

## Stubble Burning: A Prolonged Tussle between Farmers, Government and Environment

Shaily Singhal<sup>1\*</sup>, Harisha R<sup>1</sup>, Adithya P Balakrishnan<sup>1</sup>, Almas Zehra Abbas<sup>2</sup> and Pooja<sup>3</sup>

<sup>1</sup>Division of Genetics, ICAR-Indian Agricultural Research Institute, New Delhi-110012

<sup>2</sup>Division of Nematology, ICAR-Indian Agricultural Research Institute, New Delhi-110012

<sup>3</sup>Division of Plant Physiology, ICAR-Indian Agricultural Research Institute, New Delhi-110012

ARTICLE ID: 64

### Introduction:

Crop stubble also known as 'residue' or 'trash'. Stubble is the short stems of plants which are left standing on soil surface after crops have been harvested. Stubble additionally includes chaff and straw discharged from the harvester (header). Stubble (parali) burning is a common method followed by farmer of removing crop stubble from the field by setting fire to the straw stubble that remains after grains have been harvested as there is little time left between the harvesting of paddy and sowing of wheat. (Ravindra *et al.*, 2018)

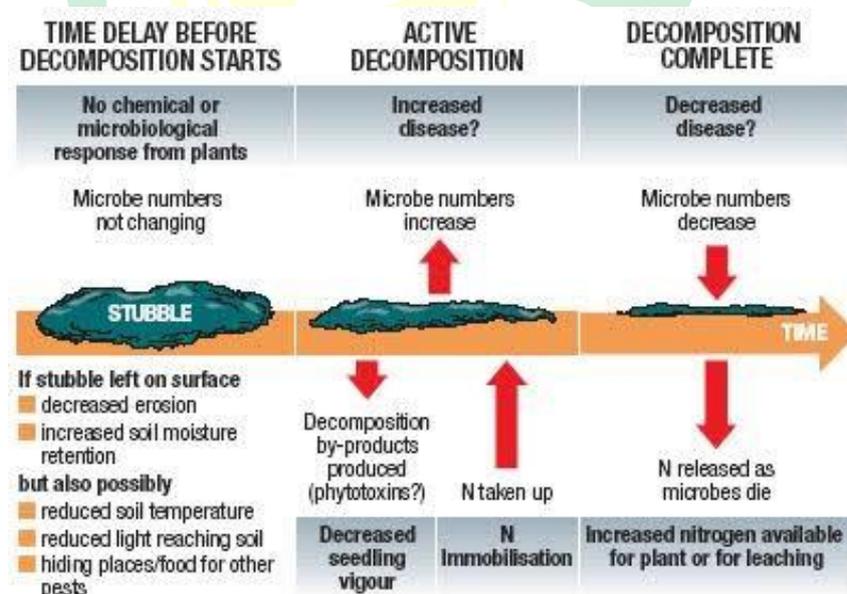


Figure 1. Natural Process of Stubble decomposition

### Effects of Stubble Burning

The burning of stubble has positive and negative effects both.

**Positive effects**

- It is cheaper and easier than other removal methods.
- It helps to combat pests and weeds including those resistant to herbicide.
- It can reduce nitrogen tie-up as microbes decompose the straw residue, and it results in nutrient release from the combusting straw.
- It helps farmers to increase their income and produce more crops as they could start sowing two types of crops on the same land.

**Negative effects**

- Loss of soil fertility: Burning husk on ground destroys the nutrients in the soil, making it less fertile.
- Damage to electrical and electronic equipment from floating threads of conductive waste
- Risk of fires spreading out of management.
- Pollution: Open stubble burning emits large amounts of toxic pollutants in the atmosphere which contain greenhouse gases and others like methane (CH<sub>4</sub>), Carbon Monoxide (CO), Volatile organic compound (VOC) and carcinogenic polycyclic aromatic hydrocarbons that damage the ozone layer. They may eventually cause smog.(Zhang *et al.*,2011; Vadrevuet *al.*,2011)
- Heat Penetration: Heat generated by stubble burning penetrates into the soil, resulting in the loss of moisture and useful microbes.

**Why do farmers burn stubble?**

Despite the fact that stubble burning has been forbidden to various degree by different governments in the world, farmers still practice it. Farmers in Haryana and Punjab were urged to rotate wheat and paddy crops as part of the Green Revolution in the 1960s in order to make India independent in production of food. As a result, rice acreage grew due to subsidies and guaranteed rice purchases. Farmers were forced to transplant paddy late in the Kharif season as a result of the Punjab Preservation of Subsoil Water Act (2009), which was designed to reduce water loss. As a result, the farmers have very little time to make the field ready for the winter crop after the rice crop has been harvested. Therefore, burning the leftover rice chaff from the field is a quick, affordable, and simple approach to do it.



The increased mechanization and modernization of agriculture is one factor contributing to the significant amount of rice residue left behind after harvest. The rice grains are extracted by mechanized harvesting, leaving just a large residue. Farmers cannot choose manual harvesting due to the high labour costs and prolonged time required. Farmers used to utilize the stubble as hay in the past to keep homes and animals warm as well as for cooking. These applications for stubble, though, are now old. Additionally, due to its high silica concentration, rice straw is not regarded as ideal as animal feed.

