

# Stubble Burning: Environmental Impacts & Proactive Steps

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## ABSTRACT

Crop residue burning incidents commence every September to November with unfailing regularity in Haryana, Punjab, and Uttar Pradesh and rise steadily as the weeks pass. This well-established pattern leads to an airpocalypse, paralysing northern India with the onset of winter every year. Multiple factors, such as the paddy–wheat cropping system and consequent mechanised harvesting that leaves behind residue in the field, delayed sowing to conserve groundwater, labour scarcity, and the lack of viable markets for residue, are responsible for stubble burning in Haryana, Punjab & Uttar Pradesh.

**Keywords:** Stubble burning, Punjab, Haryana, Uttar Pradesh, environmental impact, proactive steps

## INTRODUCTION

Crop residue burning in Punjab, Haryana and western Uttar Pradesh has been known, but nowadays it's spreading more frequently in other parts of country. Paddy & Wheat stubble burning is a relatively new issue which started with mechanised harvesting using combine harvesters. In the last four to five years, farmers from UP's Ghazipur district, especially Zamania and Chandauli areas, have also been burning wheat stubble at a large scale. Stubble burning is again in the news after reports of rising pollution in north India. Stubble burning is an old and outdated practice that is prevalent in the rice and wheat belt states of India: Haryana, Punjab, and Uttar Pradesh. It is the leading cause of air pollution in the region, especially in the capital, New Delhi. State governments are actively working to reduce and ultimately eliminate stubble burning, but there's a long journey ahead. On that note, we bring this guide on stubble burning, its meaning, environmental impact, and provocative steps.

## METHODOLOGY

We employed a mixed-methods approach in this study. We pay attention to the variables such as the area sown under paddy, environmental impacts, proactive steps that determine Punjab, Haryana, Uttar Pradesh residue generation and the choice of residue management, environmental impact, and provocative steps.

MODELING AND ANALYSIS

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Under additional emergency measures, the Delhi Government can consider closure of colleges and educational institutions; non-emergency commercial activities



**Enlarge**

Vehicles ply amid poor visibility due to smog on the Delhi-Meerut Expressway in New Delhi on Sunday. PHOTO: MANAS RANJAN BHUI

RESTRICTIONS IMPOSED UNDER GRAP-IV		24-HOUR AVERAGE AQI 454			
		CAPITAL PUNISHMENT			
AREA	AQI	AREA	AQI	AREA	AQI
BAWANA	482	DWARKA SEC 8	479	JAHANGIRPURI	476
SHADIPUR	466	MUNDKA	479	SIRIFORT	462

- Ban on entry of trucks, LCVs in Delhi
- Ban on all construction activities
- Only CNG, BS-VI, EVs allowed
- 50% staff in government/private offices to work from home

and even impose the odd-even rule for vehicles.  
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Stubble burning is not only an issue in Punjab and Haryana; it's a concern for all farmers harvesting paddy in their fields. Burning remains the cheapest method to clear the paddy field from stubble, necessary to prepare for the next harvest. We are acutely aware of the challenging conditions faced by farmers in our country. Every year, we encounter numerous reports highlighting how farmers, burdened by poor financial standards, resort to tragic measures such as suicide. India's agricultural sector, which employs over 260 million individuals, is facing a severe crisis. Recent statistics indicate that nearly 30 farmers commit

suicide each day, largely driven by insurmountable debts. Government data from 2020 reveals that over 10,000 people working in agriculture took their own lives. Stubble burning refers to the practice of intentionally setting fire to agricultural residue left in the fields after harvesting crops such as rice and wheat. This practice is commonly observed in some regions, particularly in countries like India. Stubble burning can have several environmental impacts, including:

**Air Pollution:** The burning of crop residues releases a significant amount of particulate matter, carbon dioxide (CO<sub>2</sub>), carbon monoxide (CO), nitrogen oxides (NO<sub>x</sub>), sulfur dioxide (SO<sub>2</sub>), and other pollutants into the air. These pollutants contribute to poor air quality and can have adverse effects on respiratory health, especially for people with pre-existing conditions.

**Greenhouse Gas Emissions:** Stubble burning contributes to the release of greenhouse gases, including CO<sub>2</sub> and methane (CH<sub>4</sub>). While CO<sub>2</sub> is a long-term greenhouse gas, methane has a more potent short-term warming effect. These emissions contribute to climate change and its associated impacts on weather patterns and global temperatures.

**Soil Health:** The burning of crop residues removes organic matter from the soil, negatively impacting soil health. Organic matter is essential for soil structure, water retention, and nutrient cycling. Depleting the soil of organic matter through stubble burning can lead to decreased fertility and increased vulnerability to erosion.

**Loss of Biodiversity:** The intense heat generated during stubble burning can harm or destroy small plants, insects, and microorganisms in the fields. This can disrupt the local ecosystem and contribute to a loss of biodiversity.

**Water Quality:** Runoff from fields where stubble burning has occurred can carry ash and other pollutants into nearby water bodies. This can degrade water quality and harm aquatic ecosystems.

