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Stubble Burning: Solutions and Innovations for Reducing Pollution

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Abstract:
Stubble burning, a common agricultural practice in many regions, contributes significantly to air pollution and environmental degradation. This research paper presents an innovative approach to mitigate the pollution caused by stubble burning by introducing a multi-faceted solution involving technological advancements and entrepreneurial models. Unlike previous approaches which focused predominantly on direct burning reduction or basic stubble management, this study integrates the use of a cutting and chopper system, a specialized container for processing stubble, and a comprehensive plan for stubble transformation into valuable products like animal fodder and manure.
The testing phase includes innovative methodologies for assessing the stubble's potential as animal fodder and its decomposition characteristics. The paper details the design and operation of the cutting and chopper system, the formulation and application of a decomposer solution, and the economic benefits of transforming stubble into marketable products. This research not only aims to reduce pollution but also provides a sustainable model for waste management in agriculture.

Keywords: Animal Fodder, sustainable management, Decomposer, Chopper etc.

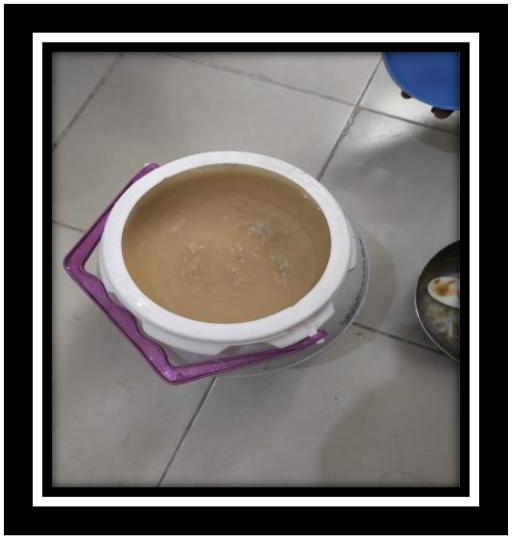
1. Introduction:

Stubble burning, a common practice in agriculture, is the process of setting fire to the residue left in fields after harvesting crops. This method, although efficient for quick land preparation, poses severe environmental and health risks. It releases large amounts of particulate matter, carbon dioxide, and other pollutants into the atmosphere, contributing to smog, respiratory diseases, and climate change. Various strategies have been proposed to mitigate the adverse effects of stubble burning, ranging from mechanical removal to chemical treatments. However, many of these solutions are either economically unfeasible or insufficiently address the underlying problems.
This paper introduces an integrated solution combining technological advancements and practical applications to tackle the pollution problem associated with stubble burning. The proposed method includes a cutting and chopper system for effective stubble management, a specialized container for processing the stubble into useful products, and an entrepreneurial model for economic viability. This

comprehensive approach aims to not only reduce pollution but also provide economic benefits by converting stubble into valuable resources.

1(a). The Decomposer solution

1(b). Stirring the solution after adding stubble



1(c). Solution with added stubble

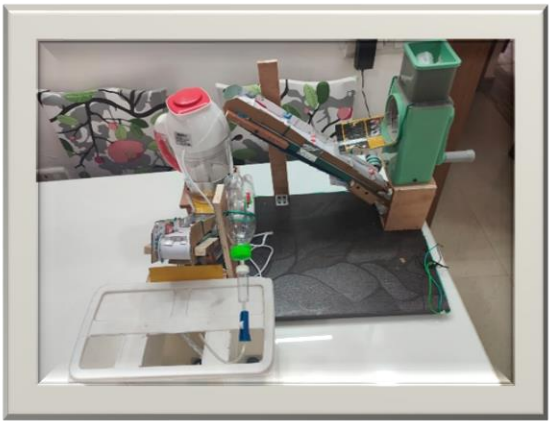
2. Compositional Evolution/ Historical Review:

2.Stubble

Stubble burning has been a prevalent practice for decades, primarily due to its convenience and the immediate benefits it offers to farmers in preparing fields for the next crop cycle. Historically, this practice has been associated with significant air quality issues, including the release of particulate matter and greenhouse gases. Efforts to address this issue have varied, from simple alternatives like manual removal and traditional composting to more advanced technologies such as stubble balers and in-situ decomposition techniques. Despite these efforts, the effectiveness has been limited due to factors like high costs, lack of awareness, and insufficient infrastructure. Recent advancements in technology and innovative agricultural practices provide new opportunities to address these challenges more effectively.

