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## **Designing of Food Waste Shredder for School Canteen**

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### **ABSTRACT**

The research article focuses on the design of a Food Waste Shredder tailored for use in school canteens, specifically targeting the issue of food waste management. The introduction highlights the environmental challenges posed by food waste, emphasizing its impact on health and living conditions. The study identifies the necessity for innovative solutions, such as efficient shredding machines that convert food waste into smaller pieces suitable for composting, thereby facilitating faster decomposition and enhancing soil quality.

Keywords: Food Waste Management, Shredder Design, Composting, Dewatering, Sustainability

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### **1. Introduction**

#### ***1.1 Background and Rationale***

Food waste has been a persistent problem affecting the environment and public health globally. The need for effective solutions is critical, as traditional methods often fail to mitigate the issue adequately. Observations indicate that consumer habits contribute significantly to food waste generation, necessitating innovative approaches to reduce this waste. For instance, markets often face challenges with decaying food waste leading to unpleasant odors and unsanitary conditions. Developing a food waste shredder can significantly combat the increasing volume of organic waste by converting it into smaller pieces suitable for composting, thereby enhancing soil quality.

#### ***1.2 Statement of the Problem***

This study focuses on designing an eco-friendly food waste shredder that converts organic waste into fertilizer. Key questions addressed include:

1. What design parameters are essential for developing the Food Waste Shredder?
2. What implementation strategies will ensure operational efficiency?

#### ***1.3 Objectives of the Study***

The specific objectives are:

1. To design a high-performance, cost-efficient food waste shredder with dewatering capabilities.
2. To implement a strategy that will efficiently simulate the Food Waste Shredder

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### **2. Literature Review**

#### ***2.1 Towards Sustainable Society: Design of Food Waste Recycling Machine***

High rate of food consumption and the poor rate of food waste recycling, mountains of food are deposited in landfills, where they are burned and emit toxic gases. Designing an environmentally friendly machine that transforms food waste to compost is the solution. Compost made from recycled food waste enhances soil health and structure, boosts drought resistance, and decreases the need for additional water, fertilizers, and pesticides.

## 2.2 Design and Fabrication of Organic Waste Shredding Machine

Food, garden, agriculture, and lawn clippings are examples of organic waste, often known as green trash. It can also comprise degradable carbon, such as paper, cardboard, and timber, as well as animal and plant-based materials. Organic waste buried in landfills is a major issue. As a result, we must first understand why solid waste management is necessary. Food waste is an organic material with high calorific and nutritional qualities for bacteria, which means that methane generation efficiency can be improved.

## 2.3 Design and Fabrication of Organic Portable Shredder Machine

Design and development of a portable shredder machine; focuses on chopping of coconut leaves, paddy straw, later this chopped powder is a source to prepare the vermin compost. Hand-operated vertical and horizontal electric chopping shredders are prone to issues such as high space requirements, uneven cutting, and personnel requirements. As a result, standard methods for cutting crop leftovers are insufficient and unsatisfactory.

## 2.4 Design and Development of Agricultural Waste Shredder Machine

The goal of this project was to design and build a shredder machine that focused on slicing coconut leaves and areca leaves into a powder that could be used to make vermicompost. Concepts were created with four distinct shredding machines and operating methods in mind. The concept was created with the user's safety, operational environment, and maintenance in mind. A prototype was created based on the needs of the users and their purchasing power. Traditional agricultural waste disposal is a traditional and oldest technique of trash disposal in which agricultural wastes are dropped in a specific location to decompose.

## 2.5 Design and Evaluation of a Household-Level Kitchen Waste Shredder

The machine works on the same premise as a simple blender, in that waste materials are put into the hopper and allowed to travel through the shredding cylinder, where the cutters and beaters cut and shear the trash. Shredded materials exit the machine in one pass through a discharge chamber. In terms of design, the machine operates admirably. It has a large capacity and can minimize the size of waste materials effectively.

## 3. Methodology

### 3.1 Methodological Framework

This study aims to make use of the related studies advantages and disadvantages, creating an Food Waste Shredder with Dewatering that is cost efficient and high performance. Food Waste Shredder are designed to be small in size and economical in operation composting machine, which uses food waste that was easy to shred, reduce to pieces and make it as a organic compost that is useful especially in farming.

