POLITEKNIK BANTING SELANGOR

FOOD WASTE FERTILIZER MACHINE

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APPRECIATION

Dear our supervisor Mrs. Mmaniyarasi Munusamy,

We wanted to take a moment to express my heartfelt appreciation for the outstanding support, guidance, and collaboration we received from you and our mentor, Dr. Tamil Moli Loganathan throughout the duration of our project. Your collective efforts and dedication played a pivotal role in the project's success, and we immensely grateful for the opportunity to work with such an exceptional group of individuals.

First and foremost, we would like to express my sincere gratitude to you, Mrs. Mmaniyarasi Munusamy. Your exceptional leadership, expertise, and guidance were instrumental in steering our project in the right direction. Your clear vision, strategic planning, and effective communication ensured that we stayed focused and aligned with our objectives. Your ability to provide constructive feedback and valuable insights helped me grow both professionally and personally. We truly appreciate the trust and confidence you placed in me, allowing me to take ownership of my work and make meaningful contributions to the project's success.

To our mentor, Dr. Tamil Moli Loganathan, we deeply grateful for your unwavering support and mentorship throughout the project. Your wealth of knowledge, experience, and willingness to share your expertise made a significant impact on my growth and development. Your guidance and advice were invaluable in helping me navigate through challenges, refine my skills, and uncover new perspectives. We are grateful for the time and effort you invested in me, as it has undoubtedly shaped my professional journey.

We also like to express our appreciation to each other. Working alongside such talented, dedicated, and collaborative individuals was a privilege. Your commitment, creativity, and teamwork were instrumental in driving the project forward. Our collective efforts, brainstorming sessions, and mutual support created a dynamic and productive work environment. We are grateful for the camaraderie we developed and the friendships that were forged during this project. Together, we achieved remarkable results that we incredibly proud of.

Collectively, everyone has made a significant impact on our professional and personal growth. The lessons that we have learned, the skills we have acquired, and the relationships we have formed will stay tthroughout our career. We are grateful for the opportunities this project has provided, and we feel fortunate to have had the chance to work with such a talented and supportive group of individuals.

Once again, we extend our deepest gratitude to you, Mrs. Mmaniyarasi, Dr. Tamil Moli Loganathan, for your unwavering support, guidance, and collaboration throughout this project. Your contributions have been invaluable, and we are truly privileged to have been part of such an exceptional team. Thank you all for everything.

With sincere appreciation,

Mior Mohammad Adam Bin Mior Mohammad Hairol

(Team leader)

On behalf of the project team :

Muhammad Aizad Eman Bin Mohd Zin

Aisyah Safiah Binti Azmi

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ABSTRACT

This project proposal aims to develop an innovative food waste fertilizer machine to address the pressing issue of food waste management and promote sustainable agriculture. The proposed machine will have the capability to efficiently convert various types of food waste, including fruit and vegetable scraps, leftover cooked food, and other organic residues, into high-quality organic fertilizer. The project will focus on designing and engineering a specialized machine that optimizes the decomposition process, minimizes odor, and maximizes nutrient retention. Additionally, techniques such as aerobic composting, vermicomposting, or anaerobic digestion will be explored to determine the most effective conversion process. The project will also aim to enhance the nutrient content and quality of the fertilizer by incorporating organic materials or bioadditives. Automation and efficiency will be prioritized through the incorporation of waste feed mechanisms, temperature and moisture control systems, and monitoring sensors. The scalability, adaptability, and environmental impact of the machine will also be assessed, along with an analysis of its economic viability and market potential. By developing this food waste fertilizer machine, the project aims to contribute to sustainable agriculture by reducing food waste, improving soil fertility, and promoting environmentally conscious waste management practices.

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

In today's world, the management of waste, particularly food waste, has become a pressing concern due to its significant environmental, social, and economic impacts. A sustainable solution to this challenge lies in the conversion of waste food into valuable resources.

"Waste food", also known as food waste, refers to any edible material that is discarded or lost along the food supply chain, from production and processing to consumption. This includes food that is not consumed for various reasons such as spoilage, overproduction, expiration, and trimmings. Waste food can originate from households, restaurants, supermarkets, farms, and food processing facilities.

Food waste is a significant global issue with far-reaching environmental, social, and economic consequences. It contributes to greenhouse gas emissions, strains natural resources, wastes energy, and exacerbates food insecurity and hunger. Addressing food waste is essential for achieving sustainable development goals related to environmental protection, hunger eradication, and resource conservation.

