

## Management of Crop Stubbles after Harvesting of Kharif & Rabi Crop

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After harvesting crops such as paddy, wheat, and other cereals, the leftover stalks that remain in the field are known as stubble. When modern machines like harvesters or reapers are used, a considerable amount of crop residue is left behind. Because there is very little time between the harvesting of paddy and the sowing of wheat, farmers often resort to burning the stubble to clear their fields quickly. This practice has become a serious problem in several regions of India.



### Straw Management

Burning crop residue has harmful effects on human health and the environment. Straw management refers to the scientific and eco-friendly use of crop residue instead of burning it. This includes using stubble as animal feed, cutting and mixing it into the soil using agricultural machinery, or allowing it to decompose naturally to form organic manure within the field.

### Harmful Effects of Straw Burning

#### 1. Environmental Damage

Stubble burning releases poisonous gases such as carbon monoxide, methane, volatile organic compounds, and polycyclic aromatic hydrocarbons. These emissions form dense smog, reduce air quality, and cause severe respiratory and other health problems.

#### 2. Impact on Soil Health

The intense heat produced during burning raises soil temperature and destroys beneficial microorganisms. Soil organisms like bacteria, fungi, algae, and protozoa play a crucial role in nutrient recycling by decomposing nitrogen, carbon, and phosphorus compounds. Continuous burning

reduces microbial population, lowers soil organic matter, and negatively affects root development and crop productivity.

### Straw Management Methods

- Straw management is mainly carried out through two approaches:
- Mixing stubble into the soil
- Removing stubble from the field

#### 1. Incorporation of Stubble into Soil

##### a) Mulcher

A mulcher is a farm implement used to cut crop residue into very small pieces and spread them evenly across the field. The chopped straw gradually decomposes and enriches the soil with organic matter. Mulching helps retain soil moisture, reduces erosion, and improves soil fertility.

##### b) Happy Seeder

The Happy Seeder is an advanced agricultural machine that allows direct sowing of crops like wheat without ploughing and without removing or burning stubble.

#### Advantages of the Happy Seeder:

- Prevents stubble burning
- Saves fuel, labor, time, and money
- Preserves soil moisture
- Reduces weed growth and soil erosion
- Working of the Happy Seeder:

Attached to a tractor, the front-mounted rotavator cuts and manages the crop residue, while the rear-mounted zero-till drill places seeds and fertilizer into the soil. The residue remains on the surface, conserving moisture and improving soil organic content.

##### c) Super Seeder

The Super Seeder performs multiple operations such as cutting stubble, light tillage, seed sowing, and covering seeds in one pass. It is mainly used for wheat sowing after paddy harvesting.

#### Functioning of the Super Seeder:

The machine cuts the residue, mixes it with the soil, levels the land, and sows seeds at proper depth and spacing. This method reduces pollution, saves labor, and enhances soil fertility.

**d) Bio-Decomposer (Pusa Bio-Enzyme):** Pusa Bio-Decomposer, developed by IARI, is a biological solution that speeds up the decomposition of crop residue.

**Method of Application (per hectare):**

- 4 bio-decomposer capsules
- 150 g jaggery
- 50 g gram flour
- 25 liters of water

The jaggery is dissolved in water and cooled. Gram flour and bio-capsules are added, and the mixture is kept warm for 5–10 days. The solution is then diluted and sprayed on the field, followed by rotavator operation. The residue decomposes into manure within 20–25 days.

**Benefits:**

- Low-cost stubble management
- Improves soil fertility
- Acts as organic manure
- Helps control soil-borne pests and diseases

**e) Use of Urea**

Applying urea to stubble before ploughing accelerates decomposition and reduces the need for residue burning.

**2. Removal of Stubble from the Field****a) Baler**

A baler compresses straw into bundles, which can be used as animal feed or sold for biomass energy.

**b) Straw Reaper**

A straw reaper converts stubble into straw suitable for livestock feed or bedding.

**c) Mulching**

Mulching helps suppress weeds, conserve moisture, and improve crop growth.

**d) Straw Banks:** Straw can be collected and stored in straw banks for use in biogas plants, biomass power generation, thermal power plant co-firing, and 2G ethanol production. It

can also be processed into eco-friendly products such as paper, packaging materials, and decorative items.

**e) Palletisation**

In pelletisation, paddy straw is compressed into dense pellets, making storage and transportation easier.

**Advantages of Palletisation:**

- Higher density reduces storage and transport costs
- Better burning efficiency due to lower moisture content
- Pelletised straw serves as a renewable energy source, reduces agricultural waste, and provides additional income opportunities. It is widely used in biofuel production, paper industries, and biomass-based power generation.

**Conclusion**

Effective straw management eliminates the need for stubble burning, protects the environment, improves soil health, and creates economic benefits for farmers. By adopting sustainable practices, crop residue can be transformed into valuable resources, ensuring cleaner air and sustainable agriculture.

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