

## Stubble Burning in India side effects and Alternatives

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### ABSTRACT

Crop residue burning is one among the many sources of air pollution. Burning of farm waste causes severe pollution of land and water on local as well as regional scale. This also adversely affects the nutrient budget in the soil. Straw carbon, nitrogen and sulphur are completely burnt and lost to the atmosphere in the process of burning. It results in the emission of smoke which if added to the gases present in the air like methane, nitrogen oxide and ammonia, can cause severe atmospheric pollution. These gaseous emissions can result in health risk, aggravating asthma, chronic bronchitis and decrease lung function. Burning of crop residue also contributes indirectly to the increased ozone pollution. It has adverse consequences on the quality of soil. When the crop residue is burnt the existing minerals present in the soil get destroyed which adversely hampers the cultivation of the next crop. The on field impact of burning includes removal of a large portion of the organic material. The off field impacts are related to human health due to general air quality degradation resulting in aggravation of respiratory (like cough, asthma, bronchitis), eye and skin diseases. The black soot generated during burning also results in poor visibility which could lead to increased road side incidences of accident. Punjab Government, its various Departments and other institutions like Punjab Agricultural University, Punjab Farmers Commission are all making efforts to devise some alternate economic uses of rice stubble. These include the stubble treated with urea as a fodder for animals, its use in biothermal energy production, paper manufacturing, mushroom cultivation, bedding for animals, etc. Punjab government is also providing subsidy to the farmers to promote the use of equipments which help in checking the burning of crop residues, like rotavators, happy seeders, zero-till-drills and straw reapers. While on the one hand, there is an urgent need to revitalize the research in agriculture and related activities, on the other hand, to tackle the problem of soil degradation and water depletion, a dedicated programme for promoting resource conservation technologies, such as zero tillage, deep ploughing, raised bed planting, laser land leveling etc., should be promoted. An eco friendly technology will be beneficial to the farmer community and the state by providing them a tool for improving soil health and environment for sustainable agriculture. Stubble burning is the deliberate setting fire of the straw stubble that remains after wheat and other grains have been harvested. The practice was widespread until the 1990s, when governments increasingly restricted its use.

### I.INTRODUCTION

**Stubble burning** is the deliberate setting fire of the straw stubble that remains after wheat and other grains have been harvested. The carbon (C) component in stubbles is lost by burning and that the process of burning

stubbles even occasionally, seriously affects the organic carbon levels of the soil. Around 80 per cent of the C in standing stubble will return to the atmosphere as CO<sub>2</sub>. Losses of carbon as CO<sub>2</sub> to the atmosphere through burning are often only slightly greater than through natural decomposition, but they are of course immediate.

### **III. ATTITUDES TO STUBBLE BURNING**

Stubble burning has been effectively prohibited since 1993 in England and Wales. A perceived increase in black grass, and particularly herbicide resistant black grass, has led to a campaign by some arable farmers for its return.

In Australia stubble burning is "not the preferred option for the majority of farmers" but is permitted and recommended in some circumstances. Farmers are advised to rake and burn windrows, and leave a fire break of 3 metres around any burn off. In the United States, fires are fairly common in mid-western states.

- In France, stubble burning is said to be fairly common.
- In China, there is a governmental ban on stubble burning, however the practice remains fairly common.
- In northern India, despite a ban by the Punjab Pollution Control Board, the practice of stubble burning is still practiced. Authorities are starting to enforce this ban more proactively.
- Stubble burning is allowed by permit in some Canadian provinces, including Manitoba where 5% of farmers were estimated to do it in 2007.

### **IV. STUBBLE BURNING IN INDIA**

Stubble burning in Punjab and Haryana in northwest India has been cited as a major cause of pollution in Delhi. From late September through October of each year, farmers mainly from Punjab and Haryana burn an estimated 35 million tons of crop waste from their wheat fields after harvesting, as a low-cost straw-disposal practice to reduce the turnaround time between harvesting and sowing for the second (winter) crop. Smoke from this burning produces a cloud of particulates visible in images from space, and has produced a "toxic cloud" in New Delhi, resulting in declarations of an air-pollution emergency. Although harvesters are available such as the Indian-manufactured "Happy Seeder" that shred the crop residues into small pieces and uniformly spread them across the field, as an alternative to burning the crops, farmers complain that the cost of these machines is prohibitive compared to burning the fields.