Converting waste food into fertilizer is essential for several compelling reasons. Firstly, food waste represents a significant environmental burden, contributing to greenhouse gas emissions and landfill pollution. By diverting this waste from landfills and utilizing it for composting, we can significantly reduce methane emissions and alleviate the strain on already overburdened waste management systems. Additionally, converting waste food into fertilizer promotes sustainable agriculture by enriching soil fertility and enhancing crop productivity. Organic fertilizer derived from food waste provides essential nutrients to plants, improving soil structure and water retention while reducing the need for synthetic fertilizers that can harm the environment and human health. Moreover, transforming waste food into fertilizer contributes to the circular economy by closing the loop on resource utilization. Instead of discarding valuable organic matter, we can repurpose it into a valuable resource that benefits farmers, gardeners, and ecosystems alike. Overall, converting waste food into fertilizer represents a crucial step towards building a more sustainable and resilient food system that conserves resources, mitigates environmental impacts, and promotes agricultural sustainability.

This proposal outlines the development and implementation of a comprehensive Waste Food to Fertilizer Conversion System, which aims to address the problem of food waste while simultaneously producing high-quality organic fertilizer for agricultural use.

1.2 PROBLEM STATEMENT

Background of the study food waste is a major challenge in the present world, tons of foods is thrown away in the garbage. all the food waste and prepare a compost out of them which can be used as organic fertilizer. This away can save the earth from the pollution caused by food waste and also do something productive. Food waste is unique as a composting agent, it is the main source of organic matters, fruits, vegetables, grain coffee filters, eggshells can be compost. Food waste is composed of organic matter which can be used for composting to make fertilizers. It is an effective and eco-friendly way of disposing of food waste in your kitchen. By using left moves and other food waste, you can convert their smelly from the kitchen waste into a highly organic product rich in nutrients that you can use to grow vegetables or flowers with it. Things like paper, twigs, and leaves are rich in carbon while grass coffee and the grounds, fruit and vegetable are rich in nitrogen. The proper mixture is key to good compost. Fertilizers are any organic or inorganic material of natural or synthetic origin [other than liming materials] that is added to a soil to supply one or more plant nutrients essential to the growth of the plants. Fruits contain a high number of antioxidants that are beneficial to our health in many ways. The present study deals with the utilization of fruit peels for the effective growth of plants and higher yield, by mainly focusing on nitrogen, phosphorous and potassium. Food waste that ends up in landfills produces large amounts of methane - a more powerful greenhouse gas than CO_2. For the uninitiated, excess amounts of greenhouse gases such as methane, CO_2, and chlorofluorocarbons absorb infrared radiation and heat the earth's atmosphere, causing global warming and climate change. With agriculture accounting for 70 percent of the water used worldwide, food waste also represents a huge waste of fresh water and groundwater resources. food gradually breaks down to form methane, a greenhouse gas that is up to 86 times more potent than carbon dioxide.

Consumer food waste also has serious implications for energy consumption. on average, household food loss is responsible for eight times the energy waste of farm-level food loss due to energy used along the food supply chain and in preparation.

1.3 OBJECTIVE

The main objective of this project is to develop a waste food to fertilizer conversion system. The specific project objectives are as follow: -

1. Design few models of Waste Food to Fertilizer machine

2. Select an appropriate design based on Pugh method by considering few criterias.

3. Develop an efficient and scalable system for converting waste food into organic fertilizer.

1.4 SIGNIFICANCE

The main target users of this project include urban households and residential communities. Small-scale of food waste fertilizer machine are designed for home use or community settings. This allows individuals or residential communities to process their kitchen scraps and food waste, producing compost or fertilizer for their gardens or landscaping purposes. By using a food waste fertilizer machine at home, households can significantly reduce the amount of organic waste they send to landfills. Instead of throwing food scraps into the regular trash, these machines enable homeowners to recycle their food waste into useful fertilizer.

1.5 SCOPE OF STUDY

- Can produce up to 3 kg of food waste
- The process took less than 30 minute
- The size of the product must be compact
- Use the most efficient power source which can be renewable
- Convenient

CHAPTER 2
LITERATURE REVIEW

2.1 INTRODUCTION

Food waste is a global crisis that demands our immediate attention. With approximately one-third of all food produced for human consumption going to waste, it's a moral concern and an environmental and economic issue. The analysis estimated that global food waste was 931 million tons of food waste (about 121 kg per capita) across three sectors: 61 percent from households, 26 percent from food service and 13 percent from retail. Food

waste and food losses contributes about 6% of total global CO2 emissions. In Malaysia, people throw away 17,000 tons of food waste everyday. When the food been throw away, it wasting the produce, all energy and resources used to produce it. Furthermore, when food waste ended up in dump sites and landfills, it will decompose and release harmful methane gas (CH4) into the atmosphere. As a greenhouse gas, methane is 28 times more potent compared to carbon dioxide (CO2).

Food waste could happen in any stage, starting from production to consumer's level. At the production stage, food waste can be in the form of trimmed parts of crops, rejected products caused by standardisation guides set by retailers in terms of size, shape and colour, inedible crop part, and many more. The rejected products increase at different stages of the supply chain due to spoilage or expiry before it could reach the consumer's table. The longer the supply chain, more wastage will be produced if there is no proper handling of food to preserve the product's freshness. The Food and Agriculture Organisation has stated that 30% of food loss happens along the supply chain. Producers should not focus at only one level of the market. Standardization is unavoidable as retailers seek for the value they pay for the goods and producers would ensure that their quality is top notch to remain on top of the market. Thus, standardization in grading goods should be emphasized by both authorities (producers and retailers) so the off-size and discoloured fruits can be sent to non-premium markets and to factories to be processed as added-value products like fruit jam, juice and beverage, dried fruit or vegetables and etc.

