

# Stubble burning Menace: Problem & Solution

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**Abstract:** *Stubble burning has been identified as a major source of air pollution, especially in South Asia. It is a significant source of both gaseous and particulate pollutants, both of which have serious consequences for human health and the environment. The situation in India has worsened as a result of the intensive rice - wheat rotation system, which generates a large amount of stubble, particularly in Punjab and Haryana. Approximately 84 Mt (23.86%) of the stubble is burned on the field immediately after harvesting every year. Farmers use crop residue combustion to prepare land for future cultivation, so they burn rice husks. During stubble burning time, most Indian cities, especially those in the National Capital Region, suffer from severe air pollution which causes lung diseases, including asthma, COPD, bronchitis and cancer. Crop stubbles (If used properly) could provide enormous economic benefits to farmers including incorporating stubble into the soil, using stubble as fuel in power plants, using stubble as raw material for the pulp and paper industries, or using stubble as biomass for biofuel production. Farmers in North India are unaware of the various options for managing stubble and, as a result, believe that burning is the quickest and cheapest option. This necessitates massive awareness campaigns to educate farmers about the accessibility of economically viable options and the cumulative impact of stubble burning.*

**Keywords:** Stubble Burning or Rice Husk Management.

## 1. Introduction

Crop residue burning has no long been known in Punjab, Haryana, and western Uttar Pradesh, but it is now becoming more common in other parts of the country.

Wheat stubble burning is a relatively new problem that began with mechanized harvesting using combine harvesters. Farmers in UP's Ghazipur district, particularly in Zamania and Chandauli, have been burning wheat stubble on a large scale for the last four to five years.

The government officials are unconcerned about this. Ramnagina Kushwaha, a farmer from Zamania, Ghazipur, died in a field after being set ablaze while burning wheat stubble.

The state government has not implemented the National Policy for Crop Residue Management to protect the parali (crop residue). The National Green Tribunal (NGT) prohibited crop residue burning in Rajasthan, Uttar Pradesh, Haryana, and Punjab on December 10, 2015. Crop residue burning is a violation of Section 188 of the IPC and the Air and Pollution Control Act of 1981. However, the government's implementation is inadequate ("India's Burning Issue of Crop Burning Takes a New Turn").

The Delhi High Court has also issued an order prohibiting the burning of crop residues, and the Punjab government fined farmers Rs 73.2 lakh in 2016 for burning crop residue.

Farmers continue to burn residues every season, poisoning both the soil and the air, despite the fact that the actual amount of fines charged is not available.

In addition to wheat and paddy, sugarcane leaves are commonly burned. According to an official report, the country produces more than 500 million tonnes of parali (crop residues) per year, with cereal crops (rice, wheat, maize, and millets) accounting for 70% of the total crop residue.

This is made up of 34% rice and 22% wheat crops, the majority of which is burned on the farm. According to estimates, 20 million tonnes of rice stubble are produced in Punjab alone each year, with 80 percent of it being burned.

Instead of being burned, the stubble can be used for cattle feed, compost manure, rural roofing, biomass energy, mushroom cultivation, packing materials, fuel, paper, bio-ethanol, and industrial production, among other things.

### Impact on environment & Health issues:

According to the IARI study, crop residue burning produced 149.24 million tonnes of CO<sub>2</sub>, over 9 million tonnes of CO, 0.25 million tonnes of SOX, 1.28 million tonnes of particulate matter, and 0.07 million tonnes of black carbon in 2008 - 09.

According to a presentation given before the Punjab government by G V Ramanjeneyulu, agriculture scientist and executive director of the Hyderabad - based non - profit Centre for Sustainable Agriculture, heat from burning straw penetrates 1 cm into the soil, raising the temperature to 33.8 - 42.2 ° C. This kills the bacterial and fungal populations that are necessary for fertile soil. According to the presentation, the monetary cost of burning to Punjab farmers is around Rs 800 - 2, 000 crore per year in nutritional loss and Rs 500 - 1, 500 crore in government subsidies on nitrogen, phosphorus, and potash fertilizers.<sup>1</sup>