#### **Stubble burning causing air pollution and health problems.**

The illegal practice of burning paddy stubble has been going on unabated in some parts of Punjab and Haryana despite a government ban on it causing air pollution and health-related issues, agri-experts said. According to Vice Chancellor of the Punjab Agricultural University (PAU) Dr B S Dhillon, stubble burning is causing multiple problems that include affecting the soil health, besides causing environmental pollution. "Hazy weather was witnessed recently which could have been due to the pollution levels caused post-Diwali and smoke

generated from burning of stubble," he said. Dhillon said stubble burning not only affects the soil fertility resulting from loss of essential nutrients but also causes serious threat to human health including breathing problems, allergies and asthma attacks. After the harvesting of paddy is over, farmers at many places burn paddy stubble ignoring warnings by the authorities including those issued by the State Pollution Control Boards and the Agriculture Departments. The problem persists in parts of Punjab including Kapurthala, Jalandhar, Patiala, Sangrur and Ludhiana while in Haryana farmers indulge in stubble burning in some places including Karnal district. Training workshops and awareness programmes for the farmers are conducted from time to time in both the states, where peasants are told about the harmful affects of burning the stubble, an official of the Punjab Agriculture Department said.

Dr Dhillon said one of the solutions to the problem can be setting up of more biomass plants as they will buy the stubble for power generation and the farmers in turn will get paid for what it. He said the PAU is apprising farmers of how the stubble can be used for making compost and ploughed back. Dhillon said 40 per cent of country's total mushroom production comes from Punjab and stubble heaps could be used in its cultivation thus saving it from being disposed in a manner which damages the soil and environment.

### **Stubble Burning side effects and Alternatives**

India has a major agribusiness sector which achieved remarkable successes over the last three or four decades. India is an agricultural driven economy where more than 50% population is engaged in cultivation of agricultural products. Production just doesn't feed the country but generates enough agriculture products to export to the outside world. India is one of the leading countries in production of crops such as wheat, rice, sugarcane and many more.

With million tons of agriculture crops producing every year, it also produces tons of agriculture waste. Agriculture waste or residue is made up of organic compounds from organic sources such as rice straw, sugar cane bagasse, coconut shell and others. With high amount of agriculture wastes, it becomes difficult for the farmers to dump that waste.

With reaping of paddy fields, large quantities of husk are generated that needs dumping. Farmers generally gather husk and put them to fire. Burning husk is the easiest of ways to dump the husk. But burning husk has several demerits.

Recently in India, husk burning cases by farmers of Haryana, Punjab and Uttar Pradesh have been penalized. FIRs have been lodged against 360+ farmers. National Green Tribunal (NGT) had imposed fine for burning husk reasoning it as the cause of pollution rise in Delhi region.

But why do farmers burn husk? There is very little they can do about the husk. When threshers thresh the paddy field, husk is left behind. Husk surrounds the paddy grain. During milling of paddy about 78% of weight is received as rice, broken rice and bran. Rest 22% of the weight of the paddy is husk. These days, farmers due to lack of labor and time prefer threshers over hand reaping, which leaves husk behind. Husk collecting machines

are not provided by the government neither they are given subsidies. So the easiest they can do before they sow wheat is collect husk and set it to fire. But they don't know the harmful effects of burning husk on ground.

#### **SIDE EFFECTS**

##### **Effects**

The burning of stubble, contrasted with alternatives such as ploughing the stubble back into the ground has a number of consequences and effects on the environment

Stubble burning:

- Quickly clears the field and is cheap.
- Kills weeds, including those resistant to herbicide.
- Kills slugs and other pests.
- Can reduce nitrogen tie-up

However, it has a number of harmful effects on the environment:

- Loss of nutrients.
- Pollution from smoke.
- Damage to electrical and electronic equipment from floating threads of conducting waste.
- Risk of fires spreading out of control.

There is a perception that stubble burning contributes to atmospheric CO<sub>2</sub>. However carbon dioxide releases are only slightly greater than those from natural decomposition.