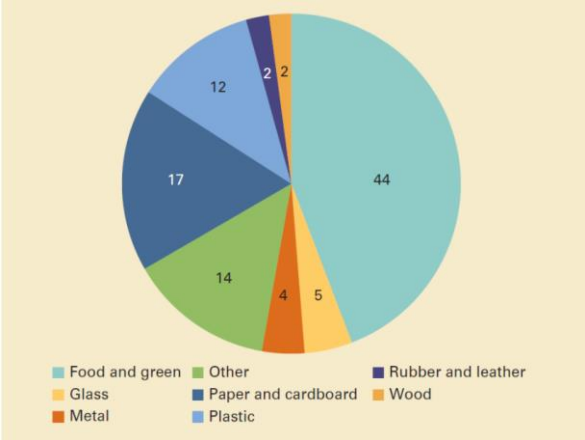
In this project that we were about to do, we convert the food waste into organic fertilizer using our product which is food waste fertilizer machine. Food waste composting is a good project to implement for the Sustainable Development Goals 13 (SGD 13) climate action goal which is to reduce its greenhouse gas (GHG) emissions intensity of GDP by 45% by 2030. This is a simple, low-cost technology with a high positive environmental impact. This will help us be less reliant on fossil fuel based fertilizers

2.2 REAL CASE

Based on a study done by the World Bank Organisation, a person produces an average of 0.74 kilograms of waste daily worldwide, and currently, our population stands at 7.9 billion and it is predicted to reach 9.1 billion by 2050. In Malaysia alone, our current population stands at 32.96 million in 2021 and in general, a Malaysian generates an average of 1.17kg of waste per day compared to the year of 2015, where it was only 0.8kg per person per capita .

For food waste alone, Malaysians waste about 16,688 tonnes of food per day which could feed about 2.2 million people, up to three-time times a day. In the 2012 National Waste Management Department Report, approximately 31% to 45% of the total waste generated in Malaysia comes from food waste alone and households are the biggest contributor which stands at about 44.5% in comparison with the Industrial, Commercial and Institution sector which generates 31.4% of waste.

This is supported by the statement made by the Solid Waste and Public Cleansing Management Corporation (SWCorp Malaysia) which also stated that 44.5% of food waste comes from household which is equal to a whopping 16,667.5 tonnes daily and about 24% of the waste is classified as edible waste which amounts to 4005 tonnes. It certainly is not a small amount and it stands on par with the percentage of food wasted globally.



Global Waste Composition. Source : Worldbank

2.3 THE COLLECTOR ON THE MARKET

There are many types of food waste fertilizer machine on the market with assorted designs and functions. The most common fertilizer machine on the market can only produce 1 outcome for the product, which is the organic fertilizer in damp form. Here's some of food waste fertilizer machine on the market.

1. ENVITEK FOOD WASTE FERTILIZER MACHINE

This machine can only product 1 outcome which is organic fertilizer. It has a removeable waste bucket with lid to store the scraps. It has air drying features to dry the fertilizer that has been produced.

2. KOEDA SMART FOOD WASTE COMPOST

This machine takes 5 to 10 hours to compost food into organic fertilizer. It has activated carbon purification features to filter and adsorbing odors. This machine also can produced 1 outcome which is organic fertilizer.

3. REENCLE PRIME

Reencle prime machine can produce food waste up to 24 hours. This machine operates quietly under the level of 28dB. It also comes with carbon filter to remove bad odour.

2.4 LIMITATIONS

This product has several limitations such as :

- This product is expensive.
- Does not use renewable energy.
- Complex design.
- Does not use recycled materials.
- Heavy.
- Use electric as power source.

2.5 SUMMARY

The literature review on food waste fertilizer machines provides a comprehensive analysis of existing research and studies related to this innovative technology. The review explores various aspects of food waste management, composting, and the conversion of food waste into organic fertilizers. It highlights the environmental and economic benefits associated with using food waste fertilizer machines, such as reducing greenhouse gas emissions, diverting waste from landfills, and producing nutrient-rich compost for agricultural purposes. The review also examines the different types of food waste fertilizer machines available in the market, their functionalities, and their effectiveness in processing food waste. Furthermore, it discusses the challenges and limitations of implementing these machines, including cost considerations, regulatory frameworks, and technological constraints. The literature review concludes by summarizing the overall findings and

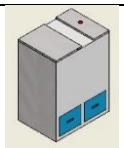
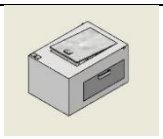
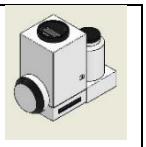
identifying knowledge gaps that require further exploration. It serves as a valuable resource for researchers, policymakers, and industry professionals interested in understanding the current state of food waste fertilizer machines and their potential for sustainable waste management and agricultural practices.

