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Stubble Burning: Effects and Its Management Strategies

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INTRODUCTION

Stubbles are known as leftover cut stems or stalks of mostly rice and other cereal crops present on ground after the grain is harvested. Now a day's stubble burning is a global concern that causes severe health related issues to both humans and animals along with pollutions to the environment and different ecosystems. On global scale the Asian countries produce 60% of biomass emission that from stubble burning. Recently Delhi has been added in the list of mostly polluted city in the world and in 2019 report it was shown that almost 14 out of 20 polluted cities are from India. The most common and broad farming system in Indo-gangetic plains is rice-wheat cropping system, which is the most important factor for stubble burning or managements issues that accounts for 12 Mha out of total 66 Mha. Use of combine harvester creates possible reason for stubble retention and burning issues are followed for management issues, this stubbles are nearly 14 million tons that are burnt each year. In Punjab areas approx. 86% of wheat and rice stubbles are burned on the field after harvesting. Stubble burning give rise to significant source of hydrogen, carbon dioxide, volatile organic compounds which accounts for 10% of total emission worldwide as it contains the particulate matter along with harmful gases such as CH_4, SO, CO, CO_2, N_2 which severely affects human health.

Effects of stubble burning are:

1. **On air quality**: The burning of stubble creates various threats to the air quality of the surrounding environment. The deposition of aerosols and gaseous pollutants is there and the air quality is considerably affected. Air quality of urban areas is highly affected due to stubble burning along with it pollutants accumulations from industries and vehicles.

2. **On soil fertility Status and decline in productivity**: The burning of stubbles develops high temperature which helps in loss of different nutrients from soil thus leading to decline in soil fertility status. The accumulation of different pollutants affects the overall production status and low fertility of soil declines the crop productivity.
3. **On Mortality rate** : Accumulation of pollutants over time causes toxic environment and inhalation of toxic air affects the respiratory systems, causes various disorders, cancer or even death. Long exposure to such toxic environment increases the rate of cardiovascular mortality.
4. **On the economic development**: Apart from impact on health and environment, economy is also affected as pollution creates unfavorable condition for tourists and hampers the flow of economy.
5. **On climate**: The stubble burning has direct impact on climate and weather through the release of various green house gases such as CO_2, CH_4, water vapor which potentially leads to global warming.

Management practices:

1. **Incorporating the stubble into the soil:** Stubble also contains some reserve nutrients in it, thus incorporation of stubbles into the soil elevates the soil fertility and helps in maintaining organic matter content in soil. The high amounts of nutrients boost the crop production.
2. **Compost material preparation**: Compost materials known to improve the soil properties and crop production. Stubbles from wheat, rice, sugarcane and pulses are rich in nutrients and can be utilized for production of good quality compost and vermicompost when integrated with cow dung.
3. **Uses as fodder for animals**: The best management of stubbles can be used as fodder materials for animals and it is quite common in India. Wheat and maize stubbles can be used as a high nutrient rich stubble material for the fodder purposes.
4. **Biochar compound production**: Stubbles can be utilized for the manufacturing of biochar by the process of pyrolysis. Biochar application helps in soil carbon sequestration and conditioning which improves the carbon content in soil and removes the carbon dioxide. Biochar production is a sustainable and viable strategy for the management of agricultural stubbles.
5. **Energy generation strategy**: Energy generation is possible from agricultural stubbles via combustion, gasification as well as methanation. Electricity and heat can be generated when stubbles are combusted direct way or mixed with other substances in the combustion chamber.

CONCLUSION

The rice-wheat cropping systems in India generate a huge amount of crop residues and stubble after the harvesting of crops. All these stubble materials are burned on the field which produces toxic pollutants that hamper environment, health of humans and animals, decreases crop productivity and soil health. The consequences of stubble burning may lead to global warming, climate change and other harmful events. Management of stubbles with proper planning and utilization can lead to better future in field of sustainability and development.