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A STUDY ON EFFECTIVE STRATEGIES FOR CROP RESIDUE MANAGEMENT

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ABSTRACT

Plant components remaining in the field after harvesting are known as crop residues. In order to prepare a field for the next crop, the residues are often burned. Farmers have adapted the most popular and inexpensive way, which is to burn the residues. As well as contributing to environmental pollution, burning residues has negative effects on soil quality. Soil fertility is decreased because germs are eliminated by the burning of residue. In addition to the macro and micro nutrients lost while burning soil residue. Crop residue burning is caused by key restrictions including time, resources, finances, and agricultural automation. Some viable alternatives to burning residue are composting, incorporating residue into other projects, using it as mulch, etc.

Keywords: Residue Management, Mulching, Livestock,Fuel

I. INTRODUCTION

Indian economy relies heavily on agriculture. Our country generates massive amounts of agricultural waste. This solves the pressing issue of how to deal with the vast quantities of crop residue produced by India's predominant farming system, rice and wheat. Crop residues are the portions of plants that are left in the field after harvesting but are not used for commercial purposes. The residues from the agro-based sectors are likewise rather substantial. Some were converted into animal feed, cooking fuel, industrial fuel, and even manure. The majority of agricultural residues, however, are left on the field and used.

The tremendous rise in food production can be directly attributed to the increasing hunger in developing countries. Successful businesses in both emerging and established countries may be found in the agro-based sector. Increases in both the volume and complexity of agricultural waste and pollution have been linked to the expansion of agricultural enterprises. The kind of activities people engage in and the amount of waste they generate are both influenced by a country's geography and culture. Large areas of formerly unsuitable land have been transformed into fertile farmland as a result of advancements in water management, innovative agritech, and extensive use of pesticides. These practices have hampered efforts to dispose of agricultural waste and led to pollution throughout the planet. Government officials, however, are continually mulling over new policies and techniques for dealing with these trash, including recycling them into useful resources.

Products from farming and allied industries create what are known as agricultural wastes. The United Nations classifies as polluting the environment manure and other wastes from farms, poultry houses, and slaughterhouses; waste from harvesting; fertilizer run-off from fields; pesticides that enter water, air, or soils; salt and silt drained from fields. The World Energy Council classifies decaying food as agricultural waste with the aforementioned. What is left in a field or orchard after a crop has been harvested, as well as what is left after a crop has been processed into a usable resource, are both considered harvest trash, also known as crop residue. Stumps, leaves, and empty seed pods are common field waste products. Molasses and bagasse from sugarcane processing are examples of process residue.

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After crops have been harvested and threshed or pastures have been grazed, the remaining plant components are known as "crop residues." Once considered useless waste that belonged in the trash, we now realize these goods are actually precious assets that should be protected and put to good use.

Using crop residues is a beneficial agricultural technique for several reasons, including improved soil quality and fertility, more efficient use of nutrients and water, and reduced insect populations. Crop residues include anything from the previous crop's leaves and twigs to any manure or compost that was used before, during, or after planting the current crop.

II. CROP RESIDUES IN INDIA

The agricultural sector has a significant influence on the Indian economy as a whole. India has many different ecological and agricultural zones, hence the country also grows many different kinds of plants. After harvest, farmers typically discard the vast majority of agricultural residues. Crop residue refers to the remaining plant material such as stalks, leaves, seed pods, and roots after the economically valuable elements of the crop have been harvested. About 500 million metric tons (Mt) of plant residues are generated every year in India, and their composition varies widely across the country. Crops grown, planting capacity and national output all affect the unequal distribution and utilization of agricultural residues. Since Uttar Pradesh has the most farmland in India, it also produces the most crop residues (60 Mt). Experts now believe that four Indian states—Punjab, Haryana, West Bengal, and Uttar Pradesh—are particularly prone to the practice of burning crop residues. The bulk of crop residue comes from cereals, fibers, pulses, oilseeds, and sugarcane, with estimated yields of 352 Mt, 66 Mt, 13 Mt, 29 Mt, and 12 Mt, respectively (Table 1). Most agricultural residue was produced by cereal crops (Table 2), specifically rice, wheat, maize, and millets. Approximately 9.26 and 5.1 Mt of oil seed residues and 28.6 Mt of fiber crop residues were burnt in Rajasthan and Gujarat, respectively.Using the ratios of dry matter to crop biomass production and total crop production, one may determine the quantity of agricultural residues generated. Different crops have different straw-to-grain ratios; for example, cereal crops have a ratio of 1.5-1.7, fiber crops have a ratio of 2.15-3.0, oilseed crops have a ratio of 2.0-3.0, and sugarcane has a ratio of 0.4. Thus, efficient use of these crop residues can boost farm waste management, lessen agricultural pollution, and lead to long-term agricultural sustainability.