CHAPTER 3
METHODOLOGY

3.1 INTRODUCTION

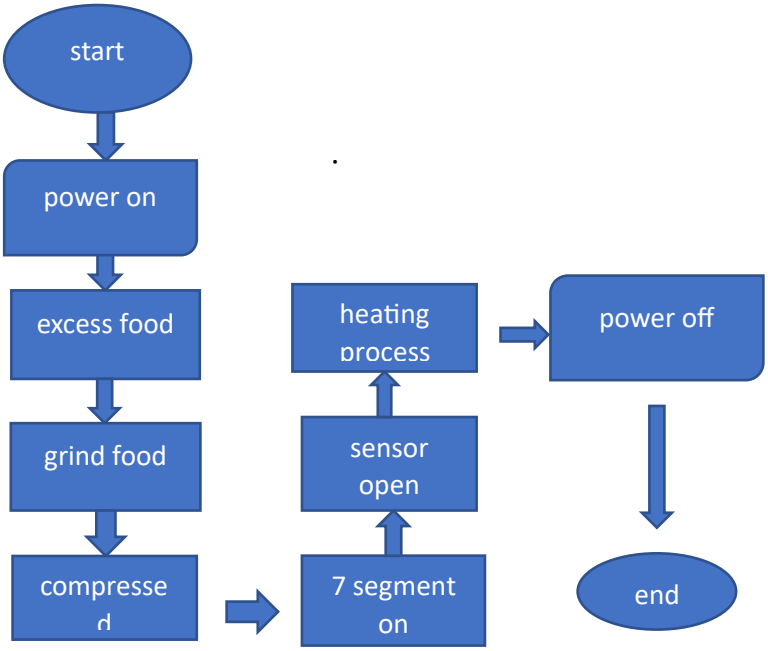
This chapter will discuss the study methodology which contains the project design and the way our group get the idea about doing this food waste fertilizer machine . The main purpose of the methodology is to indicate the process of creating a product . This chapter consists of starting from details on the design of product , material and tools , techniques used to build product and innovation that can be made from previous products that are currently on the market . We analyses the data in our way such as searching on google and asking the professional in this field . We have learned the workshops since the start of first semester such as welding , machine and more . We have choosen great quality steel for this project in high quality .

3.2 CRITERIA FOR SELECTION

DESIGN					
Ease of operation and maintenance	1	1	1	1	1
Efficiency of waste processing	1	1	1	0	1
Compatibility with different types of food waste	0	0	1	0	1
Safety , Reliable and Durability	1	0	1	0	1
Cost of the machine	0	1	0	1	0
Sensor	0	0	0	0	1
Time taken to produce	1	0	1	0	1
Total & Ranking	4 3rd	3 4th	5 2nd	2 5th	6 1st

3.3 FLOW CHART

In order to achieve a successful project it is highly recommended to have a project planning , project planning is needed and required to show the process of a project.In this case, flow chart and gantt chart are used to manage the project and it also provides a planning schedule. Flow chart shown in figure below shows the steps taken to achieve the final product. Meanwhile , the gantt chart shown in figure below shows the time taken of each task



given along the process from the first meet until the design is completed.

Figure 3.3 Flow chart

3.3.1 CIRCUIT

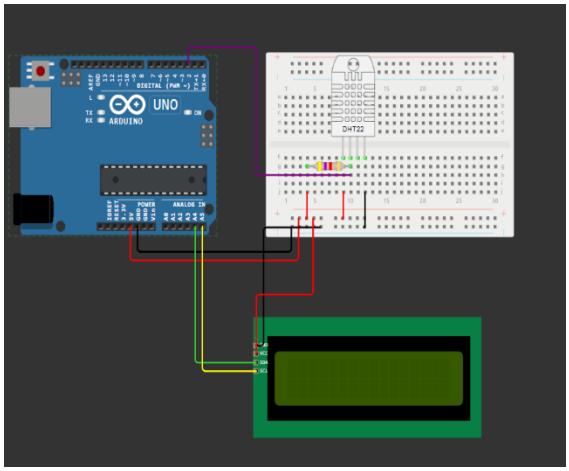


Figure 3.3.1 Arduino circuit

3.4 MATERIALS

1) MILD STEEL

Their strength is relatively low, their carbon contents limit weldability, and they transform to martensite when strained at low temperature . Good high-temperature strength some grades maintain good mechanical properties, including strength and creep resistance, at elevated temperatures. Hygienic and rejecting of contaminants; the smooth, non-porous, and unreactive surface of austenitic stainless steels makes them easy to clean and maintain.