### **Solutions to stubble burning problem**

- Farmers can also manage crop residues effectively by employing agricultural machines like: Rotavator, Happy Seeder, and Zero till seed drill, Baler, Paddy Straw Chopper and Reaper Binder. (Ravindra *et al.*, 2018) Many farmers find the rates or leases for these devices prohibitively expensive while stubble burning merely needs a matchbox.
- Farmers should be given financial compensation for their agricultural waste in order to persuade them not to burn the stubble. Crop wastes can be used as a source of energy, organic fertilizer, or as animal feed. The government should also offer subsidies or other incentives to the companies involved in converting slag into marketable commodities. The current equipment leaves behind a substantial amount of residue. The technology used in these devices needs to be updated to leave as little residue as possible. Farmers that plant their paddy early will have plenty of time to harvest it and prepare for the forthcoming Rabi crop, so encourage and reward them for doing so.
- Encourage farmers to plant alternative crops in order to transition them away from rice and toward maize, fruits, vegetables, and cotton in the long run. Use equipment, such as the Happy Seeder, to clear the stubble. The government needs to make these tools accessible and affordable for farmers. Farmers that burn straw should be punished. Many farmers still burn their stubble despite the repercussions because they think it is less expensive to pay the fines than to pay for other solutions. The government may also think about reinterpreting the MSP programme so that farmers who burn crop residue are not eligible for its benefits.
- Government must increase financial incentives to discourage stubble burning and give farmers machines that are inexpensive, useful, and simple to operate. Farmers should be made aware of the negative impacts of stubble burning as well as appealing alternatives



because they find it difficult to give up the practice. The Uttar Pradesh, Haryana, and Delhi governments should establish "Rice Bio Parks" where farmers can turn stubble into products like animal feed, cardboard, and paper, according to eminent agricultural scientist M.S. Swaminathan.

### **Measures to curb stubble burning**

The administration has taken a number of actions to stop farmers from burning stubble. In order to stop the practice, the Supreme Court ordered the governments of Uttar Pradesh, Punjab, and Haryana to provide farmers financial incentives. In order to reduce stubble burning, the Punjab government employed 8000 nodal officers in paddy-growing villages in 2020. Farmers that violate the law by burning crop residue already face consequences for doing so. More than 23,000 agricultural residue management instruments are being provided to farmers for handling straw locally. For supervision of the paddy straw without burning, farmers should receive 100 rupees per quintal from the Centre, according to the state's demands.

This was assessed to be unfeasible by the Environment Pollution (Prevention and Control) Authority, or EPCA. In-situ residue management equipment is provided to individual farmers at a 50% subsidy and to CHCs (custom hiring centers) at an 80% subsidy under a 100% centrally-funded programme. These devices are also being provided by the states of Punjab and Haryana, who are also expanding CHCs. The Center notified the Supreme Court in October 2020 that it will introduce legislation to prevent stubble burning. In order to monitor and prevent stubble burning in Uttar Pradesh, Haryana, and Punjab, the SC also resolved to create a one-person committee under the direction of Justice Madan Lokur. As of October 28, 2020, this order is still in effect.

### **Stubble burning and pollution**

Burning stubble caused pollution that dramatically decreased lung function and was especially detrimental to rural women.(Mishra, 2019) There was a more than twofold rise in 2.5 ppm concentrations between the two phases, from 100 g/m<sup>3</sup> to 250 g/m<sup>3</sup>, the category of unburned carbon particles thought to be most detrimental to respiratory health. All age groups experienced a two- to three-fold increase in the majority of respiratory symptoms during the crop residue burning period, including wheezing, shortness of breath with exertion, morning and nighttime coughs, skin rashes, runny noses, itchy eyes, etc. (10-60 years).(Saggu *et al.*,

2018) During the crop burning season, older people (>40–60) had the most respiratory symptoms, while younger people (>10–18) reported the fewest. Across all age categories, there was a reduction in lung function as 2.5ppm concentration increased, even after adjusting for a number of other exposure factors like the effect of cooking fuel, ventilation, distance from roads, etc.



A

B

**Figure 2.** Pollution in Delhi before and during stubble burning periods; (A): Image of New Delhi during July, 2019. <https://www.shutterstock.com> (B): Image of New Delhi during November, 2019. <https://theenglishpost.com/public-health-emergency-declared-delhi-ncr/>

## Conclusion

The stubble burning produces the very extremely harmful pollutants into atmosphere; it creates environment pollution especially in northern states of India, it associated with various health problems including death in some extreme cases. It also causes seasonal climate changes, global warming, and the loss of soil nutrients in addition to atmospheric pollution. Therefore, it is imperative that comprehensive policies be put in place to stop this threat at its source.

## References:

- Vadrevu, K.P., Ellicott, E., Badarinath, K.V.S. and Vermote, E., 2011. MODIS derived fire characteristics and aerosol optical depth variations during the agricultural residue burning season, north India. *Environmental pollution*, 159(6), pp.1560-1569.
- Mishra, M., 2019. Poison in the air: Declining air quality in India. *Lung India: Official Organ of Indian Chest Society*, 36(2), p.160.



- Ravindra, K., Singh, T. and Mor, S., 2019. Emissions of air pollutants from primary crop residue burning in India and their mitigation strategies for cleaner emissions. *Journal of cleaner production*, 208, 261-273.
- Saggu, G.S., Mittal, S.K., Agarwal, R. and Beig, G., 2018. Epidemiological study on respiratory health of school children of rural sites of Malwa region (India) during post-harvest stubble burning events. *MAPAN*, 33(3), 281-295.
- Zhang, H., Hu, D., Chen, J., Ye, X., Wang, S.X., Hao, J.M., Wang, L., Zhang, R. and An, Z., 2011. Particle size distribution and polycyclic aromatic hydrocarbons emissions from agricultural crop residue burning. *Environmental science & technology*, 45(13), 5477-5482.

