RESEARCH ARTICLE

Management of agricultural residues and their environmental impacts

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Pareek S. Management of agricultural residues and their environmental impacts. AGBIR.2024;40(6):1-4.

Agriculture is important to our country's economy since it includes a variety of production sectors, each of which generates its own set of waste products. This research looks into agriculture's multiple areas and analyzes Information and Communication Technology (ICT's) role in waste management. It provides a complete review of the conventional and technology waste management strategies used in various areas. This research provides light on new solutions to waste-related concerns by investigating the interaction between agriculture and ICT, supporting sustainability and efficiency in this crucial industry.

Key Words: Agriculture; Waste management; Information and communication technology; Sustainability

INTRODUCTION

India is mostly an agricultural country. Farmers are the backbone of our country. Farmers used locally accessible natural resources likewise as post-harvest trashes, weeds, cow dung, and so on as manure in the beginning. This will result in a higher-quality output. As a result of such procedure, several waste products are produced as agricultural waste [1].

Agricultural waste, which encompasses both natural (organic) and non-natural wastes, is a broad word for waste generated on a farm as a result of various farming operations. Dairy farming, horticulture, seed planting, livestock breeding, grazing area, market gardens, nursery plots, and even woods are examples of these activities. Agricultural and food sector residues, trash, and wastes account for a sizable share of global agricultural production. It has variously been estimated that these wastes can account for over 30% of worldwide agricultural productivity [2].

India, predominantly an agrarian country, is strongly reliant on its farming population, which is frequently referred to as the country's backbone. Farmers have always used locally available natural resources as fertilizers, such as crop waste, cow dung, and other organic materials, to ensure high-quality crops. This approach, however, results in the production of agricultural waste. Agricultural waste includes a vast range of materials, both organic and inorganic, resulting from a variety of farming operations such as dairy farming, horticulture, animal production, and others. These residues and wastes, which are common in the agricultural and food industries, account for a significant amount of worldwide agricultural output, demanding appropriate management and disposal strategies.

Agricultural waste

Plant wastes can be left *in situ* or utilized as firewood. Stubble an improve soil structure and prevent erosion caused by rain. When the consequences are limited, burning trees, plants, and stubble is a suitable management method. Smoke may have an influence on air quality and hence human health.

Waste from poultry houses: Poultry farming has traditionally been an important part of India's livestock production system. Production of poultry in the earlier four decades, India has made a quantum jump from an utterly unstructured and unscientific farming practice to a commercial production system with cutting-edge technical inputs. The Indian commercial poultry business has improved dramatically as an outcome of the industry's scientific approach and the government's creation of an enabling environment [3].

Waste from slaughterhouses: A slaughter house is a place where animals are defeated or murdered for use as food. Slaughterhouse wastes may include bacterial, viral, prior, and parasite diseases that may infect both animals and humans. This will allow them to compare three alternative methods of disposing of waste items generated by animal slaughtering in abattoirs.

Harvest waste: The practice of gathering a mature crop from the fields is known as harvesting. Reaping is the process of harvesting grain or pulses with a scythe, sickle, or reaper. The post-harvest industry comprises all stages along the value chain, from field production to food on a plate for consumption. Harvesting, handling, storage, processing, packing, transportation, and marketing are all postharvest operations [4].

Fertilizer waste: When farming activities are not adequately managed, they might lead to nutrient contamination. The principal causes of nutrient contamination from agricultural sources are fertilizers and animal dung, both of which are high in nitrogen and phosphorus.

Extraction can be used to measure the quantity of a fertilizer that dissolves and interacts with the soil. Excess nutrients can have an influence on water quality when it rains or when nitrogen and phosphorus-containing water and soil wash into neighboring bodies of water or leak into groundwater.

Soil waste: Solid waste includes trash, refuse, and sludge from a wastewater treatment plant, water supply treatment plant-based product, or air pollution control facility, as well as other discarded materials including solids, liquids, semi-solids, or contained gaseous material generated by industrial, commercial, mining, and agricultural operations, as well as events in the community, but it does not include solid or dissolved materials in household waste or solids or dissolved materials in irrigation reservoirs [5].

