

INDIA'S BURNING ISSUE

Cracking the code of
 stubble burning



Every year during October and November farmers of north-west India burn an estimated 30-40 million tonnes of crop residue from their paddy fields after harvesting. And as the new season of crop burning gets under way, it raises the inevitable question – what will be its impact on the air quality and people’s health? The perturbation brought about by air pollution, aggravated health conditions, and regulatory limitations become an active part of the news cycle for those couple of months. The seasonal deluge of millions of tonnes of biomass causes social, technological, logistical and legal challenges in U.P, Punjab, Haryana and Rajasthan.

Production quantity of rice and paddy straw

The production of rice in India is 104.80 million tonnes, which is grown in 43.86 million ha area. A major share of rice is cultivated during Kharif season (starts from June and ends in September). A small share of rice is grown in Rabi season (the summer season between March and May) with assured irrigation. Indian rice production largely depends on monsoon rains and only 59 per cent rice area has assured irrigation.

Table 1. The estimation of paddy straw production in four states Punjab, Haryana, Uttar Pradesh and Rajasthan

States	Area under paddy cultivation [million ha]	Productivity (grain) [Tonne/ha]	Estimated straw production [million tonne/year]
Punjab	2.98	3.97	19.70
Haryana	1.35	3.07	6.86
Uttar Pradesh	5.87	2.13	20.67
Rajasthan	0.34	1.82	0.56

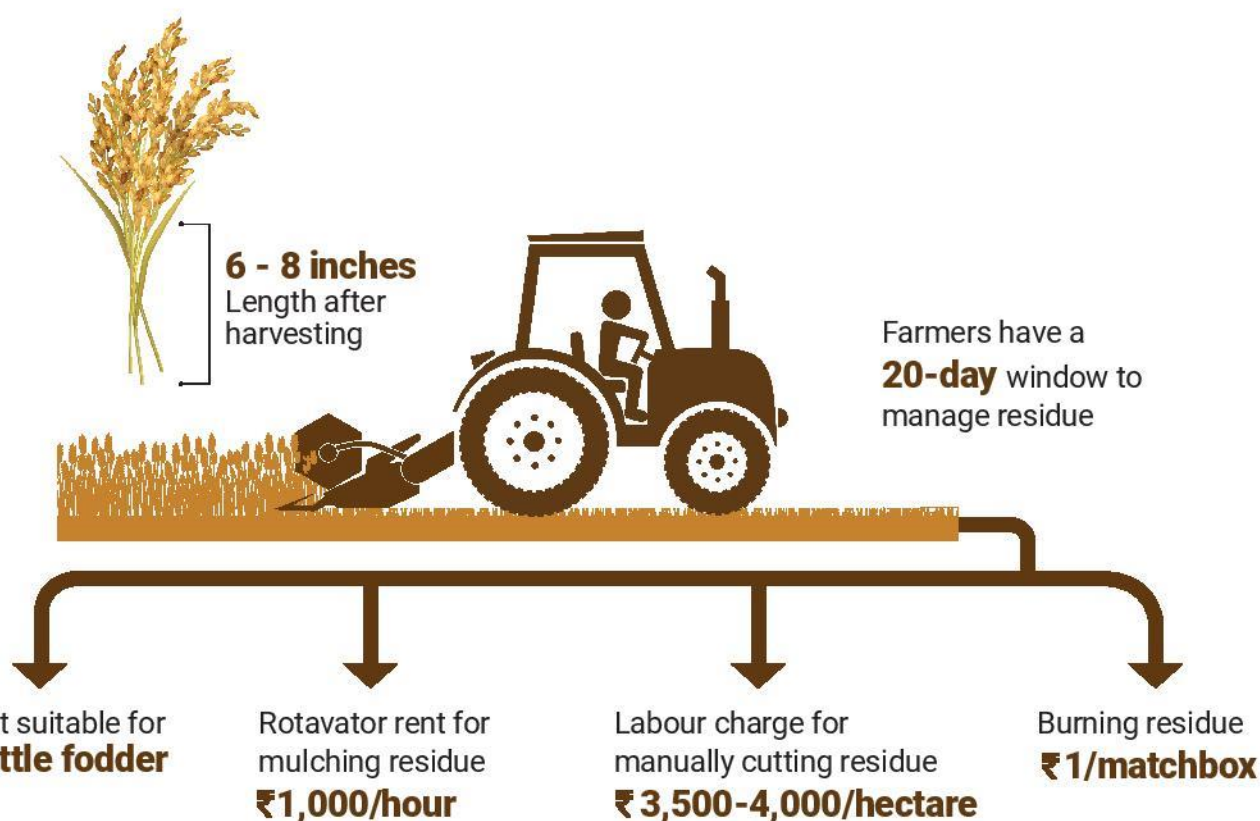
Source: NITI Aayog report, Action plan for biomass management

Table 2. The sowing / harvesting period of rice and estimated straw production

States	Harvesting	Estimated straw production [million tonne/year]
Punjab	September - November	19.70
Haryana	September - November	6.86
Western U.P	September - November	Data unavailable
Rajasthan	October - December	0.56

Reasons why farmers choose to burn the paddy

In 2017, Punjab reported over 44,000 paddy-straw burning incidents, while 25,000 incidents were recorded in neighbouring Haryana. In 2018, this became 42,126 for Punjab till November 11, while in Haryana, 7,454 incidents were reported.