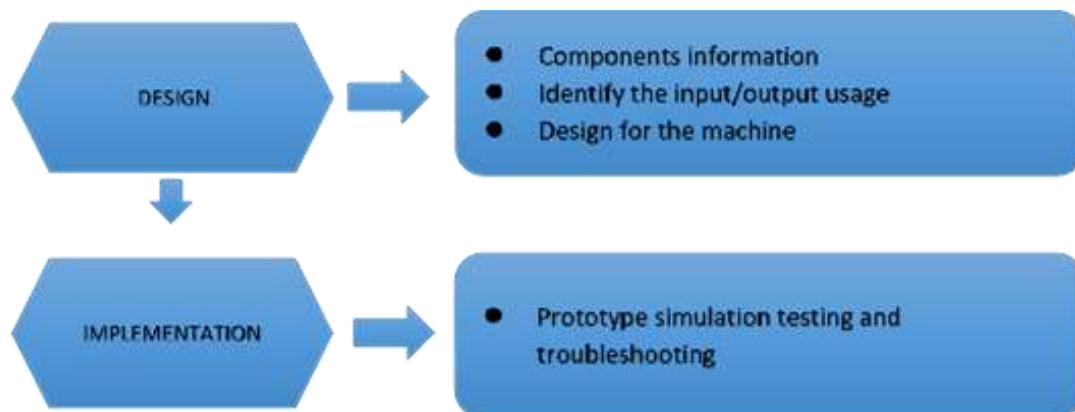


Figure 3.1 Methodological Framework

### 3.1.1 Design of the Food Waste Shredder with Dewatering

This first phase of the research is the formulation of the design of Food Waste with Dewatering. The researchers partly conformed to the design based on the methodologies and recommendations of various related literature according to the goals stated in the objectives. In the making of the design, the advantages and disadvantages were also taken into consideration in order to achieve maximum efficiency of the machine, from the choosing of the right components to be used in the machine to the function of each part with respect to its placement in the design.

### 3.1.2 Prototype Design of the Machine

After research and evaluation of the chosen related literature and design of Food Waste Shredder with Dewatering, an initial design is formulated. The overall design of the Food Waste Shredder indicated in Figure 3.2 is the result of the combined researches and recommendations of previous researchers to ensure maximum efficiency and advantage.

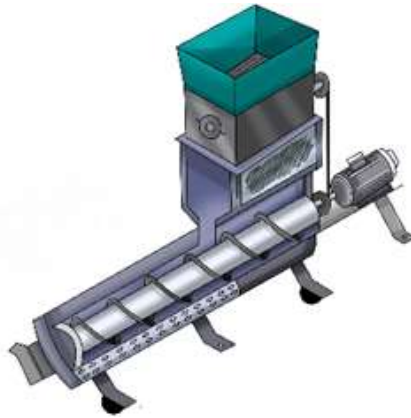


Figure 3.2 Isometric View of the Design Prototype

### 3.1.3 Prototype Components

The components of the Food Waste Shredder that are included in the design were based from the previous researchers that serve as a guide to combining every possible advantage. Figure 3.3 shows the different main components labelled on the design.

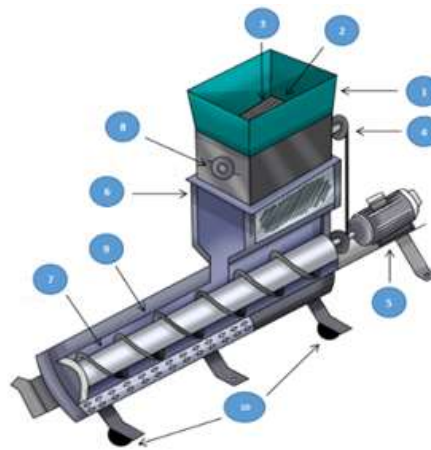


Figure 3.3 Prototype Design

Components:

- |                     |                    |
|---------------------|--------------------|
| 1. Hopper           | 6. Angle Bar Frame |
| 2. Shaft            | 7. Screw Shaft     |
| 3. Shredder Blades  | 8. Pillow Block    |
| 4. Belt and Pulleys | 9. Bi-metal Pipe   |
| 5. Motor            | 10. Wheels         |

### 3.2.4 Prototype Implementation Strategy

During the Deployment Phase, the implementation of the school canteen application begins with a phased rollout, initially launching a pilot program in one or two schools before expanding to a wider audience. Training sessions are organized to ensure canteen staff are well-equipped to utilize the application effectively. In the subsequent Promotion Phase, an awareness campaign is launched, utilizing posters, school newsletters, and social media to engage students and parents. To encourage early adoption, incentives such as discounts or rewards are offered to the first users. Following deployment, Ongoing Support and Maintenance are crucial; a feedback loop is established for users to report their experiences and suggestions, while regular updates

are scheduled to address bugs and enhance features based on user input. A technical support system is also put in place to assist users facing issues with the application. Finally, in the Evaluation stage, performance metrics such as user engagement rates and satisfaction scores are monitored to assess the application's effectiveness. This data will inform continuous improvement efforts, ensuring the application evolves to meet user needs effectively.

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## 4. Results and Discussion

### 4.1 Environmental Impact

The study highlights how food waste contributes to environmental degradation and public health issues. By developing a shredder that efficiently processes food waste, the project aims to mitigate these impacts by reducing landfill contributions and promoting composting practices.

### 4.2 Design and Functionality

The researcher focused on creating a compact, portable shredder equipped with a dewatering mechanism. This design enhances the efficiency of food waste processing, allowing for quicker decomposition and better nutrient retention in the resulting compost.

### 4.3 Economic Benefits

The shredder is designed to be cost-effective, making it accessible for farmers and communities. By converting food waste into compost, users can reduce their reliance on chemical fertilizers, thereby promoting sustainable agricultural practices.

### 4.4 Community Health and Cleanliness

Implementing this technology can lead to cleaner urban environments by minimizing food waste accumulation in public spaces, which is often associated with unpleasant odors and health risks.

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## 5. Conclusion

The design of the food waste shredder represents a pivotal step towards sustainable waste management practices. By integrating innovative design with practical functionality, this project not only addresses environmental concerns but also supports agricultural productivity and community health. Future research should focus on optimizing the shredder's performance and exploring broader applications within various sectors to maximize its impact on food waste reduction and resource conservation.

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