As a result, it is essential to have an in this phase, solid waste management is used. Waste management is concerned with the transformation of solid waste into a profitable resource. Every family, including company owners, should embrace solid waste management as part of global industrialization.

Agro-industrial waste: Agricultural Wastes (AW) are remnants from the cultivation and processing of raw agricultural goods such as fruits, vegetables, meat, poultry, dairy products, and crops. Agricultural waste can be solid, liquid, or slurries depending on the nature of the agricultural activity. Furthermore, agricultural industry leftovers and trash account for a sizable share of global agricultural production. Although the agriculture industry generates substantially less trash than other businesses, agricultural

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Received: *07-Nov-2023, Manuscript No. AGBIR-23-119496;* **Editor assigned:** *09-Nov-2023, PreQC No. AGBIR-23-119496 (PQ);* **Reviewed:** *23-Nov-2023, QC No. AGBIR-23-119496;* **Revised:** *21-Feb-2025, Manuscript No. AGBIR-23-119496 (R);* **Published:** *28-Feb-2025, DOI: 10.37532/0970-1907.24.41.2.1-4*

waste has a high long-term contamination potential. This book examines agricultural waste characteristics, kinds, and management alternatives [6].

Aims and objectives

- To investigate the impact of agricultural waste and the various techniques of dealing with it.
- Research the types of agricultural waste that are produced.
- Understanding the approaches used to handle waste.
- Determine if farmers are aware of government schemes and approaches for agricultural waste management that have been launched.

According to Neeti Vijaykumar's "farm waste to fuel" study, agricultural waste is a byproduct that is utilized as animal feed in certain regions. However, the majority of farmers do not recognize its potential; garbage is tossed into ditches and burned on fire. This behavior merely contributes to air pollution and is generally bad to the environment. However, a recent breakthrough led by experts from India's department of biotechnology has the potential to convert this trash into treasure. Harsh Vardhan, minister of science and technology, launched a new type of biofuel plant. Dr. adi Yazc, mayor of "Istanbul Tuzla Municipality in their work," said that "we acted in order to realize the main municipality tasks such as cleaning and waste collection." Soil, water, air, and sunshine are regarded as the primary resources that support food supplies and planetary ecosystems. Crop production is the most intensive use of these natural resources, particularly the soil. Crop yield is increased by high-quality soil that is rich in organic matter. Crop residue incorporation enhances soil organic matter. After harvesting the economically important sections of field crops, residues, such as stems, leaves, husks, and so on, serve critical roles in improving soil quality and resolving a variety of environmental challenges. In general, crop leftovers are a major source of elemental carbon in soil. In terms of economic relevance, crop leftovers are typically regarded as trash. Crop residues, on the other hand, provide a number of possible routes for nutrient recycling, particularly carbon sequestration. In 2013, Navdeep Singh, et al. investigated the application of agricultural charcoal is used to generate electricity. Agricultural waste may be used to make fuel cakes and charcoal.

The destructive distillation process modifies the product. Charcoal as a fuel a source of energy and can be classed according to their different calorific value. Depending on raw material availability substance with a good carboniser may aid in the generation of energy. R Vidyalakshmi, et al. investigated the xanthan synthesis from agro-industrial waste, an effort to synthesize xanthan. Potatoes from agricultural waste peel was used as the carbon substrate for *X. citri*. A large amount of xanthan was generated. Xanthan gum is a kind of water. Xanthomonas exopolysaccharides that are soluble T is a species.

MATERIALS AND METHODS

This research was conducted in order to better understand the many types of waste produced in agricultural sectors, as well as distinct procedures and strategies. To gather information in order to obtain quality value information for the offered research work, a survey-based approach is employed to collect the opinions and perspectives of several agricultural domains.

