



IMPACT OF BURNING STUBBLE ON HEALTH OF FARMERS AND RESIDENTS OF TOWN AND SURROUNDING COUNTRYSIDE

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ABSTRACT:

India is an agricultural-driven economy where 50% of the population is engaged in agriculture. The production of crops such as rice, sugarcane, and wheat are the major food products which feed the people and also are the major contributor to the foreign sector. The best, quick and easy way of clearing thousands of acre of stubble is the burning of agricultural land bearing crops grains, like paddy, wheat, and many more crops that have been harvested. However this thousand of acres of burned land could have possibilities of resulting air pollution and can affect different health hazards. Residents of towns and the surrounding countryside in the range of the smoke and pollution say that their health and quality of life has been extremely affected by such activities. This type of stubble burning is mostly associated with the urban areas as they are considered to be developed as compared to rural areas. Farmers believe that burning makes planting easier and kills pests. The practice was widespread until the 1990s, when governments increasingly restricted its use. Stubble burning causes excessive air pollution leading to higher risk of health issues. The Air Quality Index (AQI) between 0 and 50 is considered good, 51 to 100 is satisfactory, 101 to 200 is moderate, 201 to 300 is poor, 301 to 400 is very poor and 401 to 500 is severe. Such type of stubble burning cases occurred in Punjab and Haryana to Delhi-NCR. Stubble burning causes air pollution by emission of greenhouse and various harmful gases which is many times higher than the standard level of gases as recommended by Central Pollution Control Board (CPCB). This contributes to the respiratory diseases like eye irritation, bronchitis, emphysema, asthma etc.

Keywords: *Stubble, Air Quality Index, air pollution, health hazards.*

INTRODUCTION:

Pollution level of most of the metropolis like Delhi has dipped as the air quality fluctuates between poor and very poor mainly due to squall in Delhi that dispersed pollutants and rainfall in neighbouring areas that subdued the effect of stubble burning. Since the Delhi NCR area is adjacent to these states, the smoke drifts over the capital and mixes with the already polluted air here. As the air becomes laden with pollutants, the PM₁₀ and PM_{2.5} levels also rise, polluting both indoor and outdoor spaces in the NCR (Honeywell, 2018). The practice of stubble burning around October raises the concentration of particulate matter (PM) in the air to 1,000 micrograms per cubic metre, far outstripping the safety limit of 50 micrograms. During this period people are advised to stay indoors and use masks outdoors (RiturajTiwari 2019, EconomicTimes). Westerly and north-westerly wind brings dust from western regions and smoke caused by burning of crop residue in the neighbouring Punjab and Haryana to Delhi-NCR (Fig.1). During harvesting season the reaping of the paddy fields generates a humongous quantity of husk which requires fast dumping. Farmers usually collect the husk and put them on fire as it is the easiest way to dump it without leaving any trace of waste in

sight. Machines does not cut the stubble close enough to the ground, leaving stubble behind that the farmer has no use. Farmers believe that disposing of the rice straw is an eco-friendly way but it leads to additional expenditure of Rs 5,000-6,000/acre (Joydeep Thakur, Hindustan Times, 2017). The fast and cheap solution is to clear the field by burning the stubble (P. Kumar et al., 2015). But doing so is a serious issue which is directly linked to the air pollution. Burning of agricultural biomass residue or stubble burning causes severe health hazard. It affects the organic carbon levels of the soil and also produces an uncontrollable amount of harmful smoke that pollutes the environment. The Air Quality Index (AQI) between 0 and 50 is considered good, 51 to 100 is satisfactory, 101 to 200 is moderate, 201 to 300 is poor, 301 to 400 is very poor and 401 to 500 is severe (Table-1). Such type of stubble burning cases occurred in Punjab and Haryana to Delhi-NCR. NASA images revealed that red dots denoting incidents of fire can now also be seen in Haryana and Punjab (Joydeep Thakur, 2017).

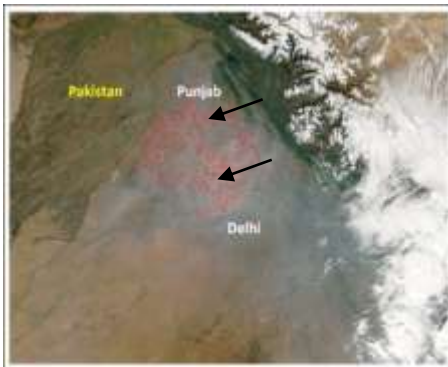


Fig.1 Crop burning areas (red colored spots) in Punjab and Haryana, as captured by NASA

AQI	Remark	Colour Code	Possible Health Impacts
0-50	Good	Dark Green	Minimal impact
51-100	Satisfactory	Light Green	Minor breathing discomfort to sensitive people
101-200	Moderate	Yellow	Breathing discomfort to the people with lungs, asthma and heart diseases
201-300	Poor	Mustard Yellow	Breathing discomfort to most people on prolonged exposure
301-400	Very Poor	Red	Respiratory illness on prolonged exposure
401-500	Severe	Maroon	Affects healthy people and seriously impacts those with existing diseases

Table 1.-(National Air Quality Index, Central Pollution Control Board. Retrieved from <https://app.cpcbcr.com/> AQI_India/ Websource:<http://rchiips.org/nfhs>).