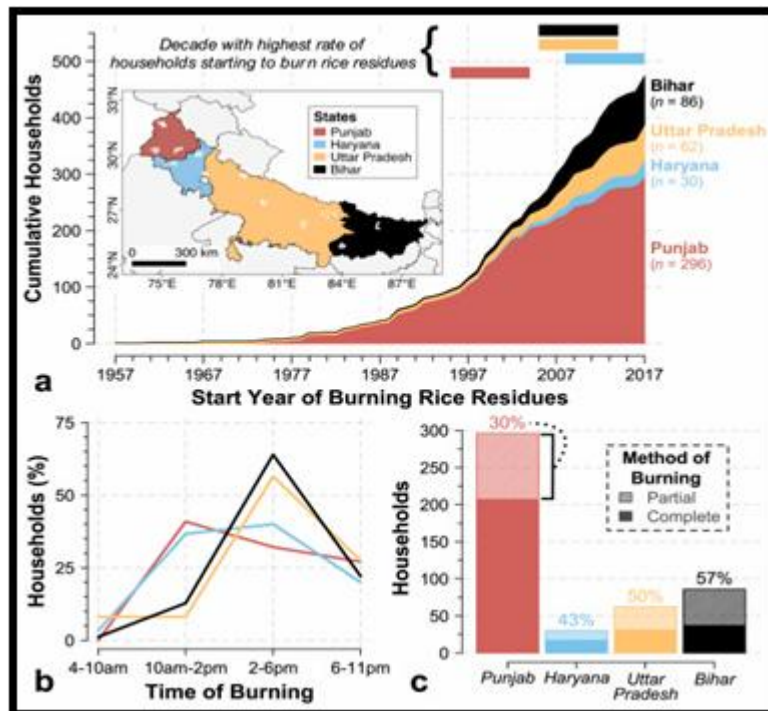
One tonne of rice straw burned results in a soil loss of 5.5 kg of nitrogen, 2.3 kg of phosphorous, 25 kg of potassium, and 1.2 kg of sulphur. According to a 2014 study published in Springer Briefs in Environmental Science, one year of crop residue in Punjab contains about 6 million tonnes of carbon, which when burned could produce about 22 million tonnes of CO<sub>2</sub> in just 15 - 20 days.

<sup>1</sup><https://www.downtoearth.org.in/coverage/india/river-of-fire-57924>



The study also shows that CO<sub>2</sub> levels become critical in the area surrounding a burning field, with concentrations of 114.5 mg/m<sup>3</sup> or higher observed at 30 metres from burning fields and 20.6 mg/m<sup>3</sup> at residences 150 metres away. CO<sub>2</sub> levels in ambient air are limited to 4.0 mg/m<sup>3</sup>. Significant amounts of nitrogen oxide (NO<sub>2</sub>) and ammonia (NH<sub>3</sub>) were also recorded during burning in the study, which also stated that a ban on crop stubble burning in the UK resulted in a

significant reduction in pollution. According to a 2016 study conducted by Vitull K Gupta, professor of medicine at Bathinda, 84.5 percent of people were suffering from health problems as a result of increased smog incidence. It discovered that 76.8 percent of people reported eye irritation, 44.8 percent reported nose irritation, and 45.5 percent reported throat irritation.



41.6 percent of people reported coughing or an increase in coughing, and 18.0 percent reported wheezing. According to another study conducted by the Institute for Social and Economic Change in Bengaluru, people in rural Punjab spend Rs 7.6 crore per year on treatment for ailments caused by stubble burning.

Many agricultural regions in India's IGP are double-cropped in a paddy rotation, which is crucial to the food and nutrition security and living conditions of over 400 million people in north India (Kumar et al.2015). This study focuses on four northern Indian states: Punjab, Haryana, Uttar

Pradesh, and Bihar (Fig.1a). Punjab and Haryana, India's western IGP states and "breadbasket," have rice yields that are 1.5 times those of Uttar Pradesh and Bihar (Palanisami et al.2019).

[<https://www.downtoearth.org.in/coverage/india/river-of-fire-57924>]

**Government initiative:**

The Union government issued the National Policy for Crop Residue Management in 2014. Crop residue management

has since helped to make the soil more fertile, resulting in a Rs 2, 000/hectare savings in farmer manure costs.

Farmers can also effectively manage crop residues by using agricultural machinery such as:

- Happy Seeding! (used for sowing of crop in standing stubble)
- Rotavator (used for land preparation and incorporation of crop stubble in the soil)
- 0 until seed drill (used for land preparations directly sowing of seeds in the previous crop stubble)
- Baler (used for collection of straw and making bales of the paddy stubble)
- Chopper Paddy Straw (cutting of paddy stubble for easily mixing with the soil)
- Binder for the Reaper.