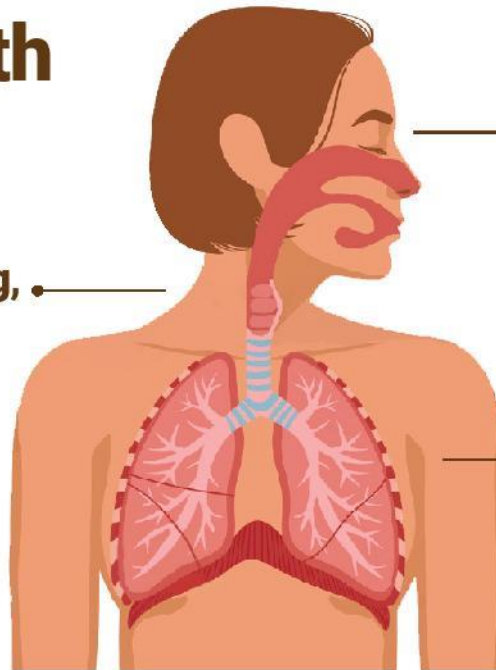
Source: Emissions of Air Pollutants from Crop Residue Burning in India, 2014, by Indian Agricultural Research institute (IARI); NASA <https://www.downtoearth.org.in/coverage/agriculture/river-of-fire-57924>

The risks associated with stubble burning

Burning of paddy waste results in harmful emissions of particulate matter global warming gases such as carbon dioxide, sulphur dioxide, nitrogen dioxide along with particulate matter. Areas where crop burning is intense have reported a three-fold higher risk of acute respiratory infection, one of the leading global causes of years lost to disability, and disability-adjusted life years. Women, children, aged and people with medical preconditions are particularly susceptible to the adverse health effects of crop burning. In addition, stubble burning causes loss of vital components such as nitrogen, phosphorus, sulphur and potassium from the topsoil, decreasing the fertility and making it unsuitable for agriculture.

Some Health Effects

Coughing & wheezing, especially at night



Irritation in eyes, throat & nasal problems are common

Shortness of breath or tightness in the chest

Note: The image is for representational purpose.

The challenges faced in mitigating the issue

The issue of paddy burning exists for two months in a year; therefore, mostly stop-gap arrangements are made for those months with no concrete results. Understanding the cost implications, the European Union-India Technical Cooperation Project: Energy (EU-India TCP) is investigating the probability of burning the paddy residue in existing facilities, such as cement plants, CHP and power plants.

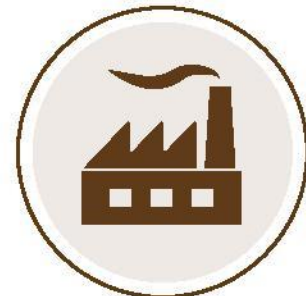
Some of the measures that have been discussed by the government are:



Increasing subsidized farm equipment to farmers & cooperative societies



Provide paddy straw management



Using Paddy straw as biofuel for power generation

The alternative uses

- For thatching (building a roof), as cattle feed (basmati rice straw) and the woody portion as fuel. Sometimes a portion of the straw is ploughed back in to the soil to be reused as bio-fertilizer
- In handicraft industry, rice straw is used in making certain fancy products like bags, wall hanging etc.
- Rice straw along with others fibrous materials can be used to prepare pulp for making boards and papers
- Rice straw is cut in to pieces and then used for making beds for growing mushroom

A potential for power generation

From legislative point of view, in India paddy straw is considered as agricultural waste which can be utilized for biogas, bio-CNG and power generation. It can also be used for captive power and thermal use through Gasification process in Industries.

In a clarification offered by the Ministry of New and Renewable Energy, the eligibility of power generated from the co-firing of biomass in thermal power plants is to be treated as renewable energy and therefore is eligible for meeting Renewable Purchase Obligation (RPO).

The Central Electricity Authority (CEA) highlighted in a document that the estimated 30-40 million metric tonnes of paddy straw that remains unutilized and burnt in north-west India has potential to generate about 45000 million units of electricity annually, by co-firing it along with coal in existing coal-fired power plants. In November 2018, the CEA issued an advisory to all public and private generating utilities to undertake use of 5–10 % biomass pellets primarily made of agro-residue along with coal.

During the scoping study it was discovered that NTPC under the advisory of Central Electricity Regulatory Commission (CERC) initiated co-burning and is utilizing bio-coal manufactured through torrefied processing of paddy straw. In our understanding, this is highly important to learn and analyse the environmental impact of production of bio-coal from agriculture waste at small scale (important when no specific technical standards for the same are in place).

However, there are technologies available from the EU countries like Sweden where the torrefication process is strictly followed considering environmental impact, but the technology imposes cost implications which need to be studied in detail.

Conclusion

Biomass co-firing is seen as a potential method of reducing emissions and the UNFCCC recognises co-firing as a carbon-neutral technology for mitigation of carbon emissions for coal-based power plants. Even the United Nations-backed Clean Development Mechanism considers biomass co-firing as a means to reduce emissions in developing countries.

In order to understand the stubble burning crisis, the EU-India TCP team approached a few stubble processing companies / organizations to understand the on-ground situation of stubble collection and discovered a successful case study in Punjab. The company is active and has its stubble processing unit in the Fatehgarh Sahib, Punjab. The solutions provided by the company are:

Problem	Solution from this case study
Short time gap between paddy harvesting and planting of new crop	Required machinery for cutting, collection and transportation of the stubble is handled by this company by charging a nominal cost to the farmers as service fee.
Shortage of technology /machinery	
Non-availability of mass manpower for stubble handling in short time	

The EU-India TCP team proposes to study and analyse this case study in detail to exploit co-firing potential without adverse environmental impact and compile the learnings from the existing experience for policy recommendations.

Note: To access the complete reports on *Indian Paddy and Converting pollution to energy*, **click on the link:** <https://drive.google.com/drive/u/2/folders/1A2xH22Q2rk0Z1-WkoqAQ9XSyltUrYEGG>

The source details and annexures are also available in these reports