2) PLASTIC (HDPE)

High-density polyethylene or HDPE is a commonly used petroleum thermoplastic and the most used of the three polyethylenes for wide range of applications .

HDPE pipe grade sheet has a higher molecular weight compared to the standard HDPE used in the above examples. This strengthening with its UV-resistance makes it ideal for piping and outdoor applications. Pipe grade sheet has the ability to withstand -220 to 180 degrees Fahrenheit. It's durable in most chemical interactions which make it useful in a lot of industrial applications.

3) PLASTIC (PP)

PP is a highly flammable material . Commodity plastic with low density and high heat resistance . It is made from the polymerization of propene monomer . PP retains mechanical & electrical properties at elevated temperatures. This occurs in humid conditions and when submerged in water. It is a water-repellent plastic.

4) LINEAR ACTUATOR

A hydraulic press uses an oil-filled hydraulic cylinder to generate a compressive force on a moveable piston. The machine works using the principle of Pascal's law, which states that the pressure exerted on a fluid is transmitted evenly throughout that fluid . Hydraulic presses

are commonly used for assembly and disassembly of tightly-fitting components. In manufacturing, they are used for forging, clinching, molding, blanking, punching, deep drawing, and metal forming operations. Hydraulic presses are also used for stretch forming, rubber pad forming, and powder compacting.

5) MOTOR AT (DC)

Motor development includes the evolution from reflexive to voluntary and goal-directed motor actions. These motor actions are never performed in isolation but always in a varying physical environment, often requiring object and social interaction.

6) TIMER (7 SEGMENT)

7 Segment LED Digital Display Tube . Type: Common Anode . Model: 5641BH; Application: Widely used in home appliances, instruments, car accessories.

7) ARDUINO BOARD

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online .

8) RESISTOR

A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element. In electronic circuits, resistors are used to reduce current flow, adjust signal levels, to divide voltages, bias active elements, and terminate transmission lines, among other uses.

9) BREADBOARD

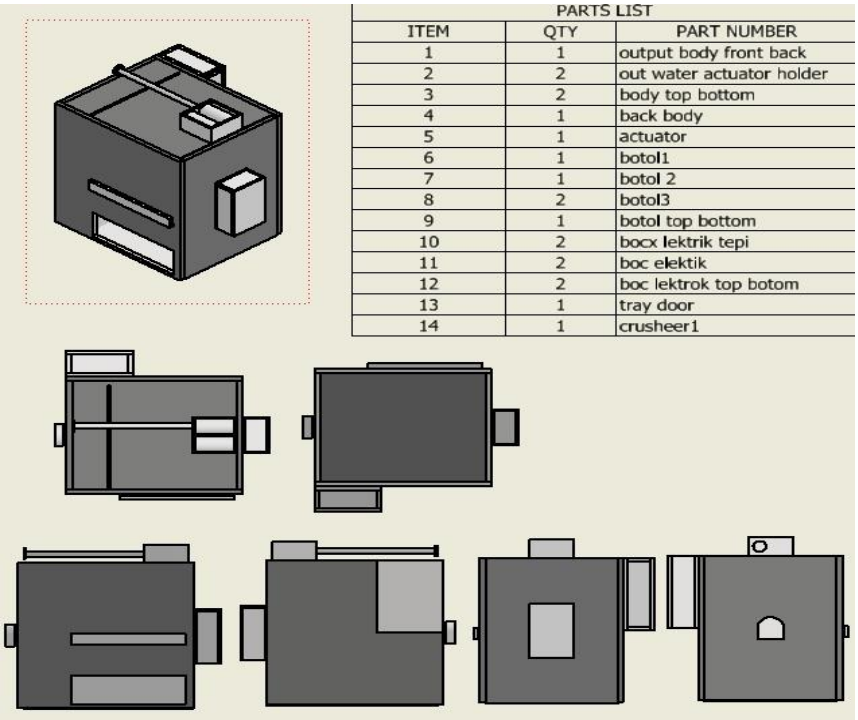
A breadboard (sometimes called a plugblock) is used for building temporary circuits. It is useful to designers because it allows components to be removed and replaced easily. It is useful to the person who wants to build a circuit to demonstrate its action, then to reuse the components in another circuit. The purpose of the breadboard is to make quick electrical connections between components- like resistors, LEDs, capacitors, etc- so that you can test

your circuit before permanently soldering it together. Breadboards have many small sockets on them, and some groups of sockets are electrically connected to each other.

