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Environmental Effect of Burning Agriculture Waste

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ABSTRACT

Burning of agricultural biomass residue, or Crop Residue Burning (CRB) has been identified as a major health hazard. In addition to causing exposure to extremely high levels of Particulate Matter concentration to people in the immediate vicinity, it is also a major regional source of pollution, contributing between 12 and 60 per cent of PM concentrations as per various source apportionment studies. In addition, it causes loss of vital components such as nitrogen, phosphorus, sulphur and potassium from the topsoil layer, making the land less fertile and unviable for agriculture in the long run.
Keywords: Environmental Effect, Agriculture, Crops, Agricultural Waste, Paddy Straw

I. INTRODUCTION

The main causes of crop residue burning are two-fold. Firstly, there is a very short window of time between harvesting of paddy and cultivation of wheat, at the end of the Kharif season. Paddy, or rice, is a water-intensive crop. The high usage of water in its cultivation has resulted in the central and various state governments restricting the cultivation of paddy in the summer months. In order to prevent diversion of scarce water resources in the summer, paddy cultivation can legally begin only around mid-June, when the monsoons typically arrive over North India. This further delays the cut short to the root with a knife, the large units of harvesters leave 6-10 cm of paddy stalk on the field. The rise in incomes and the subsequent availability of mechanical implements in Punjab and Haryana lead to increased mechanization of agriculture over the past 10-15 years.

Traditionally, farm labour in these states was in the form of seasonal, migrant workers from the states of Uttar Pradesh and Bihar. Since 2005, the demand for these workers saw a reduction, and accordingly, the availability of assured income from farm labour has declined. The launch of an assured rural income scheme in the form of the NREGA further led to income opportunities in their home states. As a result, agricultural labour has become a scarce commodity in parts of Punjab and Haryana.

The removal of the paddy stalk that remains on the field is a labour-intensive process. With labour being unavailable and the time window for preparing the field for wheat cultivation being limited, the options that the farmer has are either investing in expensive and rarely used agricultural implements, or burning the residue right on the field. Of the two, the latter is both cheaper and requires less effort.

As per estimates, Punjab produces approximately 19-20 million tonnes of paddy straw and about 20 million tonnes of wheat straw. About 85-90 per cent of this paddy straw is burnt in the field, and increasingly, wheat straw is also being burnt during the Rabi harvesting season. In Haryana, the problem of paddy straw burning also exists, although the scale is smaller than in Punjab. Paddy straw production is estimated at 2 million tonnes.

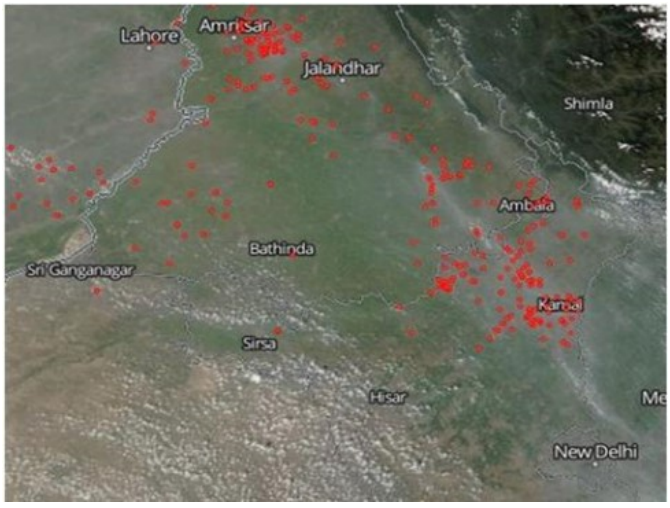

Figure 1. NASA imagery depicting fires on agricultural lands in Punjab and Haryana on October 7, 2016

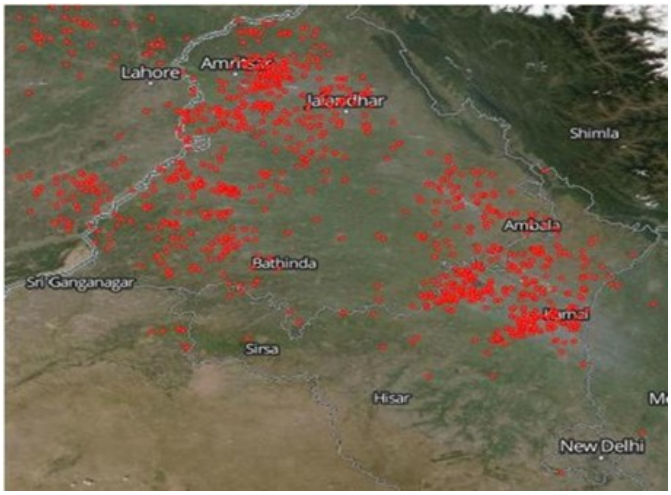

Figure 2. NASA image depicting fires on agricultural lands in Punjab and Haryana, on October 11, 2016

The kharif harvesting season begins in October. These images depict the scale of fires in Punjab and Haryana, over the past few days. Each dot represents acres of farmland on fire, easily detectable by remote sensing technology. The fires began in the first week of October and have visibly intensified since October 10.

II. PROGRESS MADE SO FAR

In terms of efforts being made to reduce crop residue burning, the following approaches have been used by various state and central administrations and regulatory bodies so far:

2.1 Banning Crop Residue Burning:

Crop residue burning was notified as an offence under the Air Act of 1981, the Code of Criminal Procedure, 1973 and various appropriate Acts. In addition, a penalty is being imposed on any offending farmer. Village and block-level administrative officials are being used for enforcement.

