



Stubble burning

Curse on soil health and environment

Rajat Singh and Robin Kumar

Department of Soil Science and Agricultural chemistry

ANDUA&T Kumarganj, Ayodhya - 224229

Email ID: vnsrajat18@gmail.com

Received: Nov 13, 2021; Revised: Nov 21, 2021 Accepted: Nov 26, 2021

Introduction

Stubble burning is a practice where fire is purposely put to the stubble which remains after grains such as Rice, Wheat, Maize etc. have been harvested.

This represents an important source of atmospheric aerosols and gas emissions, hence having potential effect on the air quality and environment. Over the past few decades stubble burning has increased.

In India alone the total amount of crop residue is 516 million tons (Mt) estimated and the burnt was estimated to be 116 million tons respectively. Approximately generating 176.1 Mt CO₂, 10 Mt CO, 0.31 Mt PM_{2.5}(particulate matter) & 0.936 Mt PM₁₀.

India is a farming country with many farming practices in step with agro-climatic zones.

Rice and wheat cropping patterns are among the extensive farming practices in the states of Haryana, Punjab and Uttar Pradesh. These regions are also famous for burning straw and stubbles after the harvesting season. Each year in October and November farmers from Punjab and Haryana burns approx 35 million tons (Mt) of crop residue from their paddy fields after harvesting. Burning the stubbles leads to the loss of nutrients and resources. Apart from deteriorating the ambient air quality flaming stubbles raises soil temperature up to 42 °C and leads to soil nutrient loss of organic carbon, nitrogen, phosphorus, potassium and discharges large volumes of various air pollutants such as CO₂, CO, CH₄, NO₂, SO₂ and particulate matter.

Effects of stubble burning

Environmental Effects

The burning of crop residues generates various environmental issues. The most adverse effects of crop residue burning incorporate the emission of greenhouse gases (GHGs) that contribute to global climate changes. In addition to that, enhanced levels

of PM (particulate matter) and other air pollution that causes health hazards, loss of diversity of agricultural land, and the deterioration of soil fertility. The burning of the crop stubble in an open field influences soil fertility, eroding the sum of soil nutrients.

Effects on Soil Fertility

Stubble burning affects soil productivity by burning the essential nutrients inside the soil. Burning raises the soil temperature to about 42 °C and above thus killing or destroying the important micro-organisms in the soil at depth of 2.5 cm. long term burning also

reduces the amount of 0-15 cm soil loss along with loss of nitrogen, biomass and potentially mineralized nitrogen and organics. Stubble burning depletes the essential nutrients of soil *i.e.*, Nitrogen, Phosphorus, Potassium (NPK) as well as other micro nutrients.

Effects on agricultural productivity

The effects of burning crop stubble extend to the agricultural sector. There is convincing

empirical evidence that air pollution affects food production. The pollutants may affect

agricultural productivity directly or indirectly. Direct effects entail injury to leaves, grains, or assimilation of heavy metals. For example, Nitrogen oxide can

Effects on air quality

Burning of stubbles poses a serious threat to the air quality of exposed environment. Pointed out that air quality is considerably affected by stubble burning due to emission of various air pollutants like green house gases (GHGs), carbon monoxide (CO), NO₂,

Effect on human health & well being

The harmful effects of air pollution ranges from skin and eyes irritation to severe neurological, cardiovascular and respiratory diseases. In some cases it may lead to lethal effects especially when the exposed person is having pre-existing respiratory problems. In

damage the tissue of plants and cause discoloration. SO₂ may lead to the formation of acid rain which has severe effects on plants and soil, and may lead to plant mortality.

SO₂, CH₄, Non- methane organic compounds and particulate matter (PM).

The air quality becomes adverse mostly in November of each year across the North Indian states.

chronic cases exposure to a high level of air pollution may causes permanent health injuries such as development of lung diseases like asthma, chronic obstructive pulmonary diseases, bronchitis, emphysema, cancer etc.



Management Practices

The best management approach is to tackle the problem at its base through the adoption of precautionary & preventive techniques. Some management practices are-

- Incorporating the stubble into soil.
- Use of bio decomposer e.g. Pusa decomposer
- Composting the crop residues by biological process where organic waste is converted into compost by microorganisms under controlled aerobic condition that can be used as manure.
- Mulching
- Use of Happy Seeder for sowing.
- Energy generation from stubble via combustion, gasification or anaerobic decomposition.
- Use stubble as animal feed (Fodder).

Government Support and Policies

Potential Future Strategies

1. Providing farmers with incentives not to burn crop residue outdoors.
2. Crop residues should be classed as recycled fertilizers, and their use as fertilizers or amendments should receive government support.
3. Facilitation of maximum land covers using agricultural conservation practices.
4. Promoting the sustainable, environmentally friendly, and cost-effective use of surplus crop residues for generating bioenergy in power plants.
5. Increasing subsidy rates for farmers who retain and utilize their crop residues.
6. Promoting in-situ management of crop residues by fast decay by chemical or biological means and mulching by mechanical means.
7. Promoting the use of farm equipments such as double disks, zero tillage and happy seeders.
8. Increasing the awareness among the farmers on the serious impacts of the open field burning practices.