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Biochar - An Alternative Method for Stubble Burning

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Introduction

In northern India, particularly in Punjab and Haryana, the rice-wheat cropping system (RWS) is the major agricultural method. The intense RWS cultivation technology is used to grow around 90% of the agricultural land. The short time between harvesting rice and growing wheat is the system's primary drawback. In the absence of any other effective management technique or alternative use of stubble, farmers burn the stubble to get rid of it in order to prepare the field for wheat harvest.Alternative to stubble burning are badly needed. Direct incorporation of stubble into the soil, stubble as fuel, raw material for the pulp and paper industries, or biomass for biofuel production are all examples of alternative management approaches. Because biochar is an effective technique for converting stubble into a carbon-rich source, it can also be used in agroecosystems to improve soil fertility, increase soil carbon, decrease fertilizer use efficiency, and increase agricultural output. Biochar, with its several advantages, can be used as an alternative to stubble burning.

KEYWORDS- Stubble burning, harvesting, environment, biochar

STUBBLE BURNING

Stubble burning is the process of clearing agricultural fields by burning the stubble that remains after harvesting in order to prepare the soil for the following round of sowing.

Fig.1 Stubble burning

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According to an official report, the country produces more than 500 million tonnes of parali (crop residues) per year, with cereal crops (rice, wheat, maize, and millets) accounting for 70% of total crop waste.This is made up of 34% rice and 22% wheat harvests, the majority of which is burned on the farm. According to estimates, Punjab produces 20 million tonnes of rice stubble each year, with 80% of it being burned.

Stubble can be used for cow feed, compost manure, biomass energy, packaging materials, and fuel instead of being burned.Crop residue burning is illegal under Section 188 of the Indian Penal Code and the Air and Pollution Control Act of 1981. The government's implementation, on the other hand, is weak.