On the other hand, these machines are extremely expensive, and state governments should step up and provide better subsidies so that farmers can afford them. Former Agriculture Minister Radha Mohan Singh stated that the government is subsidising crop residue management machinery by 50 - 80%.

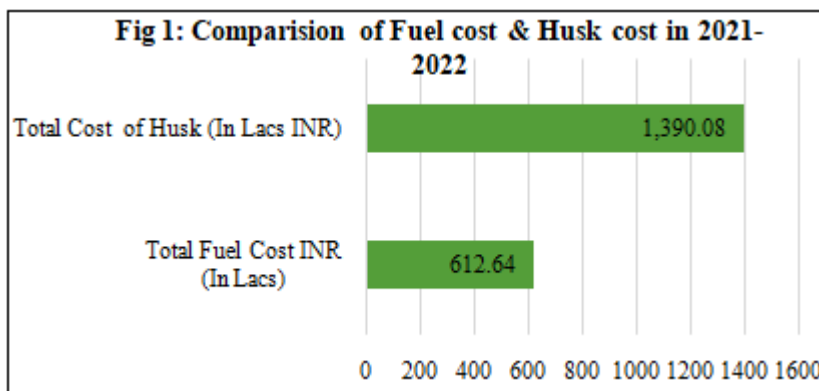
This scheme includes an allocation of Rs 1, 151.80 crore for two years for states such as Punjab, Haryana, Uttar Pradesh, and the National Capital Region.

**Analysis of Primary research:**

In the secondary research finding, it was observed how paddy straw waste is handled in other countries& it was evident that some European countries, such as Germany and Denmark, collect it in the fields in the form of bales and burn it in specially designed industrial boilers. Companies such as BWE in Denmark and Babcock & Wilcox manufacture such Vibrating Grate or Reciprocating Grate Boilers for controlled burning of paddy straw bales.

To understand why it is not happening in India, visited a few industrial houses and discovered that the high initial capital cost, as well as collection and storage, are the two main issues that are preventing management from installing such boilers.

Also tried to have an understanding about current boilers and the fuel used in them and it has been observed that their current boilers are flued bed boilers that use rice husk as fuel. The cost of producing steam from rice husk was calculated using the cost and efficiency parameters attained by the industries.



To determine the technological feasibility and commercial viability of Vibrating Grate/Reciprocating Grate Boilers, boiler manufacturers such as Cheema Boilers and Process and Pressure Boilers were consulted. Based on achievable norms, the initial capital cost and cost of producing steam from paddy straw were calculated. The cost of generating

steam from rice husk and paddy straw was tabulated, and it was discovered that there are significant savings in the steam cost from paddy straw. It was calculated that, despite the high capital cost of Vibrating Grate Boilers, the payback period on the basis of steam cost savings is approximately one year.





PIONEER AGRO INDUSTRIES										
40 MT BOILER(20MT ON BALE FEEDING)										
Year /Period	Paddy Straw Bale	Rate	Fuel Cost	Steam	Steam Cost	Equivalent Consumption of Husk			Cost Diff. Benefit	Banefit to Farmers@500 Per Ton For Bale Procurement
						Qty (In MT)	Rate (Per KG)	Value (In Lacs)		
Jan 22	4645	2.47	114.73	14400	0.80	4500	5.35	240.75	126.02	23.23
Feb 22	4181	2.47	103.27	12960	0.80	4050	6.50	263.25	159.98	20.91
March 22	4485	2.47	110.78	12960	0.85	4050	6.15	249.08	138.30	22.43
Apr 22	4490	2.47	110.91	13920	0.80	4350	6.40	278.40	167.49	22.45
May 22	4468	2.47	110.36	13850	0.80	4328	6.75	292.15	181.79	22.34
June 22	4490	2.47	110.90	13975	0.79	4367	7.50	327.54	216.64	22.45
July 22	4832	2.47	119.35	13530	0.88	4228	8.55	361.50	242.15	24.16
<b>Total</b>	<b>31591</b>		<b>780.31</b>	<b>95595</b>	<b>0.82</b>	<b>29873</b>		<b>2012.67</b>	<b>1232.36</b>	<b>157.96</b>

While, a presentation was made to the management of Chandigarh Distillers & Bottlers Ltd, in which the cost - benefit analysis of constructing new or replacing existing boilers was discussed. Appendices A and B contain the cost - benefit analysis presented to management. Following extensive discussions and being convinced of the commercial attractiveness, availability of Paddy Straw fuel, and encouraged by the State government's promotional mindset, management was persuaded to install a Vibrating Grate Boiler using Paddy Straw bales as fuel. The CDBL management plans to commission the aforementioned boiler in September 2020.