Stubble burning period

Stubble burning is setting a fire to the straw stubble i.e, the act of removing paddy and wheat crop residue from the field to sow wheat

and it remains after a crop has been Harvested (Fig.2).Smoke from burning of crop residue and the stubble left in farms after mechanised harvesting starts enveloping the skies (Ishani Duttgupta, 2018).The period between October 15 and November 15 is considered as the critical period as maximum number of stubble burning cases takes place in this span in Punjab and adjoining states. This is the main reason for the alarming spike in pollution in Delhi-NCR.



Fig. 2Burning of rice residues after harvest, to quickly prepare the land for wheat planting, around Sangrur, Punjab, India. [Image Credit: Neil Palmer (CIAT) via Wikimedia Commons CC BY-SA 2.0]

Formation of brown cloud or ash cloud

A large number of toxic pollutants are emitted in the atmosphere due to the burning of the husk in open. These pollutants also contain harmful gases like Methane, Carbon Monoxide, Volatile Organic Compound, and Carcinogenic Polycyclic Aromatic Hydrocarbons (Anant Shrivastava,2019; Pyali Chatterjee,2018). These toxic gases either build a cloud of ash or formulate into smog that is formed due to the intensified amount of smoke present in the atmosphere (Fig.3). These harmful gases create an inexorable amount of cumulative danger that has the ability to travel thousands of kilometers, increasing the level of air pollution in nearby cities by completely wrecking the air quality index and becoming the cause of numerous health issues.



Fig. 3 Formation of brown clouds(Google Image)

The burning of husk or stubble more often contributes to the frequent formation of brown clouds that have an adverse effect on the local air quality hampers atmospheric visibility and further impacting the reasons for climate change. Besides the stubble burning, entrainment of husk particles in the air from the threshing and shattering process of rice and wheat seeds also contribute to the gradual increase in the magnitude of the pollutant level.

Health Risk

After burning of the stubble the crop releases 149.24 million tonnes of carbon dioxide (CO₂), over 9 million tonnes of carbon monoxide (CO), 0.25 million tonnes of oxides of sulphur(SOX), 1.28 million tonnes of particulate matter and 0.07 million tonnes of black carbon (Sunita Yadav et al., 2017, Sowmiya Ashok, 2017). These directly contribute to environmental pollution, and are also responsible for the haze in Delhi and melting of Himalayan glaciers. It has been observed that stubble burning causes various health issues. People reported irritation in eyes, nose, and throat. And often suffer from cough and wheezing problem. People in rural Punjab spend Rs 7.6 crore every year on treatment for ailments caused by stubble burning (Study by the Institute for Social and Economic Change, Bengaluru). These gaseous emissions can result in health risk, irritating asthma, chronic bronchitis and decreased lung function (J.Reddy Pranay et al., 2019).

The release of CO₂ in the atmosphere due to stubble burning results in the depletion of the oxygen layer causing greenhouse effect. As the

level of CO₂ and CO increases in the blood, stubble burning can convert normal haemoglobin into deadly haemoglobin resulting in the death of animals by polluted air. People also suffer from cardiovascular disease. Pregnant women and small children are also likely to suffer from the smoke produced by stubble burning (P. Kumar et al., 2015).

Solutions to the burning problem

The Union government released the National Policy for Management of Crop Residue In 2014. Crop residue management has helped to make the soil more fertile, thereby resulting in savings of Rs 2,000/hectare from the farmer's manure cost. Farmers can also manage crop residues effectively by employing agricultural machines like:

1. Happy Seeder (used for sowing of crop in standing stubble)(Sindhu S.H., et al., 2007; Singh R.P. et al., 2008).
2. Zero till seed drill (used for land preparations directly sowing of seeds in the previous crop stubble)
3. Rotavator (used for land preparation and incorporation of crop stubble in the soil)
4. Paddy Straw Chopper (cutting of paddy stubble for easily mixing with the soil)
5. Reaper Binder (used for harvesting paddy stubble and making into bundles)
6. Baler (used for collection of straw and making bales of the paddy stubble) (Rakhi Jagga, 2016).

Wheat and rice crops are grown alternatively. Wheat grown through zero tillage (ZT) after rice gives higher yield (5–10%), fuel saving of 36-43 litres/ Hectare and subsequently higher returns of Rs 4300-5700/ Hectare. ZT also emerged as new tool for integrated management (Harmeet Singh, et al., 2017).

As these machines are very costly("Grains and Other Crops» Crop Production» Stubble Burning"). The state government is providing subsidy at 50-80 per cent for crop residue management machinery so that farmers can

afford these machines. States like Punjab, Haryana, Uttar Pradesh and the National Capital Region have the provision of Rs.575.9 crore per annum under this scheme.

CONCLUSION

The physical and biological changes taking place in the environment due to anthropogenic activity have caused a dramatic impact on human health. Stubble burning is a major environmental and health hazard. As there is lack of human labour during harvesting period and less span of time, the farmers go for stubble burning as it is a cheaper and easier way. Government is also providing subsidy on machines like baler, seeders etc. various training programmes, workshops and camps are organized to create awareness among the farmers so that the land is with zero tillage. This will help to overcome the stubble burning by conservation of agriculture by improving soil health, increasing crop productivity, reducing pollution and enhancing sustainability and resilience of agriculture. Ultimately there will be reduction in pollution thus the impact on health hazards will be minimized.

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