



## Transforming Crop Residue into Sustainable Solutions

This editorial is based on “[Don't waste crop residue](#)” which was published in The Hindu Business Line on 07/11/2023. It argues that crop residue burning is a major source of air pollution in India, especially in the northern states. It suggests some alternative ways of using crop residues, such as converting them into biofuels, compost, or animal feed.

**For Prelims:** [Volatile organic compounds \(NMVOC\)](#), [Green credit programme \(GCP\)](#) [Compressed biogas \(CBG\)](#), [Waste to Energy \(WTE\) Programme](#), [GOBARdhan scheme](#)

**For Mains:** Reasons behind Crop Residue Burning, Problems Posed by Crop Residue Burning, Measures to Reduce Crop Residue Burning

For the past sixty years, [Indian agriculture](#) has mainly concentrated on increasing crop production without paying much attention to managing crops after harvesting. Consequently, the development of effective value chains for agricultural products has been limited while there has been almost no development of value chains for by-products and crop residue.

Additionally, **due to the growing demand for producing more crops in a year, it has become common practice to consider crop residue as waste and burn it for quick disposal.**

As a result, it has become a significant and pressing matter in current policy discussions. **Burning crop residue not only results in the loss of valuable biomass but also contributes significantly to the increase of [Greenhouse Gas Emissions \(GHEs\)](#) and [pollution](#).**

On average, **India produces about 650 million tonnes** of crop residue per year according to a Working Paper published by [NITI Aayog](#) in July 2023.

### What are the Primary Reasons behind Crop Residue Burning?

- **Short Time Interval Between Rice Harvesting and Wheat Sowing:** The tight time frame between [rice harvesting](#) and [wheat sowing](#) restricts farmers from exploring alternative methods of crop residue disposal. This rush may lead them to opt for quicker, albeit environmentally harmful, solutions like burning.
- **Increased Use of Combine Harvesters:** The widespread adoption of **combine harvesters** contributes to the challenge of [stubble management](#). These machines leave behind a significant amount of stubble, **which proves arduous to manually or mechanically remove**. This leftover residue adds to the incentive for farmers to resort to burning as a quick solution.
- **Lack of Adequate Alternatives for Crop Residue Management:** The absence of affordable and viable alternatives, such as **composting, mulching, incorporation, or conversion to bioenergy**, further exacerbates the problem. Without accessible options, farmers may find themselves compelled to resort to the seemingly convenient method of burning.

- **Low Nutritional Value and Palatability of Rice Straw:** The nutritional inadequacy and unpalatability of rice straw **make it an unsuitable option for animal feed.** This limitation reduces the avenues for utilizing crop residues beneficially, pushing farmers toward disposal methods like burning, despite the associated environmental consequences.
- **Economic and Social Factors:** Various economic and social factors contribute to the prevalence of crop residue burning. **Labour scarcity, resource constraints, and peer pressure create an environment where farmers may prioritize immediate, cost-effective solutions over long-term sustainable practices.** Additionally, a lack of awareness about the detrimental impacts of burning further perpetuates this cycle.

## What are the Problems Posed by Crop Residue Burning?

- **Environmental Degradation:** Crop residue burning contributes to environmental degradation by releasing harmful pollutants into the air, soil, and water.
  - The burning of crop residues releases large amounts of carbon dioxide, methane, and other **greenhouse gases** into the atmosphere, contributing to global warming.
  - It also leads to the loss of plant essential nutrients from the field, loss of organic carbon, and loss of plant residues on the soil surface to protect against soil erosion.
  - According to the **Food and Agriculture Organization** Corporate Statistical Database (FAOSTAT), **crop residue burning in India contributed to about 23 million tonnes of CO<sub>2</sub> equivalent emissions in 2020.**
- **Biodiversity Degradation:** It reduces the biodiversity of the agricultural lands by killing beneficial microorganisms, insects, and plants. This can affect the natural balance of the ecosystem and make the crops more vulnerable to pests and diseases.
- **Soil Degradation:** Crop residue burning can lead to soil degradation by reducing soil fertility and killing beneficial microorganisms.
  - Burning crop residues **destroys essential nutrients** such as **nitrogen, phosphorus,** and potassium, which would have otherwise returned to the soil.
  - This can lead to a decrease in soil fertility and crop yields over time.
- **Contribution to Air Pollution:** CRB releases large amounts of **particulate matter (PM), carbon monoxide (CO), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), ammonia (NH<sub>3</sub>),** and non-methane **volatile organic compounds (NMVOC)** into the atmosphere.
  - These pollutants can cause respiratory problems, cardiovascular diseases, cancer, and premature death for people who are exposed to them.

## What should be done to Reduce Crop Residue Burning?

- **Use Crop Residue for Clean Energy:** Crop residue can be efficiently **used for producing clean renewable energy** instead of wasting it by burning.
  - As per a report by the Centre for Science and Environment, about **10 kg of agricultural residue can generate 1 kg of compressed biogas.**
  - Towards this, there is an **urgent need for necessary policy measures to promote circular agriculture that may not only help in reducing emissions, but also fetch additional income to farmers** by creating a value chain for crop residues.
- **Promote Circular Agriculture:** Indian agriculture has traditionally been circular with efficient on-farm management of crop residue for restoration of soil organic nutrients and off-farm management by turning it into fodder, thatches, mulches, organic manure, etc.
  - However, with **increasing intensive crop production practices,** farmers are **not finding on-farm residue management as an economical option** and opting to burn the residue.
  - Under such a scenario, circular agriculture can be promoted in two ways with appropriate incentives:
    - **On-farm management** of crop residues by incentivising individual farmers with schemes like **Green Credit Programme (GCP).**
    - **Off-farm management,** either at farmer or village level through **cooperatives** or at commercial level by creating a value chain for crop residue as feedstock for **biogas production.**
- **Promoting Bio-CNG Production:** Globally, commercial production of **bio-CNG or compressed biogas (CBG)** is picking up as one of the clean and renewable energy sources for energy. In India,

several schemes were announced to promote biogas production over the past 40 years or so but, **the progress has remained muted.**

- Nevertheless, the latest initiative of allocating ₹10,000 crore in **Budget 2023-24** to install 500 new bio-CNG plants under **GOBARdhan scheme** can be a potential step towards creating a viable value chain for crop residue as feedstock.

- **Effective Implementation of Waste to Energy (WTE) Programme:** **Waste to Energy (WTE) Programme** is also operational with about 90 WTE projects under implementation till March 2023. In order to be successful, **such initiatives require effective implementation**, creating widespread awareness and facilitating adequate flow of finance.
- **Biogas Plants in Rural Areas:** Emphasize the establishment of biogas plants in rural areas. This not only contributes to **renewable energy** production but also generates significant non-farm rural employment opportunities, addressing economic aspects.

## Conclusion

There is an urgent need to promote circular agriculture for efficient use of crop residues towards reducing emissions and enhancing renewable energy production, while providing economically profitable alternatives that may fetch additional income for farmers.

### **Drishti Mains Question:**

Q. Discuss the challenges associated with crop residue burning in Indian agriculture and propose comprehensive strategies to address the issue, emphasizing the role of circular agriculture, bio-CNG production, and sustainable rural development.

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