The management of CDBL communicated the same concept and decision to three other distilleries: Globus Spirits and Haryana Liquors Pvt. Ltd. in Haryana, and Pioneer Distillers in Pathankot, Punjab. They, too, were taken with the idea and have installed Paddy straw - based boilers in their distilleries. All of the distilleries' boilers have been commissioned and are now operational.

This initiative benefits all stakeholders. Farmers now profit from the disposal of paddy straw, which was previously an expense. Significant cost savings in operations have benefited the industry. Paddy straw collection and controlled combustion in boilers has resulted in enormous benefits to the environment.

### 3. Conclusion

Every stakeholder benefit from this initiative. Farmers are now earning money from the disposal of paddy straw, as

opposed to the expenses they were incurring previously. The industry has benefited from significant cost savings in their operations. The collection and controlled combustion of Paddy straw in boilers has resulted in significant environmental benefits.

Encouraged by the response of the industrialists, it appears that an initiative was taken to seek management support to the concerned Secretary and Minister of the Industry Department, using the political connections of the management of the distilleries visited, namely CDBL, Pioneer Distillers, and Bathinda Chemicals pvt Ltd. Following our persistent efforts, the Department of Industry and Commerce has announced a policy declaring incentives for industries that will build boilers using paddy straw as fuel.

### Acknowledgement

Prof. Indrajeet Acharjee (M. A, B. Ed., B. P. Ed., Professor IDBP Economics with teaching experience of 24 years).

I am deeply grateful to Professor Acharjee, under whose able guidance I worked on this research paper. His knowledge and expertise greatly assisted my work.



Appendix – C

**12MT FUEL CONSUMPTION ANALYSIS**

Year /Period	Rice Straw Bale Consumed			Mustard Bale			Sugar Cane			Rice Mustard Husk			Total Fuel Cost (In Lacs)	Steam Generated	Per KG Cost	Equivalent Consumption of Hunk@ Factor 3.3			Cost DRP. Month	Benefit to Farmers@50 \$ Per Ton For Bale Procurement (In Lacs)
	Qty (In MT)	Rate	Amount (In Lacs)	Qty (In MT)	Rate	Amount (In Lacs)	Qty (In MT)	Rate	Amount (In Lacs)	Qty (In MT)	Rate	Amount (In Lacs)				Qty (In MT)	Rate	Value (In Lacs)		
Total	2683	62.60	294	6.11	2776	62.24	462	30.14	154.64	13546	0.73	4100	484.13	289.40	30.675					
Total	24924	411.86	1022	69.51	4732	111.89	3814	246.39	835.47	106369	0.73	33240	2807.32	1171.04	137.89					

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Appendix - D



**CHANDIGARH DISTILLERS & BOTTLERS LTD.**

**CDBL/2020**  
**12<sup>th</sup> Feb., 2020**

Dear Soham,

We appreciate your efforts for all the research and ground work put into your presentation. It has the potential to solve the persistent problem of Environmental pollution caused by stubble burning, while simultaneously benefiting the farmers and translating into huge savings in the cost of steam generation for our unit.

Our boiler capacity is 82 MT. Our daily steam cost using the Fluidized Boiler is Rs.44 lakhs/day which works out to 158 Cr./year approximately. As per your presentation and our calculations, the saving of Rs.0.5/Kg. when using the Vibrating Grade Boiler will lead to a total saving of approximately Rs.25.20 Cr./year.

Our team is engaged in initial discussions with the farmers for the supply of paddy straw. We have also invited proposals from the boiler manufacturers.

We thank you for your contribution and wish you success.

Thanking you,  
 Yours sincerely,  
 For Chandigarh Distillers & Bottlers Limited,

**Ashish Mishra**  
 Asst. Vice-President



**Pioneer**  
Industries Private Limited  
(Formerly known as 'Pioneer Industries Limited')

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website : www.pioneerindustries.org  
CIN : U24241PB1997PTC020695  
GSTIN : 03AABCP4708L1Z1

PIL:2022-23:PI:

August 25, 2022

Mr. Soham Modi  
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Sector 9,  
Chandigarh-160009

Dear Soham,

As per your request, we are providing the data that you asked for. Due to company regulations and obligations, we cannot share the complete financial data.

Hope you find this useful for your research paper. Wishing you all the best for your endeavour.

Best wishes,

  
Jagat Mohan Aggarwal  
Managing Director

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