

Happy Seeder: Technology to Stop Stubble Burning

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ARTICLE ID: 36

Concern:

The months of October and November are the worst for residents of the National Capital Region of India. Smog steadily drifts in and remains around throughout winter, raising particulate matter (PM) levels to dangerous levels. Patients with respiratory difficulties are crowding hospitals. Every year, the Delhi government appeals neighbouring states Haryana and Punjab to prohibit stubble burning, which is a major contributor to winter pollution? It is responsible for about 60% of Delhi's smog during the last 3-4 years.

Stubble burning:

Stubble or *Parali* burning is a method of removing paddy crop residues from the field to sow wheat from the last week of September to November, coinciding with the withdrawal of southwest monsoon. Stubble burning is a process of setting on fire the straw stubble, left after the harvesting of grains, like paddy, wheat, etc. It is usually required in areas that use the combined harvesting method which leaves crop residue behind. It is a common practice in October and November across North West India, but primarily in Punjab, Haryana, and Uttar Pradesh.



Figure 1: Stubble burning

Effects of stubble burning:

- ✚ **Pollution:** Emits large amounts of toxic pollutants in the atmosphere which contain harmful gases like methane (CH₄), Carbon Monoxide (CO), Volatile Organic compounds (VOC) and carcinogenic polycyclic aromatic hydrocarbons. These pollutants disperse in the surroundings, may undergo a physical and chemical transformation and eventually adversely affect human health by causing a thick blanket of smog.
- ✚ **Reduction in soil fertility:** Burning reduces fertility. Organic matter can be added through proper management of stubble.
- ✚ **Damage to soil microbes:** The heat generated by stubble burning leads to the loss of moisture and useful microbes.
- ✚ **Toxic to health:** Harmful gases emitted are toxic to human beings and animals.
- ✚ **Damage to atmosphere:** Harmful gases imbalance the concentration of gases.

Happy Seeder Technology:

The Happy Seeder is a tractor-mounted machine that cuts and lifts rice straw, sows wheat into the soil, then mulches the sown area with the straw. It was developed by the Punjab Agriculture University (PAU) in collaboration with Australian Centre for International Agri Research (ACIAR). It is also known as Turbo Happy Seeder. It was developed in 2002, the PAU officially recommended it to farmers in 2005-06 and it made to the markets in 2006. It costs around 1.5 lac to 1.75 lac Rupees. It requires a minimum of 50-55 HP tractor to operate.

Components of Happy Seeder:

It consists of a seed box, fertilizer box, seed and fertilizer metering mechanisms, furrow opener tynes, PTO drive gear box, cutter blades mounted on a shaft, drive wheel and adjustable depth wheels. The sowing depth can be adjusted by depth wheel. Cutter blades shred crop residue and forged tynes make furrow for sowing seeds on straw free residue seed bed. Cutter blades cut residue and make it fit to be absorbed in soil as organic mass.



figure2: Major components of Happy Seeder

Mechanisms of Happy Seeder:

- 1. Metering mechanism for seed:** Fluted rollers which are traditionally used on conventional seed drill are used in Happy seeder for metering of seeding. Fluted roller is attached to a shaft which is powered by ground wheel through a set of chain sprocket system. As the Happy seeder moves the ground power wheel powers the shaft and fluted rollers rotate, thus delivering the seed to the furrow openers through the pipes.

 - ✚ **Seed rate adjusting lever:** This lever is used to *adjust the seed rate*. A scale is provided which helps in increasing or decreasing the rate.
 - ✚ **Seed pipe:** It is used to take the seed from flow control tongue to the seed boot.
 - ✚ **Seed boot:** Seed boot drops the seed into the slit in the soil opened by the furrow opener.
- 2. Fertilizer metering system:** The fertilizer metering systems control the rate of fertilizer application in the field. A lever is used to adjust the fertilizer rate. The roller fitted on the shaft make the fertilizer to pass through an opening in the seed box. The opened area makes way for the fertilizer to move down through the pipes to the boot and then to the furrows.