2.2 Detection and prevention:

A combination of remote sensing technology-use of satellite imagery-and a team comprising local officials–Sub-Divisional Magistrates, Tehsildars, Block Development Officers, Patwaris and village-level workers-is being used to detect occurrences of crop residue burning in real-time and to prevent them from taking place.

2.3 Establishment of a marketplace for crop residue burning:

Efforts are being made to increase the avenues for the alternate usage of paddy straw and other crop residue. For instance, paddy straw has a considerable calorific value, making it suitable for use as a fuel in biomass-based power plants. Similarly, it can be utilised for the preparation of bio-fuels, organic fertilisers and in paper and cardboard making industries. The strategy, broadly, is to assign a real economic and commercial value to the agricultural residue and making burning it an economic loss to the farmer.

2.4 Outreach and public awareness campaigns:

There are ongoing efforts to highlight the health effects of crop residue burning. It produces extremely high levels of toxic particulates, which affect the health of the people in the direct vicinity of the burning. In addition, efforts are also being made through *kisan* camps, trainings and workshops, apart from campaigns through various print media, televised shows and radio jingles, in informing farmers about the alternative usage of crop residue.

2.5 Subsidy on agri-implements:

The state governments, in collaboration with the Centre, has rolled out schemes for providing subsidy on mechanical implements that help tillage of soil, so that the crop residue can be retained in the soil, adding to its fertility, or alternately, collection of crop residue for putting it to commercial usage. However, the high cost of these implements means that in spite of subsidies, only a small number of farmers have access to these implements at the moment.

2.6 Crop Diversification:

There are various ongoing, long-term efforts at diversification of cropping techniques, such that crop residue burning can be effectively prevented. This is being attempted through cultivation of alternate crops (apart from rice/paddy and wheat) that produce less crop residue and have greater gap periods between cropping cycles.

III. MEASURES REQUIRED GOING FORWARD

Stronger monitoring and enforcement mechanism through the use of remote sensing technology–use of real-time satellite imagery, along with village-level enforcement teams with the aim of zero incidence rate of crop residue burning, through prevention and penalization.

3.1 Establishment of a larger number of biomass-based power projects utilising greater amounts of paddy straw is needed.

Currently, operational and planned projects in Punjab cumulatively utilise just 0.94 million tonnes of paddy straw against estimated 19-20 million tonnes of production. Punjab will have to expedite the construction of plants in progress and plan new one. Haryana has no operational biomass-based power projects presently. It will have to develop a policy programme around biomass-based power plants. The Central Electricity Regulatory Commission (CERC), under the Ministry of Power, has already notified favourable tariffs to biomass-based power plants, in order to incentivise establishment of higher numbers of such plants. In Punjab, this tariff has been determined at Rs 8.17 per unit, and is even higher than competing sources of renewable energy, such as solar energy or wind-based power projects.

3.2 Effective and greater scope of subsidy provision

So that agricultural implements can be made widely available. The extraction of paddy straw or any other crop residue from the field is an essential step for its utilization in power plants, or in any other usage. Currently, this cannot be done manually, owing to supply-sided deficiency in the labour market. The alternative is a provision of subsidy of agri-implements, with the aim of reducing CRB. Punjab has a proposal to provide subsidy on 67,750 units of agricultural implements, and Haryana has notified a scheme in May to subsidies 1810 units of agricultural implements. This is not sufficient, considering the production of 19-20 million and 2 million tonnes of paddy straw, respectively. One way forward is to promote the co-ownership model. There are more than 1700 existing cooperative and privately-run Agricultural Machinery Service Centers (AMSC), which can be the focus of such subsidies. It is important that the farmer understands the value of the crop residue and wants to use these implements for extraction and packaging.

3.3 Creation of a market for paddy straw

Along with a mechanism for commercial procurement of paddy straw for use in biomass-based power projects, as fuel in brick kilns and in production of ethanol. Establishment of bio-refineries for utilisation of paddy straw is another viable option. Punjab has projects in various stages of planning utilising 1.5 million tonnes of paddy straw. There's need to expedite operational status and plan more projects.

3.4 Utilization of paddy straw in the form of biomass pellet fuel

It can be commercially sold as the main fuel for an industrial boiler, as a replacement for coal. Micro-pelletisation establishments need to be incentivised and local usage promoted. Alternate usage of paddy straw to produce paper, card boards, packing materials needs to be promoted, as an alternative to synthetic compounds.

IV. EXPERT RECOMMENDS

According to Sunita Narain, director general of Centre for Science and Environment, "Farmers should be paid Rs 1,000 per acre under the Rashtriya Krishi Vikas Yojana so they can shun the practice of burning paddy straw. They should be given subsidies for buying Rotavator machines that help cut and mix agricultural stubble with soil. We need to understand why the farmers burn stubble and then deal with the basic problem."

V. CONCLUSION

Each year, crop burning in the region is the start of the annual escalation of pollutant concentrations in the air, leading to massive winter pollution in the region. It is acerbated by the massive usage of firecrackers in the region, around Diwali, at the end of October. Followed by this, the weather patterns change, making temperatures drop and reducing the dispersion effect of pollutants. Burning of biomass (leaves, and other organic waste) and garbage through thousands of small fires lit for warmth, along with massive MSW landfill site fires only add to making the air full of toxic pollutants and unfit for breathing.

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