crop productivity and profitability of the sugarcane growers, in addition to reducing the environmental pollution by avoiding the trash burning and reduced emissions of GHGs. Further, with improved soil health and carbon sequestration through residue retention, it has potential to address the adverse effects of climate change in long run.

Sugarcane: the only source of sweetness in the country

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