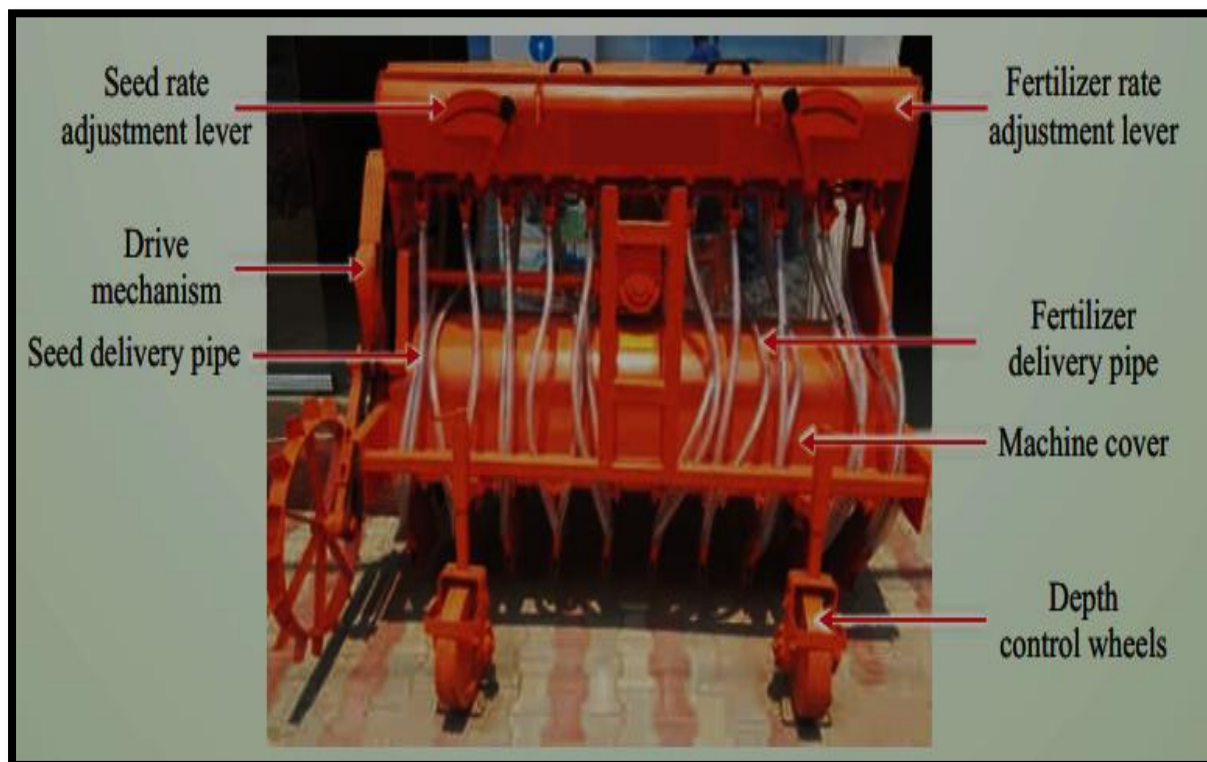


Figure 3: Mechanisms of Happy Seeder

Advantages of Happy Seeder:

Majority of the residue is not disturbed and seed is sown in a single pass. The happy seeder technology is eco-friendly with environment for the health of soil as well as it also saves water. It also removes the need to burn rice stubble before planting wheat, therefore reducing air pollution. Direct sowing also reduces soil disturbance, enabling it to retain more nutrients, moisture and organic content. It also saves money as less time is needed to carry out field operations, which in turn reduces fuel and labour costs.

Issues:

Delhi's Pollution always in news due to stubble burning

According to the Commission for Air Quality Management (CAQM), fire count from Stubble Burning in Delhi and the NCR (National Capital Region) has reduced by 31.5% in 2022 as compared to 2021. As compared to 2021, stubble burning decreased in Punjab, Haryana, and Uttar Pradesh by 30%, 47.60%, and 21.435% respectively in 2022. The fire counts are based on information from NASA (National Aeronautics and Space Administration) Satellites.



Figure 4: Delhi in news always

Way forward:

The NGT (as of April 2023) has started imposing fines of between Rs 2500 and Rs 5,000, Rs 7,500, and Rs 15,000 for properties larger than 10 acres for stubble burning. In 2021, there were 86,000 reported stubble fires, with Punjab accounting for 71,304 of those. The number decreased to about 54,000 in 2022, but the issue is still difficult because 40–50% of crop residue is still burned. Punjab saw a rise in paddy production area from 29.6 million acres in 2021 to 3.14 million acres in 2022. As a result, it is probable that Punjab produced 19.99 million tonnes of straw total in 2022 as opposed to 18.74 million tonnes in 2021. Section 188 of the Indian Penal Code (IPC) makes stubble burning a crime. Additionally, it was notified as an offence under the Air (Prevention and Control of Pollution) Act, 1981. Despite being banned, the practice continues in India, where farmers cite a lack of viable alternatives to clear their fields of stubble.