3.4.1 ESTIMATE QUANTITY AND COST

ITEM	QUANTITY	COST (RM)
MILD STEEL	6	74.60
PLASTIC HDPE	2	155.00
PLASTIC PP	1	24.00
LINEAR ACTUATOR	1	120.00
MOTOR AT	2	59.80
TIMER (7 SEGMENT)	1	72.40
ARDUINO BOARD	1	52.60
RESISTOR	1	2.50
BREADBOARD	1	22.00
TOTAL	**15**	**773.90**

3.5 FINAL DESIGN



PARTS LIST		
ITEM	QTY	PART NUMBER
1	1	output body front back
2	2	out water actuator holder
3	2	body top bottom
4	1	back body
5	1	actuator
6	1	botol1
7	1	botol 2
8	2	botol3
9	1	botol top bottom
10	2	bocx lektrik tepi
11	2	boc elektik
12	2	boc lektrok top botom
13	1	tray door
14	1	crusheer1

After carefully evaluating the various design options, we have arrived at a final product design that takes into consideration both the pros and cons discovered during the design process. Our team recognized the importance of addressing the limitations identified in the initial designs, while also capitalizing on the strengths and advantages they possessed. One of the key aspects we focused on was enhancing the product's usability. We identified areas where the previous designs fell short and made necessary adjustments to improve ease of use and intuitive interaction. By incorporating intuitive controls and streamlining the user interface, we have ensured that customers can effortlessly navigate and engage with the product, reducing the learning curve and enhancing overall satisfaction. Additionally, we took a close look at the product's performance and efficiency. While some initial designs may have exhibited certain drawbacks in terms of power consumption or speed, we leveraged our findings to implement innovative solutions that maximize efficiency while maintaining optimal performance. By integrating cutting-edge technologies and refining the internal components, we have achieved a balance that delivers exceptional performance without compromising on energy consumption or reliability.

3.6 CONCLUSION

The Waste Food to Fertilizer Conversion System presents a holistic and sustainable solution to the challenge of food waste management while contributing to the promotion of organic agriculture and environmental sustainability. By harnessing the potential of waste food as a valuable resource, we can reduce environmental pollution, conserve natural resources, and support the transition towards a circular economy. Through collaborative efforts and strategic implementation, we can realize the full potential of this innovative approach and create lasting positive impacts for communities and ecosystems alike.

3.7 GANTT CHART

PROJECT ACTIVITIES	WEEK 1	WEEK 2	WEEK 3	WEEK 4	WEEK 5	WEEK 6	WEEK 7	WEEK 8	WEEK 9	WEEK 10	WEEK 11-14
Meeting with our teammates and supervisors Choosing ideas from each of us Review existing product on lab											
Each of us sketching a design for chosen idea Present our design to supervisor and receive comments											
Making proposal and report Refer to supervisor and correcting the slides											
Receive suggestion from supervisor Combining our design to create final design											
Insert information into proposal slide to presents Separate each task to each members											
Correcting our proposal slides											
Log Book											

CHAPTER 4

RESULT AND ANALYSIS DATA

4.1 INTRODUCTION

In this chapter, we present the findings from our research on the food waste fertilizer machine. The objective of this project was to design and evaluate a machine that effectively converts organic food waste into nutrient-rich fertilizer, to produce methane gas and produce organic fertilizer from the liquid waste. This analysis aims to demonstrate the machine's efficiency, operational performance, and the quality of the resultant fertilizer.

4.2 DATA ANALYSIS AND STATISTICS

The statistics and data analysis below are the response from users through google form platform to identify the effectiveness of "Food Waste Fertilizer Machine" for all community.

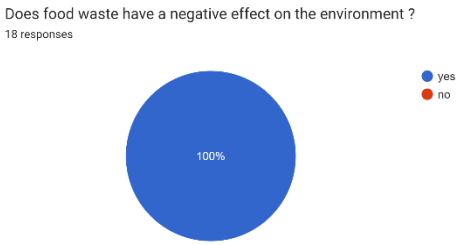


Figure 4.1 Pie chart of negative effects of food waste on the environment

The pie chart above shows that 100% respondents agree that food waste brings negative effects on the environment. Food waste releasing harmful substances into the soil and methane into the atmosphere. Notably, methane is a greenhouse gas that is estimated to be 25 times more potent than carbon dioxide.

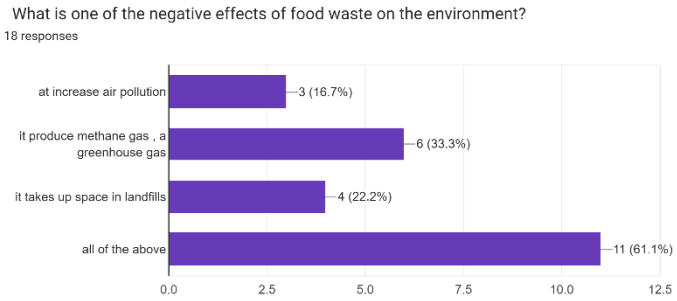
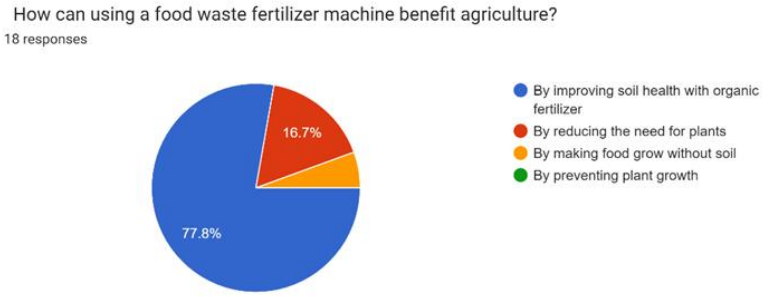