Table 1: Crop residue production estimate of major crops in India

Crop	**Estimate of residue production (Mt)**
Rice	105
Wheat	94
Sugarcane	361
Oil seeds	30
Cotton	35
Jute	11
Pulses	17

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Table 2: Crop residues produced by major crops

Source	Composition
Rice	Husk, Straw
Wheat	Bran, straw
Maize	Stover, husk, skins
Millet	Stover
Sugarcane	Sugarcane tops, bagasse, molasses

III. STRATEGIES FOR RESIDUES MANAGEMENT

Residue incorporation

Instead of having a negative impact on soil climate and microorganisms through removal or burning, crop residue can actually be beneficial. One viable strategy for making use of the vast majority of surplus rice straw is to incorporate it into agricultural areas. Soil organic matter and nutrient (N, P, and K) levels are boosted. Crop residues are included to boost crop output by 15% to 35% compared to a control treatment. The best way to incorporate residue is by plowing. The integration of Crop Residues in the field is helpful in recycling nutrients, but it temporarily immobilizes nutrients (such as Nitrogen), thus extra nitrogenous fertilizer must be supplied to adjust the high C:N ratio at the time of residue incorporation. Soil health qualities and fertility would be enhanced, and air pollution would be reduced, as a result. On the one side, it would lessen farmers' reliance on synthetic fertilizers, and on the other, it would keep agricultural chemicals from degrading soil quality.

Surface retention and mulching

Mulch is a layer of plant residues or another material that has been intentionally or naturally spread over the top of the soil in order to preserve the soil through its low bulk-density and low energy yield per unit of weight. No matter the bio-energy technique, it will be expensive to transport the massive amounts of straw needed for effective energy generation.

Livestock feed

Crop residues are commonly used in India as animal feed, either unprocessed or with the addition of chemicals. However, due to their lack of palatability and digestibility, crop residues cannot serve as the only source of nutrition for cattle. Crop residues are fibrous materials with a low density that are poor in nitrogen, soluble carbohydrates, minerals, and vitamins and contain varied quantities of lignin, a physical barrier that slows down the decomposition process by microorganisms. The processing and enrichment of the residues with urea and molasses, as well as the addition of green fodders (leguminous/non-leguminous) and legume straws (sunhemp, horse gram, cowpea, and gram), are necessary to satisfy the nutritional needs of animals.

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Energy and bio fuel

Because of its positive effects on the environment, biomass has attracted attention throughout the world as a potential energy source. Crop residues have become increasingly popular as a renewable energy source and fossil fuel replacement in recent years. Biomass is a sustainable energy source that can be stored for later use, is cheap, efficient, and kind to the environment, especially when compared to solar and wind power. Bio-oil, produced by fast pyrolysis technology, is a dense liquid made from biomass. Since ethanol may be used as a pure fuel in internal combustion engines or combined with gasoline as a range extender and octane enhancer, its production from ligno-cellulosic biomass from crop residues is of critical relevance. Straw, however, has a poor energy yield per unit weight and a low bulk-density. No matter the bio-energy technique, it will be expensive to transport the massive amounts of straw needed for effective energy generation.

Biochar

Biochar is a high-carbon substance created by the low-temperature (<700°C) pyrolysis of biomass such as wood, dung, or leaves in an enclosed container with little or no air circulation. This fine-grained charcoal has great promise as a tool for reducing greenhouse gas emissions and storing carbon in the soil for the long run. However, given the state of the art in technology right now, it is not practical or marketable to farmers. After all the heat energy, gas like H2, and bio-oil produced in the biochar formation process are gathered and put to use, the process becomes economically feasible.

As mushroom cultivation

Mushrooms, despite their high moisture content, have two to three times as much protein as ordinary vegetables and an amino acid composition equivalent to that of milk or meat, making their use in mushroom cultivation a profitable conversion of inedible crop residues into nutritious food. Both the white button mushroom, Agaricusbisporus, and the straw mushroom, Volvariellavolvacea, thrive when cultivated on wheat and rice straws. The substrate may be converted into fungal bodies at a very high efficiency when straw is combined with horse dung and hay for Agaricus culture.

Crop Residue as animal bedding and compost

Compost is made by using agricultural residues as animal bedding and then piling the resulting piles in dung pits. Because of the benefits to the animals' comfort, udder health, and leg health, using paddy straw bedding throughout the winter increased milk production. The animals were able to maintain a comfortable body temperature and heat loss thanks to the paddy straw bedding. Straw in the animal shed absorbs roughly 2 to 3 kg of pee, increasing its N content. About three tons of nutrient-rich manure may be produced from the composting of the rice crop residues from one hectare of land. Compost made from rice straw can be improved by adding P from a local, low-grade rock phosphate source, increasing its value to 1.5 percent N, 2.3 percent P2O5, and 2.5 percent potassium oxide.