**Impact on Human Health:** The pollutants released during stubble burning, such as particulate matter and other harmful gases, can have direct and indirect effects on human health. Respiratory problems, eye irritation, and other health issues may arise, particularly for those living in or near areas where stubble burning is prevalent.

Despite the presence of laws and regulations, the government has consistently failed to effectively address the issue of stubble burning, which occurs like clockwork every year, resembling a recurring season of problems that come and go. This persistent problem has severe consequences for farmers and the environment.

In many instances, farmers find themselves in dire financial straits, compelled to take loans for their agricultural activities. Over time, this debt burden can become intergenerational, with succeeding family members inheriting the financial stress. When these loans accumulate, along with high-interest rates, they can become insurmountable, leading some desperate family members to consider taking their own lives as a way out of the financial crisis. It is a heart-wrenching choice, but one that can appear less daunting than attempting to clear the debt.

The issue of wheat stubble burning has emerged relatively recently, and it is closely tied to the adoption

of mechanized harvesting methods that involve combine harvesters. Over the past four to five years, farmers in Uttar Pradesh's Ghazipur district, particularly in the Zamania and Chandauli areas, have resorted to large-scale wheat stubble burning as a means of disposal. This practice has severe environmental implications and contributes to air pollution. Despite the seriousness of the situation, government officials seem to be turning a blind eye to this critical issue.

Even though there is a National Policy for the Management of Crop Residues in place, the state government has failed to effectively implement measures to protect crop residues. Additionally, the National Green Tribunal (NGT) imposed a ban on crop residue burning in the states of Rajasthan, Uttar Pradesh, Haryana, and Punjab as early as December 10, 2015. However, the government's enforcement of these laws appears to be lacking in both strength and commitment, leaving farmers in dire straits and the environment at risk.

The issue of stubble burning remains a persistent and pressing concern that demands immediate attention and effective solutions from government authorities to break the cycle of devastation that occurs year after year. In India, an annual production of over 500 million tonnes of crop residues, primarily from cereal crops like rice and wheat, underscores a critical issue. Approximately 70 percent of the country's total crop residue comes from these sources, with 34 percent from rice and 22 percent from wheat crops. Alarming, a substantial portion of this residue, particularly from rice and wheat, is routinely burned on farms, leading to severe air pollution and environmental degradation. For instance, Punjab alone generates an estimated 20 million tonnes of rice stubble annually, with roughly 80 percent of it being burned.

It's evident that farmers continue to engage in stubble burning not out of ignorance but due to the financial constraints they face in acquiring the necessary machinery for crop residue management like Happy Seeder, Rotavator, Paddy Straw Chopper, etc. Despite government subsidies, many farmers struggle to gather the funds required because of their impoverished financial situations. To address this issue effectively, there are alternative approaches that can be considered.

Crop residue can be managed in two ways. The residue left after the crop harvest can either be incorporated back into the soil, or collected and supplied for other applications as boiler fuel in industries and power. The issue of stubble burning is complex and multifaceted, involving agricultural practices, economic considerations, and environmental concerns. To address stubble burning, it's important to take a collaborative and comprehensive approach that involves farmers, policymakers, researchers, and the community. Here are some steps that can be taken to address stubble burning:

**Promote Alternative Farming Practices:** Educate farmers about alternative practices such as using crop residue for mulching or incorporating it into the soil. Provide financial incentives or subsidies for farmers adopting sustainable practices. Introduce and promote advanced agricultural machinery that can effectively manage crop residues without the need for burning.

**Research and Development:** Invest in research to develop and promote crop varieties that generate less residue. Explore and promote innovative technologies for residue management, such as biomass conversion and bioenergy production.

**Awareness Campaigns:** Conduct awareness campaigns to educate farmers about the environmental and health impacts of stubble burning. Highlight the benefits of sustainable agricultural practices for long-term soil health and productivity.

**Policy Measures:** Enforce and strengthen regulations against stubble burning, imposing fines or penalties for non-compliance. Develop and implement policies that support sustainable agriculture and provide support to farmers transitioning to eco-friendly practices.

**Financial Support:** Provide financial assistance to farmers for the purchase of equipment or machinery that facilitates non-burning methods of residue management. Establish funding programs to support research and development in sustainable agriculture practices.

**Collaboration and Partnerships:** Foster collaboration between government agencies, agricultural extension services, non-governmental organizations (NGOs), and research institutions to address the issue collectively. Collaborate with farmers' associations and community leaders to ensure that the transition to alternative practices is well-received and supported at the grassroots level.

**Incentivize Biomass Utilization:** Encourage the development of biomass-based industries that can utilize crop residues for the production of bioenergy, biofuels, or other value-added products. Create markets for agricultural residues to provide economic incentives for farmers to manage residue sustainably.

**Capacity Building:** Provide training and capacity-building programs for farmers on sustainable agriculture practices and the use of modern farming equipment. Ensure that farmers have access to information and resources necessary for the successful implementation of non-burning methods.

