

Effect of Burning of Crop Residues on Soil Health

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Introduction

Our country has total geographical area 329 million hectare, which included 195 and 140 million hectare is gross cropped and net sown areas. However, net irrigated areas are only 83 million hectares. The amount of surplus crop residues available in India is about 141 million tons per year, out of which 92 million ton is burned per year. Rice wheat and Sugarcane are produced a large number of residues in India. Therefore, burning of crop residue has been identified as a major health hazard. The Burning of crop residues causes remarkable pollution problems in the air, huge nutritional loss and physical health deterioration to the soil and also affect human health due to general degradation in air quality resulting in aggravation of eye diseases, skin diseases and lung diseases.

Main causes of the burning of crop residues

- Very short time available between the rice harvesting and wheat sowing.
- Paddy is a water-intensive crop and takes high usage of water in its cultivation. Paddy cultivation can legally begin only around mid-June, when the monsoons arrive over North India.



- In the harvesting of paddy crop, the large units of harvesters leave 6-10 cm of paddy stalk on the field and the removal of the paddy stalk that remains in the field is a labour-intensive process. The rise in labour cost and the subsequent costly availability of mechanical implements in Punjab, Haryana and Western Utter Pradesh lead to about 85-90 per cent of the paddy straw is burnt in the field.

National Schemes and Policies for the Control of the Burning of Crop Residues

1. Rastriya Krishi Vikas Yagna, State Plan Scheme of Additional Central Assistance launched in August (2007) is a government initiative, as a part of the Eleventh Five Year Plan by the Government of India. In this scheme 08 demonstration and training projects were established in different villages of Azamgarh district of eastern Utter Pradesh. 456 farmers are trained to work for agro-waste bio-conversion and bio-compost production.
2. Recently the Government of India directed the National Thermal Power Corporation (NTPC) to mix crop residue pellets (nearly 10%) with coal for power generation. This helped the farmers with a financial return of approximately Rs. 5500/ ton of crop residue. These lucrative measures are yet to take action and it can be profitably exploited by the farmers.
3. Recently the Ministry of Agriculture of India developed a National Policy for Management of Crop Residue (NPMCR). The main objectives of the NPMCR are following:
 - Promote the technologies for optimum utilization and In SITU Management of Crop Residue, to prevent loss of essential soil nutrients, and diversify uses of crop residue in industrial applications.
 - Develop and promote appropriate crop machinery in farming practices such as (modification of the grain recovery machines). Provide discounts and incentives for purchase of mechanized sowing machinery such as the shredder, happy seeder, turbo seeder and baling machines.
 - Provide financial support through multidisciplinary approach and fund mobilization in various ministries for innovative ideas and project proposals to accomplish. National Green Tribunal (NGT), funds have been released from the sanctioned budget for Sub Mission on Agricultural Mechanization (SMAM)



which is implemented on the ratio (60:40) sharing pattern between Centre and State.

- Utilization of satellite-based remote sensing technologies to monitor crop residue management with National Remote Sensing Agency and Central Pollution Control Board.

Major impacts of the burning of crop residues

- Emission of greenhouse gases (Carbon dioxide, Methane and Nitrous oxide) and shoot particles.
- Loss of plant nutrients (Nitrogen, Sulphur, Phosphorus and Potassium) and biodiversity.
- Burning of crop residues causes damage of active beneficial soil bacteria.
- Loss of soil nutrients availability and fertility capacity.
- Loss of flora (bacteria and Fungi) and fauna (Mites, Protozoa, Nematodes, Mice, Moles and Rabbits etc).

Importance of crop residues for soil and living organisms

- The field crops remain is a great natural resource of nutrients to soil fertility.
- The benefits of retention of crop remains on soil surface are improves physical, chemical and biological attributes of soils (Increasing soil moisture content, decrease bulk density, increase porosity and aggregate stability etc.), control of temperature and recycling of plant nutrients and lowering fertilizer use in the next successive crops.
- The crop remains also helps in increased cation exchange capacity, increase in microbial biomass, enhanced bacteria and enzymes activities such as alkaline phosphatase and dehydrogenase.
- The use of crop residues as an option to feed animals, nutritional added value compost and farmyard manures, and mushroom cultivation and spawning bio-energy for rural supply.

Management of crop residues:

- Targeting crop residue to produce renewable energy for upgrading of air, soil health and global warming.



- Crop residues should be categorized as recycling (lime or gypsum) and their use in agriculture field like any other mineral fertilizers.
- The surplus crop residue is utilized for energy generation by establishment of energy plants.
- In-situ management practices in the field, fast decomposition by chemical or biological means and straw mulching by mechanical means must be promoted.
- The farmers can also manage crop residues effectively by employing agriculture machines like use of zero till seed drill, double disc coulters, happy seeder, combine harvester, Straw Chopper / Mulcher, Rotary Slasher, Reversible M B Plough and Rotavator etc.
- Paddy residue could be collected and may be used for generating useful products like organic manure, making compost and bio-char to improve soil health and gasification as an alternate fuel for power generation.
- Change in the method of harvesting of paddy crop and the crop stem may be cut from the root level itself with the help of suitable reaper cum harvester that should be developed using indigenous techniques.
- Establish provision of encouragements to farmers for not burns paddy residues in the open environment.

Conclusion

Crop residues can be used as raw materials for industry and feed for livestock. Management of crop residues remains diverse in different regions. In some regions crop residues is burns due to lack of proper education to farmers, and in the other places everyone is aware of the adverse effects of paddy straw burning at the farm level, but they are constrained by the lack of machineries, economically viable and alternatives for disposal of paddy residues. Government should promote and provide need-based support alternative options to stop burning of residue instead of strict law enforcements to minimize its implications on human and soil health.