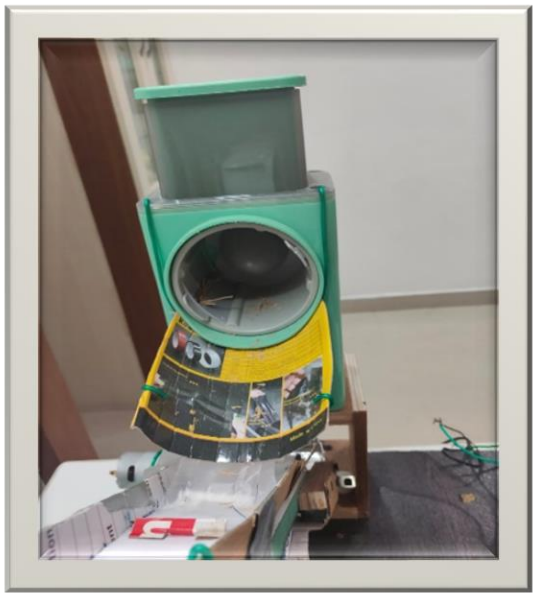
3. Framework design:

The research involved the development and implementation of a multi-step solution to address stubble burning:

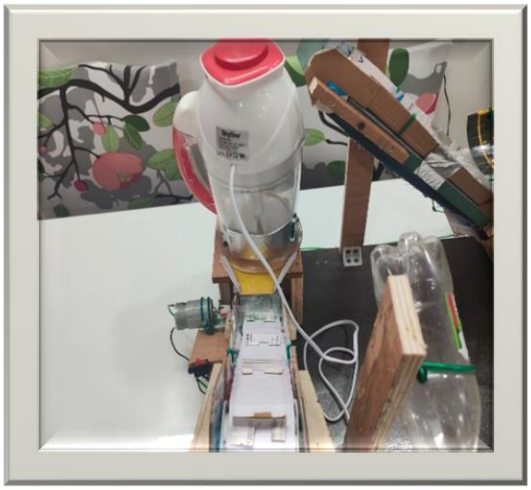


3(a). A Glimpse of the Machine Design

a) **Cutting and Chopping System:** We designed a cutting and chopper system that includes a specialized cutter for initial stubble removal and a conveyor to transport the cut stubble to a chopper. This system finely shreds the stubble, making it easier to handle and process.

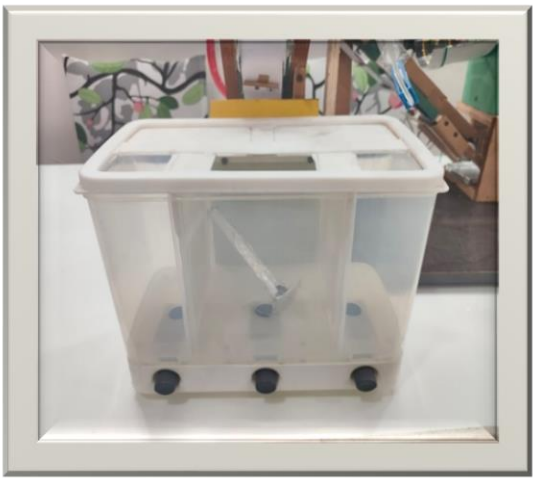


3(b).chopping of the stubble



3(c). Image Depicting the Cutting and Chopping Mechanism

b) **Container Design:** A container was developed to facilitate the transformation of chopped stubble into useful products. The container is divided into three main sections:

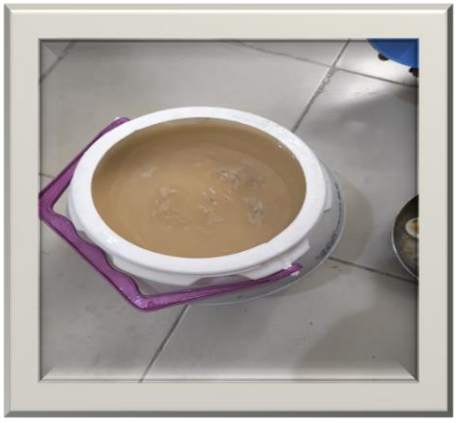


3(d). Container used to store chopped stubble

- Animal Fodder: The chopped stubble is packaged into small units suitable for animal fodder. This not only helps in recycling agricultural waste but also creates a new market for farmers.