One potential solution is for the government to leverage existing data that highlights Punjab as the state with the highest crop residue burning rates. The government can compile a list of farmers involved in rice and wheat cultivation in the region. The Agriculture Department can then directly monitor these farmers and provide them with agriculture machinery for crop residue management.

This could be done without imposing any additional charges on the farmers. While initially, the government may incur some economic costs in providing these machines for free, there are ways to manage this loss, such as purchasing the stubble from the farmers and then selling it to the industry for conversion into fuel or manure, which can then be sold into the market. Another instance, during election campaigns, political parties often promise to alleviate the debt burden on farmers. Instead of only offering debt relief, they could provide machinery and tools that farmers can use for harvesting. This would not only help farmers achieve better crop quality but also contribute to their profitability.

By taking such proactive steps, the government can address the root cause of stubble burning, which is the lack of affordable alternatives for farmers. This approach can lead to a win-win situation, benefiting both the environment and the livelihoods of farmers while mitigating the harmful effects of stubble burning on human and animal health. It demonstrates that with strategic planning and resource allocation, it is possible to find sustainable solutions to pressing agricultural and environmental challenges. One has to understand the root cause of why farmers are using the stubble burning method to clear fields; only then can we solve the issues.

For a person who is unable to pay the debt to the bank or money lenders, it will be impossible to pay fines to the government as a pecuniary punishment for violating the law. If a farmer is arrested and put in prison, the public will go hungry due to a shortage of food. Farmers cannot be stopped from farming, but we must find other ways to address these issues. The only way to solve this serious stubble burning issue is to provide alternative, scientifically cost-effective, and environmentally friendly methods to farmers. This

will enable them to use such methods instead of continuing the practice of stubble burning. Additionally, more agricultural research is needed to address this issue effectively.

## RESULTS AND DISCUSSION

Our assessment concludes that the Punjab, Haryana & Uttar Pradesh has a long way to go to eliminate crop residue burning. The reduced area under non-basmati paddy and the rising stock of the Happy Seeders and the Super Seeders presents an opportunity to control burning in the forthcoming season. However, grasping this opportunity requires augmenting the supply of CRM machines, better logistical management of the existing stock of Residue Management machines, ensuring the financial viability of using these machines, increasing ex-situ utilisation capacity, and dedicated outreach to farmers to bring about their behavioural change. .

## CONCLUSION

The decades-old practice of stubble burning in Haryana , Punjab & Uttar Pradesh has been resulting in a serious air pollution crisis in northern India. Despite a slew of policy measures and judicial directives, the practice continues to persist. Importantly, the state's ex-situ residue management capacity has also remained stagnant for the last three years. Several projects that were to be commissioned this year have missed their commissioning deadlines. Efforts are being made to address the issue of stubble burning through the promotion of alternative agricultural practices, such as using machinery to incorporate crop residues into the soil, encouraging the cultivation of crops with less residue, and promoting sustainable farming methods. Reducing stubble burning can contribute to improved air quality, soil health, and overall environmental sustainability.

## REFERENCES

1. Dept. of Legal & Legislative Affairs. 2009. 'THE PUNJAB PRESERVATION OF SUBSOIL WATER ACT, 2009'. Chandigarh: DEPARTMENT OF LEGAL AND LEGISLATIVE AFFAIRS, PUNJAB. <https://dswcpunjab.gov.in/contents/docs/Pb-preservation-of-Subsoil-Act,2009>.
2. <https://epaper.tribuneindia.com/3784764/Bathinda-Edition/Bti-06-November-2023#page/3/2>
3. <https://epaper.tribuneindia.com/3785646/Bathinda-Edition/Bti-08-November-2023#page/5/1>
4. Gupta, Niti. 2019. 'Paddy Residue Burning in Punjab Understanding Farmers' Perspectives and Rural Air Pollution'. Council on Energy, Environment and Water. <https://www.ceew.in/publications/paddy-residue-burning-punjab> Gyusoo Kim and Seulgi Lee, "2014 Payment Research", Bank of Korea, Vol. 2015, No. 1, Jan. 2015.
5. Hindustan Times. 2021b. '31,970 Machines Sanctioned for Crop Residue Management in Punjab'. Hindustan Times, September 15. <https://www.hindustantimes.com/cities/chandigarh-news/31970-machines-sanctioned-for-crop-residue-management-in-punjab>.
6. Hindustan Times. 2021c. 'Ludhiana: Now, Book Machinery for in-Situ Stubble Management on i-Khet App'. Hindustan Times. September 19. <https://www.hindustantimes.com/cities/others/ludhiana-now-book-machinery-for-in-situ-stubble-management-on-i-khet-app>.
7. Economic Times. 2019. 'Govt Launches Mobile App for Farmers to Hire Tractor, Farm Machineries - ET Auto'. ETAuto.Com. <https://auto.economictimes.indiatimes.com/news/automotive/farm-equipment/govt-launches-mobile-app-for-farmers-to-hire-tractor-farm-machineries>.
8. Agriculture Engineering Wing, Punjab



9. Bharti Kisan Union Mansa
10. Bharti Kisan Union Doaba
11. Kissan Bachao Morcha