This literature research does not provide enough data to comprehend the utilization and knowledge of information technology among agricultural waste in India. As a result, a quantitative method was used to better comprehend the situation. To collect data, this survey approach was employed. A questionnaire and face-to-face interviews were used to elicit relevant information from respondents in the affiliated study activity. The precise people are chosen to conduct the survey [7].

Ideal approaches on agricultural waste management

The primary purpose of any waste management system is to maximize economic profit from trash while maintaining acceptable environmental standards. The system must also be inexpensive and simple to operate in order to be practical. Undisposed of garbage can contaminate surface and groundwater and contribute to air pollution. When most people think of farm waste, they think of manure. Farm waste in a livestock company may comprise waste feed, dead stock, silage effluent, and milk house rubbish, in addition to manure. Horticulture outputs include culls, rotten produce, wash line sediment, and processing plant trash.

Management of livestock and poultry:

- Examines waste management in the cattle and poultry industries.
- Manure control, feedlot and pasture management, milk house wastes, and dead cattle disposal are all prioritizing.

Management of horticultural waste:

- Discusses potato, other vegetable and fruit wastes.
- Highlights the environmental concerns associated with handling wastes.
- Suggests acceptable options for disposal.

Farm plastics:

- Discusses the best management practices for handling farm plastics in both the livestock and horticultural sectors (Figure 1).

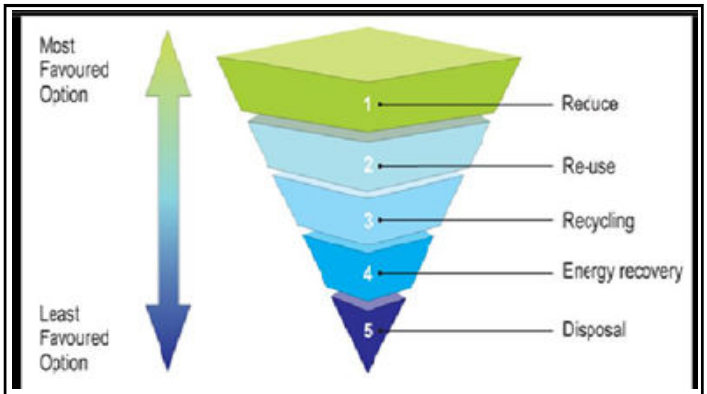

Figure 1) *Best management practices for handling farm plastics in both the livestock and horticultural sectors*

Waste management categories on: The study on this domain, gives a reach features to handle the waste in agriculture, as growth of ICT in today's era has led to increase in method to waste management. That government and private sectors are actively contributing on waste handling approaches includes residential and commercial wastes in city and rural areas in either organic or chemical form of waste including wastes like solid waste, plant waste, poultry and slaughter houses, fertilizer waste and harvest waste etc.

Recycling and conservation

Energy conservation and renewable energy: As a responsible corporate citizen, ITC has pledged to minimize its reliance on fossil fuels by recycling useable garbage. Significant progress has been achieved in expanding the renewable energy portfolio, and over 43% of ITC's overall energy supplies were fulfilled by carbon-neutral oils such as biomass gases in 2016-17. As an accountable corporate citizen, ITC has pledged to minimize its reliance on fossil-fuel energy. Significant progress has been achieved in expanding the renewable energy portfolio, and in 2016-17, carbon-neutral fuels like as biomass, wind, and solar provided over 43% of ITC's total energy demand.

Water conservation: With water scarcity becoming a growing concern, research continues to focus on integrated waste water management initiatives at its units, including water conservation and harvesting initiatives, while also working to meet the water security needs of all stakeholders at the local watershed level. Adopting cutting-edge technology to minimize fresh water input and boost reuse and recycling methods, best practices to achieve zero effluent discharges, rainfall collecting, and so on are examples.