- Open burning of husk produces harmful smoke that causes pollution. Open burning of husk is of incomplete combustion in nature. Hence large amount of toxic pollutants are emitted in the atmosphere. Pollutants contain harmful gases like Methane, Carbon Monoxide (CO), Volatile organic compound (VOC) and carcinogenic polycyclic aromatic hydrocarbons.
- Clouds of ash and smoke can travel more than thousand kilometers and create an obstinate and non-clearing clouds. Smog formed of the smoke can increase the levels of pollutants by manifolds in the air, making it difficult to breathe. After release in the atmosphere, these pollutants disperse in the surroundings, may undergo physical and chemical transformation and eventually adversely affect the human health. Frequent husk burning may contribute to the formation of the brown clouds that affects the local air quality, atmospheric visibility and earth climate.
- Some think burning is a quick, easy and cheap method as all unwanted husk, plants and shrubs gets destroyed. Some believe that fire may return nutrients to the land. But burning husk on ground destroys the nutrients in the soil, making it less fertile. Heat generated by stubble burning penetrates into the

soil, leading to the loss of the moisture and useful microbes. Thus adversely affecting the soil. It kills natural nutrients and bacteria that helps rejuvenate soil.

- The burning of paddy or stubble leads to the loss of precious nutrients as nearly 25% nitrogen and phosphorus, 50% Sulphur and 75% potassium uptake from the soil are retained soil residues. It is estimated that burning of 1 Ton of stubble or paddy straw accounts for loss of 5.5 kg nitrogen, 2.3 kg phosphorus, 25 kg Potassium and 1.2 kg Sulphur, besides organic carbon.
- Husk has high prolific value. Rice husk is unusually high in ash, which is 92-95% silica, highly porous and lightweight, with a very high surface area. Its absorbent and insulating properties are useful in many industrial applications, such as acting as strengthening agent in building materials. Husk is also produced as fuel for processing paddy, production through direct combustion or gassification. It is also used as cattle feed. Burning stubble would be a waste of such utility.

## **V.ALTERNATIVES**

Few possible alternatives to Stubble Burning can be:

- 1) Providing stubble collecting machines to farmers to collect stubble.
- 2) Subsidizing or availing the stubble collecting machines at rent.
- 3) Providing reasonable labor to reap the paddy to avoid stubble generation. Providing labor would give temporary employment to people in need.
- 4) Allowing cattle to graze or feed upon to clear away husk and stubble.
- 5) Decomposing stubble in the farm field and turning it into the useful manure.
- 6) Making fodder for livestock out of collected stubble.
- 7) Setting up Bio-mass fuel plants to generate fuel using paddy husk.
- 8) Government should Involve or invite benefiting industries like cement industry to collaborate in husk/hull or stubble collection to use it proficiently.
- 9) Inviting packaging industries to collect stubble to make packaging boxes which are more environment friendly than other non-disposable materials like thermocole and plastic.

## **VI.CONCLUSION**

The study on the impact of stubble burning on ambient air quality has shown significant 89+increase in PM<sub>10</sub> and PM<sub>2.5</sub> concentrations during crop residue burning periods in Mandi-Gobindgarh (an industrial town of Punjab). Before harvesting, the concentration of PM<sub>10</sub> and PM<sub>2.5</sub> was minimal at site 1 (agricultural site), as

compared to other four sites, which are industrial and partially industrialized areas. During harvesting, there was a substantial increase in the magnitude of PM<sub>10</sub> and PM<sub>2.5</sub> at all the sites because of three reasons viz. threshing process, which leads to entrainment of rice husk particles in air, secondly, the shattering process which leads to entrainment of dry shell of wheat seed and lastly, stubble burning. During post-harvesting season, the values of PM<sub>10</sub> and PM<sub>2.5</sub> showed a decline trend because of the reduced quantum of stubble burning and dispersion of pollutants. Total mass of water soluble ionic species were higher during harvesting and post harvesting period of paddy and pre harvesting period of wheat and lower during harvesting and post harvesting period of wheat and pre harvesting period of paddy. Concentrations of chloride (Cl<sup>-</sup>) and potassium (K<sup>+</sup>) ions were highest in winter and lowest during summer and fall seasons. Concentration of PM<sub>10</sub> and PM<sub>2.5</sub> obtained at all the sites were above the permissible limits as given in National Ambient Air Quality Standards (NAAQS-2009). Thus, it can be concluded from the study that the stubble burning caused great deterioration in the ambient air quality and pose serious threat to biological life as well as property.

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