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IV. GOVERNMENT POLICIES FOR CROP RESIDUE MANAGEMENT

- To curb farm residue burning, the Ministry of farm developed a nationwide policy for managing crop residue in 2014. advocate for high-quality farm equipment. Second, work along with the National Remote Sensing Agency and the Central Pollution Control Board to track how agricultural residue is handled using satellite.

- Agricultural mechanisation for in-situ management of agricultural residues in the states of Haryana, Punjab, and Uttar Pradesh, and the national capital territory of Delhi" cost the Indian government Rs. 6,950 million over the course of the fiscal years 2018–19 and 2019–20. The objectives are to increase the use of farm machinery banks for individualized equipment rental and to encourage in-situ crop residue management through retention and absorption into the soil.

- Crop residue management project for Punjab, Haryana, and Rajasthan, costing Rs. 549.38 crores over three years and three months, to help farmers become more resilient to climate change. The objectives are to reduce greenhouse gas emissions, create models of rural entrepreneurship that are both practical and sustainable, and to discover possible co-benefits and policy interventions.

- Farmers may hire residue management equipment such as a Happy Seeder, Rotavator, Zero till Seed Drill, Straw Baler, Paddy Straw Chopper/Mulcher, Gyro Rake, Straw Reaper, Shredder, and so on from village-level Farm Machinery Banks or Custom Hiring Centres.

- To promote renewable energy in the state, the government of Punjab announced a 'New and Renewable Sources of Energy Policy' in 2012. Under this initiative, a goal of 600 MW of biomass capacity and 500 MW of cogeneration capacity will be reached by 2022.

- In 2018, the government of Haryana implemented a bioenergy program to put the state's surplus crop residues to use producing bio-CNG, bio-manure, and biofuel.

V. CONCLUSION

As a result, agricultural residue fires pose a serious risk to global warming and pollution levels. Burning crop residue results in the release of more harmful and hazardous chemicals. It produces a plethora of greenhouse gases and other carbon-based substances. Consequently, eco-friendly waste management of the resulting residues is essential. Biofuel, animal feed, and mushroom cultivation are just a few of the many viable alternatives to burning residues. Crop residues have significant monetary value as animal feed, fuel, and industrial raw materials, as well as in conservation agriculture, which requires them. Crop residue is a dynamic substance that boosts soil health by enhancing its physical, chemical, and biological qualities. Crop residues must be used in conservation agriculture, either in whole or in part, to ensure the security of the nation's food supply, to make agriculture sustainable, and to maintain a healthy soil resource base.

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REFERENCES: -

1. Sukul, Premasis& Kumar, Kaushal. (2020). INTEGRATED CROP RESIDUES MANAGEMENT FOR A SUSTAINABLE AGRICULTURE: ONLY ANSWER TO THE STUBLE BURNING -A REVIEW. Plant Archives. 20. 972-5210.

2. Bhuvaneshwari, S.; Hettiarachchi, H..; Meegoda, J.N. Crop Residue Burning in India: Policy Challenges and Potential Solutions. Int. J. Environ. Res. Public Health, 2019, 16, 832-840.

3. Bimbraw AS. Generation and impact of crop residue and its management. Current Agriculture Research Journal 2019;7(3):304.

4. Kaur K, Kaur P, Sharma S. Management of crop residue through various techniques. Management 2019.

5. Behera, B. Recycling of crop residues for improved soil nutrient status and farm income. PhD Dissertation; Department of Agronomy; College of Agriculture; Orissa University of Agriculture and Technology, Bhubaneswar; 2018; pages 72.

6. Gupta, Vikas& Sharma, Bhagwati& Singh, Mahender& Gupta, Meenakshi& Sharma, Rakesh. (2018). Crop residue management for productivity enhancement and sustainability under various cropping systems-A Review. Journal of Soil and Water Conservation. 17. 83. 10.5958/2455-7145.2018.00012.7.

7. Bisen N, Rahangdale CP. Crop residues management option for sustainable soil health in rice-wheat system: A review. International Journal of Chemical Studies 2017;5(4):1038-1042.

8. Mhlanga, Blessing &Muoni, Tarirai. (2014). Crop Residue Management in Conservation Agriculture Systems in Zimbabwe Smallholder Farming Sector: Importance, Management Challenges and Possible Solutions. Asian Journal of Agriculture and Rural Development. 4.

9. Gangil, S., and Wakudkar, H. M. (2013). Generation of bio-char from crop residues. International Journal of Emerging Technology and Advanced Engineering, 3(3), 566-70.

10. Brar NK, Condon J, Evans J, Singh Y. Nitrogen management in wheat sown in rice straw as mulch in North West India. In 19th World Congress of Soil Science, Soil Solutions for a Changing World 2010,1-6p.