Greenhouse gases and carbon sequestration: ITC's social and farm forestry programs resulted in the sequestration of more than double the amount of CO_2 generated by its operations. These programs assist green degraded wasteland, minimize soil erosion, increase organic matter content in soil,

and permit ground water recharge, in addition to lessening the impact of rising levels of GHG emissions in the atmosphere. The ITC Green House Gas (GHG) inventory for 2016-17, created in accord with the ISO 14064 standard, has been guaranteed, as in previous years, at the highest 'reasonable level' by a third-party assurance source.

Recycling of waste: Advance methods and techniques in this sector have achieved substantial success in lowering particular waste creation *via* continuous nursing and improvement of material use efficiency, as well as in attaining nearly 100% recycling of trash created in operations. ITC has thereby prevented garbage from entering landfills and causing problems like as soil and groundwater pollution and GHG emissions, all of which can have an impact on public health.

The dramatic reduction in the number of incidents, as well as multiple national and international honors and certifications earned by various divisions, have confirmed ITC's commitment to providing a safe and healthy workplace for all. The company's strategy is to institutionalize safety as a value-driven concept, with an emphasis on instilling a feeling of responsibility at all levels and driving behavioral change that will result in the formation of a safety culture [8].

For all investments in the built environment, ITC includes recognized technical standards into the design and project execution phases, assuring the highest levels of safety while also minimizing costs. Environmental, health, and safety audits are performed before to commissioning and during unit operation to ensure compliance with requirements.

Waste resources reusability innovations

The agricultural industry is faced with the primary task of expanding production to feed a rising population while also dealing with agricultural waste products. Agriculture is becoming one of the most significant industries in India. Technology has been a critical component in furthering the development of this industry. Typically, dealing with trash from the agriculture industry can be problematic due to a variety of variables. As a result, farmers are being pushed to employ technology that is appropriate for their agricultural waste in order to address such issues. This will try to increase farmers' use of technology and the benefits that may be derived from various ways and technologies. Furthermore, this will describe the aspects influencing technology use in an agricultural waste. In India, the management sector comprises of the crop production, processing, and waste management for crops, animals, and waste (Figure 2).

Figure 2) *Agriculture and their waste sectors*

A farmer who has access to the most up-to-date information on his farm must always be one step ahead of others who do not. Consider a farmer who has to tackle crop protection and waste management issues. The ongoing growth in ITC for agricultural waste in order to make better use of it by recycling, generating electricity, biogas, fuel oils, fertilizer, and so on, resulting in increased application and efficacy in the agriculture and waste sectors.

RESULTS AND DISCUSSION

A survey of data was collected from numerous researches works, agricultural domains, and instructive sources. Farmers' perspectives from many agricultural domains have been reviewed. This will provide a larger context for all types of trash produced in the agricultural realm, as well as approaches that individuals use to deal with garbage. A total of 1000 farmers (72.80%) revealed what ways they use to recycle unwanted plants into useable food and fertilizer, waste water as refining water, organic waste to biogas approach, and other fuel conserving strategies, etc. Only 170 farmers (27%) do not use efficient waste management methods. It was also discovered that the majority of farmers who used such schemes and practices for waste management had got the better to reuse, recycle and to reduce it.

What approach do you follow for waste management?

According to current poll results, 62% of individuals prefer to use the traditional approach for waste management in the agricultural sector. In order to treat their agricultural waste, around 12% of individuals use the technical approach, while approximately 32% use both ways (Figure 3).

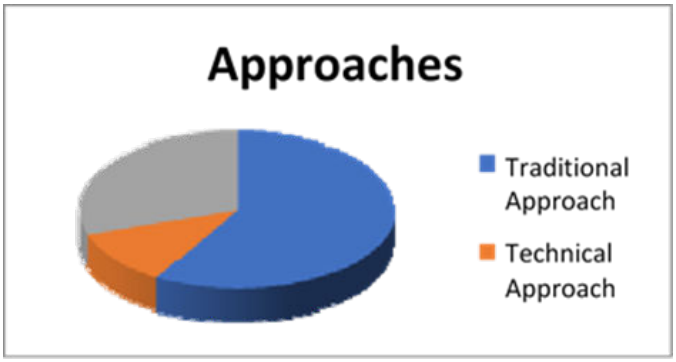

Figure 3) *Waste management approaches*

What type of agricultural waste is produced on your farms?