Figure 4.2 Bar chart of the negative effects of food waste to the environment

We analysed the data obtained and found that 61.1% respondents says that all of the negative effects above is side effects of the food waste

Figure 4.3 Pie chart of benefit food waste fertilizer machine to agriculture

Based on the pie chart above, 77.8% respondents agree that food waste fertilizer machine can improving soil health with organis fertilizer, 16.7% respondents agree that it reducing the need for plant and the other 5.6% agree that it can making food grow without soil.



4.3 QUESTIONAIRE THROUGHOUT OUR RESEARCH

1. What is the benefit of the Food Waste Fertilizer Machine?

The benefit of this product is it can produce 3 outcome such as organic solid fertilizer, liquid fertilizer, methane gas. Using a Food Waste Fertilizer Machine can help to reduce the amount of organic waste that ends up in landfills, which can contribute to greenhouse gas emissions and other environmental problems. Additionally, composting can help to enrich soil and promote healthy plant growth, making it a great way to reduce waste while improving the health of your garden or yard.

2. What are the suggestions to ensure that the Food Waste Fertilizer Machine can increase its performance in household and agriculture industry?

Our proposal ensure that Food Waste Fertilizer Machine can increase the use of it performance by to improve the performance of the Food Waste Fertilizer Machine in households and agriculture industry, there are several key suggestions that can be applied. First, optimizing the machine to handle a diverse range of organic waste types, from common household food scraps to larger-scale agricultural byproducts, would enhance its versatility across sectors. This could involve incorporating more robust grinding and decomposition mechanisms, along with microbial or enzymatic solutions to speed up the composting process. For households, user-friendly interfaces, automated settings, and compact designs would increase ease of use and encourage widespread adoption. For agriculture, the machine could be adapted to handle bulk waste, and equipped with IoT sensors for real-time monitoring of performance, allowing farmers to track compost quality and optimize waste management. These improvements would enhance performance, reduce waste, and promote sustainability across all sectors.

4.4 PROJECT OUTCOME

The picture below shows the result of a project that we were appointed to create in 14 weeks :

Figure 4.4 Picture of the Food Waste Fertilizer Machine

4.5 PROJECT TESTING AND PERFORMANCE ANALYSIS

FIRST ATTEMPT	
Arduino system	YES
Linear actuator	YES
Crusher motor	NO
SECOND ATTEMPT	
Arduino system	NO
Linear actuator	YES
Crusher motor	NO
THIRD ATTEMPT	
Arduino system	YES
Linear actuator	YES
Crusher motor	YES

Table 4.5 Project performance analysis

4.6 ANALYSIS

Based on the project test analysis, we have identified several problems. On the first try, the crusher motor is not operational. This indicates an issue with the motor. The motor that we bought is overpowered for the fertilizer machine, so we had to buy a new motor for the crusher. For the first attempt, we can summarize that the arduino system which is sensor timer, heater temperature and linear actuator worked, but the crusher motor failed. The project was partially successful but lacked full functionality.

For the second attempt, the arduino system failed this time, which would likely stop all other components from functioning correctly or responding. The arduino system failed due to exposed to rain. We had to buy and change the LCD for the arduino system. Despite the arduino failure, the linear actuator remains functional, possibly due to an independent power supply. However, the crusher motor still did not work, indicating a persistent issue that wasn't resolved from the first attempt.

On the final try, all of the components is well function. This attempt marks a successful test where the entire system worked as intended. The project testing demonstrates a methodical approach to troubleshooting and system improvement. The third attempt's

success suggests the project is now reliable and functioning as designed. Further tests could help verify consistency and durability.

4.7 DISCUSSION

In preparing this project report, all the tasks have been done by us through planning, and a lot has been discussed with our supervisor to complete this report. From the starting week 1 to week 14, a lot of struggles have been faced by us, and many challenges were encountered to complete this report. Even though some problems were faced, such as a lack of ideas on our project making in the first few weeks, a lot of research has been conducted on Google, and all previous project 1 assessments and model builds have been reviewed. After sufficient knowledge was gained on how to come up with an idea, the project making was begun in the workshop following the designing that had been previously completed on project 1.

CHAPTER 5

CONCLUSION AND SUGGESTIONS

5.1 INTRODUCTION

In this chapter , we will describe the achievement of goals and objectives of the study “Food Waste Fertilizer Machine” and the suggestions and recommendation from us to futher improve the efficiency of this product in order to attract many consumers to buy it.

