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Maximizing agricultural yield: The advantages of crop residue management

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Abstract

Despite the fact that crop residues are abundant in plant nutrients, farms burn a lot of them—roughly 90 metric tons—mostly to make room for new crops to be sown. However, a manpower shortage prevents farmers from burning crop residues. They simply burn off the residue in order to dispose of it (NPMCR, 2019). Raindrop impact is absorbed by crop residue, and wind is deterred from blowing across the soil surface. This lessens wind and water erosion as well as the separation of soil particles. Additionally, there is less surface crusting through the soil's surface, which enhances infiltration and lowers runoff. According to Cox *et al.* (2004), crop leftovers serve as substitute hosts for a variety of insects, pests, and illnesses. In light of the aforementioned, we work to gather information and provide a range of technical and policy options for managing agricultural straw in order to outlaw burning it, increase soil fertility, and stop environmental damage. Important suggestions include incorporating crop residues into soil, following the ICAR's advice on crop rotation or in the soil care given to farmers, encouraging competitive alternatives for using crop residues in small-scale industries like straw paper, cardboard, and packaging materials, and establishing biomass power plants under a public-private partnership model to guarantee farmers financial returns and maintain soil fertility and food production while halting environmental degradation in the nation.

Keywords: Maximizing agricultural yield, crop residue management, manpower shortage

Introduction

Crop residues refer to the remaining plant components in the field following the harvesting of the crops (grains, tubers, roots, etc.). Crop residues were once considered a waste resource, so farmers didn't give them much thought. However, in recent years, there has been a rise in understanding of the potential uses for crop residues. Crop leftovers are now recognized as natural sources of microbiological population and minerals. After harvesting, keeping crop remains is thought to be an efficient anti-erosion strategy. India produces 500 million tons of crop leftover year on average, according to the Ministry of New and Renewable Energy (MNRE) (Bhuvaneshwari *et al.*, 2019)^[3]. Agricultural crop residues are generally.

1. Field residues: After the crop is harvested, materials that remain on agricultural land or in plantation regions are referred to as field residues. Field remnants include stems, leaves, seed pods, and stalks. The leftovers can either be burned first or planted directly into the ground. Erosion control and irrigation efficiency can be efficiently achieved with correct management of these wastes.

2. Process residues: These are components or byproducts that are created or released during the processing of valuable resources. Examples of process wastes are bagasse, husks, seeds, roots, and molasses. These leftovers can be used as fertilizers to improve the soil and as animal feed.



Organic materials and nutrients can be found in crop leftovers. When added to soil, they improve both the physical and chemical environments of the soil and its microbial community. Despite the many benefits of recycling crop wastes, farmers are burning their crop remains on the field to prevent the following crop from being sown too late. Lately, Delhi pollution has spread across the country, primarily as a result of Punjabi farmers burning their leftover rice.

Table 1: Nutrient content in crop residues

Crop Residues	Nutrient content (%)		
	N	P ₂ O ₅	K ₂ O
Rice	0.69	0.20	1.20
Wheat	0.50	0.18	1.19
Maize	0.55	0.20	1.30
Sugarcane	0.50	0.18	1.20
Pulses	1.50	0.50	1.70

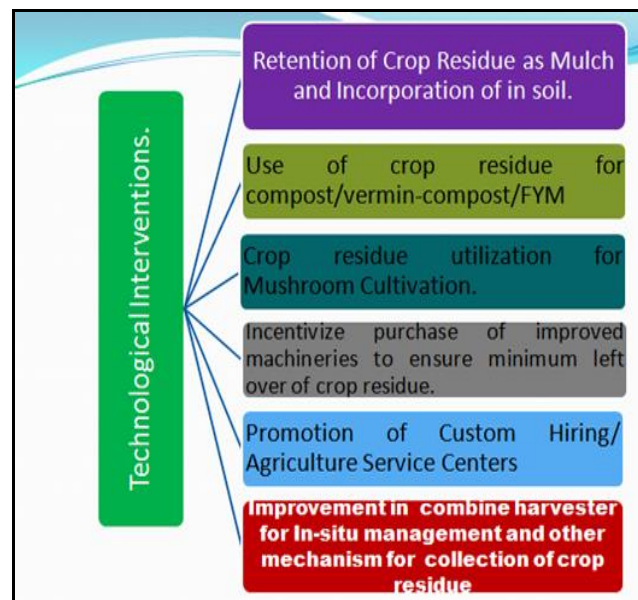
Source: Reddy & Reddy. (2003)

Table 2: Crop residue potential in India crop wise

Crops	Residues (Mt)
Cereals	350
Pulses	13
Oilseeds	30
Sugarcane	12
Fibers	65

Source: The MNRE, Govt. of India (2009)

Several nations make use of the crop wastes produced by agricultural activities in various ways. Depending on the intended usage, they are exploited in either processed or unprocessed form. They can be utilized to produce biofuels, as well as animal feed and compost material. They can also be used in the cultivation of mushrooms. Numerous nations, including China, Indonesia, Nepal, Thailand, Malaysia, Japan, and the Philippines, use their crop leftovers to produce compost and bioenergy, according to Lohan *et al.* (2018) [2]. Crop residues have the ability to maintain soil moisture content, enhance soil structure, and increase the amount of organic matter in the soil. They are essential to the sequestration of carbon, which lessens the effects of climate change. Effective residue management techniques provide numerous benefits for agricultural fields.



Major crops farmed worldwide include maize, wheat, rice, and sugarcane, which together make up the majority of lignocellulosic biomass. Because lignocellulosic biomass, which is made up of cellulose, hemicellulose, and lignin, is so readily available as a raw material for biofuel production, it is becoming recognized as a valuable commodity. In an effort to address the energy problem and the requirement to reduce greenhouse gas emissions, researchers, policy officials, and investors have given the idea of using biomass for liquid fuels, or biofuels, for sustainable energy production a lot of attention. These energy constraints can be exacerbated by clean energy generated from locally sourced biomass, which can also give the farming community an alternate source of income. Converting biomass to methanol and using it in place of energy produced by fossil fuels.

Conclusion

The physical, chemical, and biological qualities of soil are enhanced by the inclusion of crop residue. Crop residue that has been incorporated over time improves soil production. By adding more N and other advantages to the soil, crop residues that are retained or incorporated into the soil enhance crop production and the cropping systems' N economy. It will be necessary to show the relative advantages of crop residues returning to soil for sustainable agricultural productivity for farmers who burn their crop residues in the field or treat them as waste material. It is vitally important to raise knowledge about crop residue management among the farming community and other relevant stakeholders in order to break through the generational mindset that holds that waste management is not their duty. It is crucial.

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