According to survey data, various categories of waste were produced in the agricultural sector, and each of them can be utilized for many sectors such as fuel, energy, bio-gases, and fertilizers, among others, with the implementation of ICT, as those waste can be of organic waste, chemical waste, slaughterhouse waste, and waste water (Figure 4).

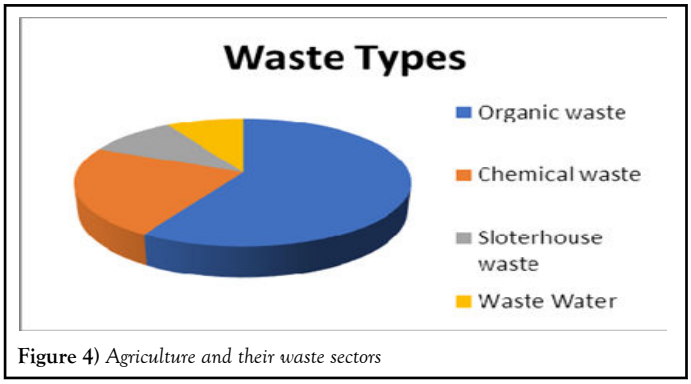

Figure 4) *Agriculture and their waste sectors*

Are you aware of any government schemes for farmers in agricultural waste management?

According to the survey, about 56.22% of farmers use government schemes and ICT for waste management in their agricultural domains and for other farm-related tasks. According to the graph, 43.88% of farmers are unaware and do not know how to use government ICT apps. Because the majority of

local farmer's farm on their own. Because government programs vary by location and time, I recommend contacting your local agriculture department or completing internet research for the most up-to-date information on such programs in your area (Figure 5).

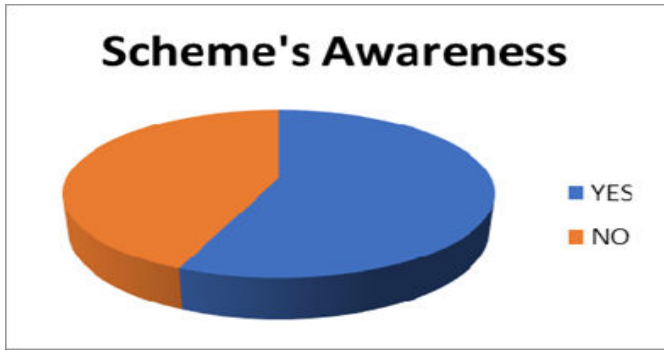

Figure 5) *Scheme awareness*

CONCLUSION

The survey data emphasizes the presence of many waste categories in the agricultural sector, which have the potential for positive exploitation in areas such as fuel, energy, bio-gases, and fertilizers, made possible by ICT implementation. Organic waste, chemical waste, slaughterhouse waste, and wastewater are among the waste categories.

Surprisingly, the poll finds that a sizable proportion of people (62%) favor the traditional approach for agricultural waste management. However, a significant 12% of respondents prefer the technical approach, while around 32% prefer a hybrid of the two ways. As the government also launches many beneficial schemes, systems for them but the ground reality is that it is still not reachable to the people who need such approaches. Surprisingly, 56.22% of farmers use government programs and ICT tools for waste management in their agricultural operations, demonstrating an increasing appreciation for the benefits of technology and government initiatives. Nonetheless, it is troubling that 43.88% of farmers are ignorant of government ICT apps, thus missing out on crucial assistance.

To solve this issue, agricultural authorities must increase knowledge and accessibility to ICT resources as well as government waste management programs. Local differences in government programs highlight the significance of contacting regional agricultural departments and undertaking extensive internet research to remain current on the newest advancements in agricultural waste management schemes and technology. This research points to the possibility of improved waste management methods and asks for enhanced education and outreach initiatives to provide farmers with information.

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