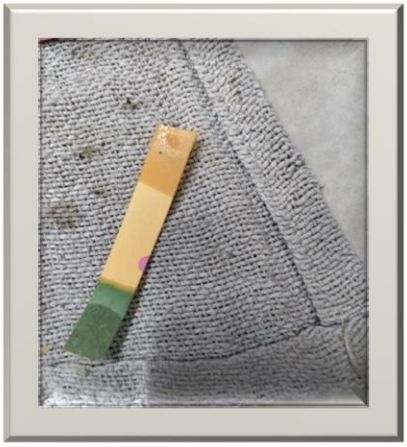
3(e). Stubble

- **Manure Production[1]:** A decomposer solution, combining Pusa decomposer, warm water, and besan (gram flour), is used to decompose the stubble into manure. This process involves mixing the decomposer with warm water and allowing it to ferment for a week before application.

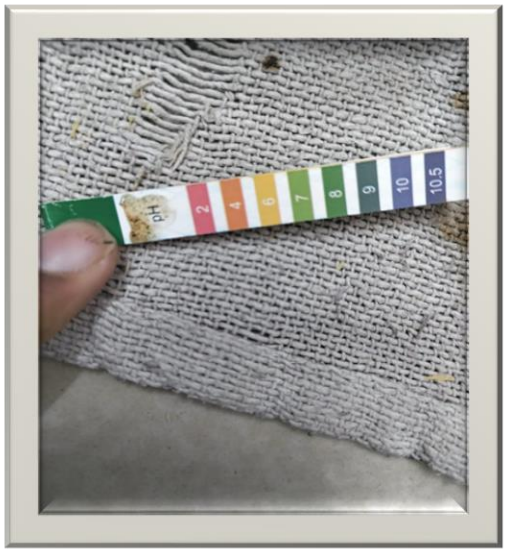


3(f). Freshly prepared Pusa[4] decomposer solution

- **Testing and Analysis:** The stubble's suitability as fodder is tested using an HCl solution to determine pH levels and decomposition time. This testing provides insights into the stubble's acidity or basicity and its potential consumption by humans.



3(g). pH paper showing change in nature



3(h). pH paper used to test change in nature

c) **Economic Model[2]:** We developed an entrepreneurship model to market the processed stubble. This includes selling packaged stubble as animal fodder and converting decomposed stubble into manure for agricultural use. The economic analysis shows that the entire process is cost-effective and beneficial for farmers.

4. Observation:

The implementation of the cutting and chopper system significantly reduced the volume of stubble and improved its manageability[3]. The container design facilitated efficient processing of stubble into useful products. Testing revealed that the decomposed stubble had a balanced pH and was suitable for the use as manure. Additionally, the animal fodder produced was well-received, demonstrating the potential for a new revenue stream for farmers. The overall process proved to be environmentally friendly and economically viable.

5. Conclusions:

The proposed solution for managing stubble burning addresses both environmental and economic challenges. By integrating a cutting and chopper system, a specialized container for processing stubble, and an entrepreneurial model, this approach offers a sustainable alternative to traditional stubble burning practices. The innovative methods for testing stubble and converting it into valuable products provide practical benefits for farmers while significantly reducing pollution.

6. Inferences:

The research indicates that the integrated solution for stubble management can effectively reduce pollution and provide economic benefits. The cutting and chopper system, combined with the decomposition and fodder packaging processes, offers a comprehensive approach to managing stubble. The economic model supports the feasibility of this approach, making it a viable alternative to traditional stubble burning practices.

7. References:

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