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# Stubble Burning: Fields on Fire in North-India

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## Introduction

Stubble (also known as "Parali") burning is the intentional practice of setting fire to the crop debris or straw stubble that is left over on the field after the harvest of crops such as paddy, wheat, etc. In northern India, burning of stubble has long been a major concern for the government and environmentalists. Farmers of Punjab, Haryana and Uttar Pradesh have short span of time for harvesting the paddy crop planted in May and preparing their fields for sowing of next crop, usually wheat, in November. This short interval pushes farmers to clear off their crop stubble quickly by setting the fields on fire.This act of setting fireemits humongous amount of toxic pollutants in the atmosphere and adversely affect the flora and fauna by creating dense smog layer in the surroundings. A number of effective policy measures have also been taken up by the union and various state governments in order to discourage stubble burning and encourage farmers to convert this crisis into opportunity.

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**Why Farmers Set Their Fields on Fire?**

There is plethora of reasons that force farmers to set fire to crop debris such as mechanized harvesting using combine harvester leaves several inches of stubble in the field which takes approximately one to two months for its decomposition by its own. As farmers do not have enough time, so they burn the stubble instead of waiting for it to decompose. Another reason is the short interval between the harvesting of paddy crop of monsoon season and sowing of the immediate winter season crop i.e. usually wheat. Thus, in order to prevent the delay in sowing of winter season crop, farmers clear off their fields by burning the crop residue. Therefore, burning of stubble is found to be the cheapest and quickest way to tackle the problem of stubble. Further, if crop debris is left undisturbed in the field, there are chances of pest attack (like termites) on the forthcoming crop. Furthermore, other factors such as lack of both financial and technological means to choose alternatives to stubble burning also plays a critical role in continuation of this practice.

**Adverse Effects of Stubble Burning**

- **Atmospheric Pollution:** As a result of stubble burning, humongous amount of dangerous pollutants are released into the atmosphere which contains harmful gases like methane ($CH_4$), carbon monoxide (CO), nitrogen oxides, sulphur dioxide ($SO_2$), particulate matter (PM) and ground-level ozone ($O_3$). These toxic pollutants get dispersed in the surroundings and eventually create a thick blanket of smog or toxic cloud.
- **Human Health:** The resulting air pollution has been linked to a number of negative health impacts, including everything from skin and eye irritation to serious neurological, cardiovascular, and pulmonary ailments. Long-term exposure to high levels of pollution also raises mortality rates. According to a study, the life expectancy of Delhi residents has declined by 6.4 years as a result of this prolonged exposure to pollution.
- **Soil Health:** Stubble burning is also a nightmare for farmers because it destroys the essential nutrients in the soil, thus reducing its fertility. Moreover, the heat produced by stubble burning penetrates into the soil and causes a significant loss of moisture and beneficial micro-organisms.
- **Costs to the Economy:** As a result of rise in air pollution due to stubble burning, tourists' inflow in Delhi has reduced by 25-30 per cent, thus reflecting an economic or monetary loss to the economy.

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**Effective Ways to Tackle Stubble Burning**

- ✓ **Pusa Decomposer:**

The Indian Agricultural Research Institute (IARI), New Delhi, has developed a bio-enzyme called "Pusa Decomposer" for converting the crop stubble into compost. It is a form of capsule that break downs the paddy straw quickly and ensures complete decomposition of stubble within 20-25 days. In addition to this, the bio-decomposer helps in improving the soil fertility, which, in turn, will significantly reduce the fertilizer costs for the upcoming crop. Further, use of this bio-decomposer is an efficient and affordable alternative to stop the harmful practice of stubble burning. Furthermore, it is very eco-friendly and sustainable agriculture technology that can help to cut back the emission of harmful gases leading to air pollution in North India.


- ✓ **Turbo Happy Seeder (THS) Machine:** This is the widely used technology in Punjab and Haryana to tackle the problem of stubble burning in recent times. THS is a tractor-mounted machine that can drill wheat seeds directly into the standing crop residue. It also scatters the straw evenly across the field; thus, creating a mulch cover, which will help in moisture conservation and effective seed germination. Thus, the use of Happy Seeder is also an ideal solution to tackle with the problem of crop residue burning.
- ✓ **Converting Waste to Wealth:** Firstly, with the help of Chhattisgarh model, high-grade organic fertilizers can be obtained by simply mixing the stubble with cow dung and a few natural enzymes, which will help in cutting down the fertilizer expenses of the next crop. Secondly, a process for turning stubble into bio-char has been developed by Punjab

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Agricultural University (PAU),Ludhiana, in order to reduce pollution and increase soil fertility. Thirdly, crop residue can be used for electricity and bio-mass fuel generation. To combat stubble burning, a USA-based company has planned to build 1000 MW biomass energy generating plants in Punjab.

- ✓ **Crop Diversification:** Paddy-wheat is the dominant cropping pattern in the green revolution belt of Punjab, Haryana, and western Uttar Pradesh. These water guzzling crops were encouraged in late 1960s-70s to attain self-sufficiency in food grains, but, their continued cultivation till date poses serious sustainability concerns which need to be taken care of. So, diversifying the existing cropping pattern of paddy-wheat to more sustainable and remunerative crops like maize, cotton, fruits and vegetables, floriculture, etc. become the need of the hour in order to tackle with the novel problems of water table depletion, weed resistance, stubble burning, etc. It is the most economical, practical and sustainable way of dealing with the problem of stubble burning.
- ✓ **Government's Intervention:** For efficient management of large quantum of crop stubble, the government should invite industries such as cement industry, cardboard industry, and other packaging industry for collecting the stubble for their use in making some eco-friendly products like card board, packaging boxes, etc. In addition to this, the government should ensure subsidized and timely availability of machines for in-situ management of crop stubble and awareness needs to be created among the farmers regarding the ill effects of stubble burning. Furthermore, the government can also provide a cash incentive to the farmers who effectively manage their crop stubble and penalize those who resort themselves to stubble burning.