Harmful Impacts of Stubble Burning

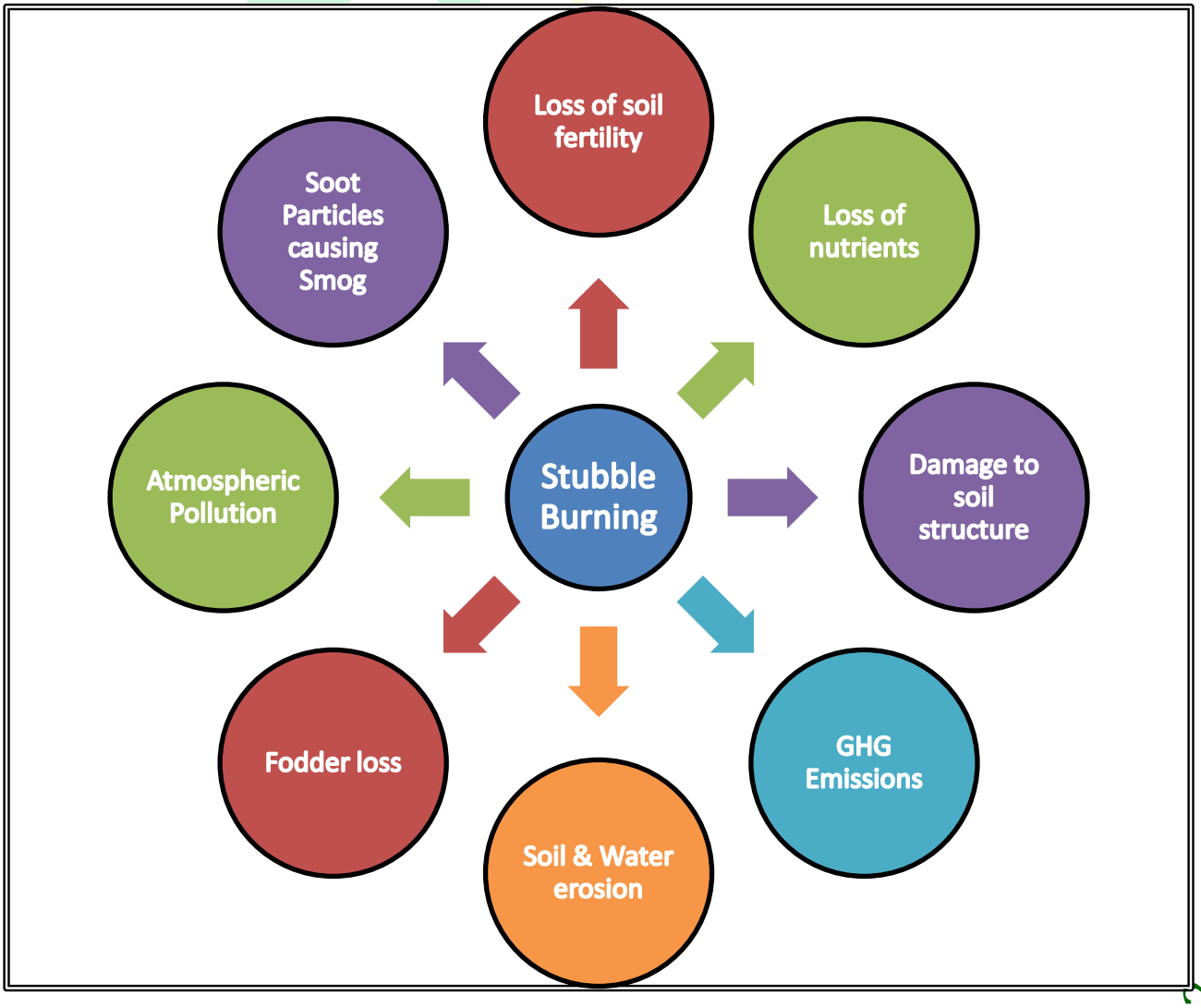

Fig.2 Impacts of Stubble Burning

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Biochar as an Alternative

The word "char" means any carbonaceous solid material processed under thermal decomposition without or under starved O2 conditions. Carbonization, combustion, torrefaction, gasification, and pyrolysis are some of the thermal procedures used to make biochar. Because of its simplicity and efficacy, pyrolysis is the most popular method for producing biochar. Pyrolysis can be accomplished in a furnace in oxygen-deficient circumstances. Biochar has been shown to be potentially effective in boosting soil carbon sequestration, crop production, and remediating contaminated soil and water. Farmers can use biochar as an alternative for stubble burning as it is a carbon-rich, stable, and long-lasting substance and it will help to improve health and quality of the soil.

Fig.3 Biochar

The enormous quantities of rice-wheat stubble generated in the Haryana-Punjab region of India could potentially be pyrolyzed to produce biochar as a suitable way to waste management over stubble burning. Biochar has a huge potential for mitigation of climate change by carbon sequestration and reduction in greenhouse gas emissions through reduced waste biomass burning, clean bio-energy production and reduction in methane and nitrous oxide emissions thereby achieving sustainable development goals.

Advantages

- **Soil Quality Improvement**- Biochar is a good soil conditioner since it contains a variety of useful characteristics. The high carbon content, large surface area and ability to improve soil aeration all contribute to the promotion and support of the rhizospheric microbial population, which improves soil health and fertility.

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- **Climate Change Mitigation**- The creation of biochar has the potential to address the threat of climate change. This is accomplished through the carbon sequestration technique. If agricultural wastes are pyrolyzed to form biochar, which has long-term stability in the soil, carbon dioxide and other GHGs emitted during stubble burning would no longer be released into the sky.
- **Bioenergy from Biochar**- Depending on the temperature at which biomass is pyrolyzed, varying amounts of biochar, bio-oil, and syngas are produced. Biomass pyrolysis produces more bio-oil and less charcoal when done quickly.The emissions (air pollutants) emitted during biomass pyrolysis could theoretically be collected and condensed into bio-oil, a bioenergy source.
- **Biochar as Bioremediation Technology**- The use of biochar to remove heavy metals has been identified as a potential field. The use of biochar is a good way to reduce pollutant bioavailability in the soil. Biochar is a highly effective sorbent and a novel carbonaceous substance for removing organic and inorganic pollutants from soil and water, including heavy metals, especially in dry and semi-arid environments.

Conclusion

Despite numerous efforts, the wheat-paddy stubble burning problem has only seen a slight decrease and has not yet dropped to tolerable levels. Stubble burning has a number of negative health and environmental consequences. Agriculture also faces multiple challenges due to rapid increase in food demand and environmental concerns. Biochar application is good deal of attention as it boosts soil fertility and retains nutrients. It also reduces gashouse gas emissions, improve water quality and climate change mitigation. Hence, we can say that biochar is a good way to combat stubble burning.