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SUCCESS STORY

Transforming waste to wealth with the tractor-operated banana stem shredder

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Situation Analysis / Problem Statement

Ahilyanagar is a major hub for banana cultivation in Western Maharashtra, particularly in the Nevasa, and Shevgaon block village's approximately over 4500 hectares area. After harvesting of Banana, farmers are left with 60–80 tonnes of pseudo stem waste per hectare. Traditionally, disposal of these stems is a "double loss" for farmers. Farmers used to spend Rs.8,000 – Rs. 10,000 per hectare on intensive manual labor to physically uproot, chop, and transport the bulky pseudo stems out of the field.

Productivity & Quality: The slow-decaying stumps became breeding grounds for the Banana insect and fungal pathogens, leading to a 15–20% decline in the quality of subsequent crops.

Resource Depletion: Despite the availability of irrigation from the Mula and Nathsagar backwater the intensive cropping cycles led to a decline in Soil Organic Carbon (SOC) content and a high dependency on chemical fertilizers.

Plan, Implement, and Support

KVK Dahigaon-ne Ahilyanagar-II intervened by introducing the tractor-operated banana shredder as a sustainable alternative. On Farm Testing (OFT) were conducted across 30 major clusters. Farmers witnessed the machine pulverizing a stem into fine flakes. A heavy-duty, tractor operated PTO-driven shredder was promoted for in-situ incorporation of stubble's, permitting the biomass to decompose directly in the field. KVK scientists also explained the importance biomass incorporation into the soil through training and extension programmed. KVK helped farmers to avail the implement on hiring basis from nearby custom hiring centres.

Output: Performance & Technical Results

The OFT of the tractor operated banana stem shredder resulted in following output:

A. Operational Efficiency

Time Saving: The demonstrated technology resulted in field clearance of 1 hectare in 4-5 hours, representing a 96% reduction in time compared to the 4-5 days required for manual labor in traditional way.

Labor Optimization: Availability of labour for agricultural work is a major problem before the farmers. The introduction of this technology replaced the need for 25 man-days with a single tractor-operated unit.

B. Capacity Building & Knowledge Gain

Imparting of training upgraded the skill adoption of participating farmers who successfully demonstrated the ability to operate the banana shredder and applied bio-decomposing cultures on chopped banana stem for faster decomposition.

Waste Management: Handling of banana stem is a huge problem in field after harvesting the banana crop. It takes so many months to decompose banana waste in traditional way but in demonstrated technique "resource recycling of banana stem waste," is observed by utilizing shredded mulch as a high-quality base for preparing organic compost.

C. Plant Protection & Agronomic Impact

Pest Suppression: Mechanical shredding effectively destroyed the breeding habitat of the Pseudo-stem Borer, resulting in reduction of pest incidence for the subsequent crop cycle.

Soil Health: Improved soil physical properties through enhanced aeration and the incorporation of huge quantity of organic matter into the soil.

D. Productivity & Economic Gain

Yield Increase: Participating farmers recorded

on an average 15% increase in productivity in the succeeding crop, attributed to the immediate nutrient return and improved soil structure.

Cost Reduction: Direct savings in land preparation and labor costs, averaging Rs. 3800 per hectare.

Outcome

Horizontal Spread: The technology has spread to 5 neighboring villages in Newasa, with over 50 farmers adopting mechanical shredding through custom hiring.

Input Reduction: Significant reduction in the use of chemical Potash (MOP) and Nitrogen fertilizers, as the decomposed stems returned roughly Rs.4,500 worth of nutrients back to the soil per hectare.

Economic Status: Participating farmers reported a net saving of Rs. 5000 to Rs. 7000 per hectare (combining saved labor costs and reduced fertilizer needs).

Impact

Macro-Level Change: The adoption of shredders in Newasa has led to a noticeable shift toward "Zero-Burn" agriculture, contributing to the district's environmental goals.

Institutional Development: Seeing the demand, two Farmers have purchased the Banana stem shredder implement, creating local employment.

Social/Environmental Benefit: Reduced labor drudgery has allowed farmers to focus on farm waste management. Environmentally, the increase in soil organic carbon has improved the crop's tolerance to dry spells (drought resilience) by increasing the water-holding capacity of the soil. The details of comparative study are given as follows: -

Table 1. Banana Stem Shredder vs. Traditional farmers practice of manual disposal

Sr. No.	Parameter	Tractor Operated Banana Shredder	Traditional farmers practice
1.	Operation time (hrs/ha)	4 hrs. 15 minutes per ha	200 hrs/ha
2.	Operation cost (Rs/ha)	Rs. 3725	Rs. 7500
3.	Land Preparation	Immediately land is available for next crop	Land availability delayed by 1 month
4.	Nutrient Recycling	High	Negligible
5.	Soil Organic Carbon	Positive: Adds 60–70 tonnes of biomass, significantly boosting Soil Organic Carbon. Content and improved environment	Negative: Removal or burning of stems depletes carbon and pollute environment
6.	Irrigation Efficiency	High: Shredded mulch acts as a protective layer, reducing evaporation by 20–25% and addition of soil organic matter improves pulverization of soil.	Low: Bare soil leads to high evaporation and water runoff and also deteriorate quality of soil.
7.	Soil Structure	Improves soil aeration and porosity; increases water-holding capacity.	Becomes compact and dry over a period of time.



Fig. 1. Tractor operated banana stem shredder operation



Fig. 2. Farmers traditional practice of manual disposal of banana stem