5.2 ACHIEVEMENT OF AIMS AND OBJECTIVE OF RESEARCH

With all research and information gathering now we can conclude that the goal and the objective presented at the beginning of the research were successfully achieved . The primary objective was to design few models of waste food to fertilizer machine and develop an efficient and scalable system for converting waste food into organic fertilizer . At the same time , it has also achieved the objectived of being used by farmer , restaurant , ordinary people and it also can be indoor and outdoor . A review of the study has been carried out carefully throughout the implementation of the project and also in terms of weaknesses such midsteel too thin for welding and design that are different from original sketch . However , what is very important in the production of this Food Waste Fertilizer Machine that we can study the function and give experience in the production of this project .

5.3 SUGGESTION AND RECOMMENDATION

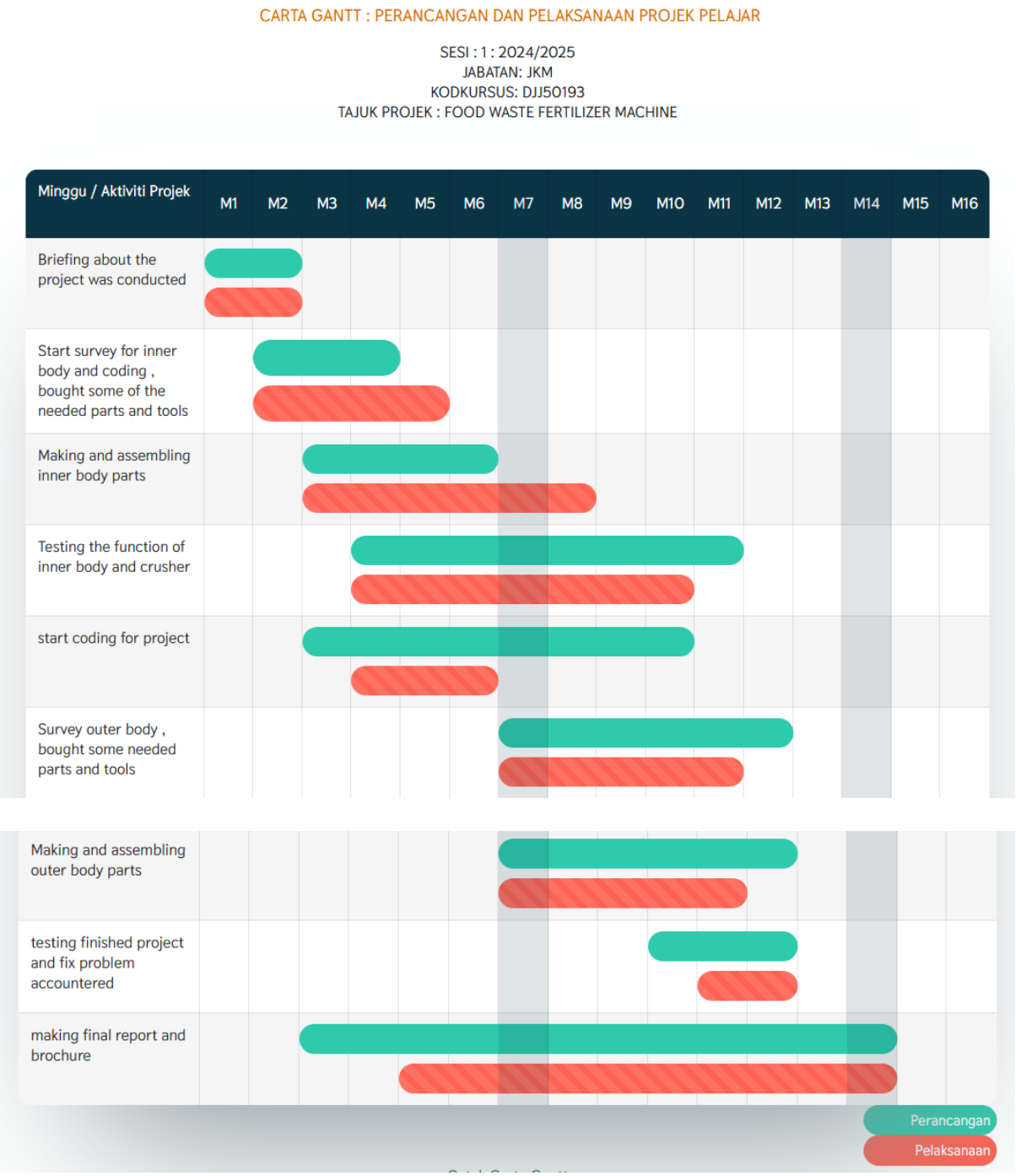
After the completion of the fabrication of the project , the Food Waste Fertilizer Machine has been designed and made exactly according to the set expectations . Even with that , there are several obstacles and limitations that have been overcome to produce this Food Waste Fertilizer Machine more quality than existing one and compatible with the technology on nowadays . A suggestion that can be given is to improve the safety especially at chain , it can be more dangerous if it is not covered .

5.4 CONCLUSION

This product is highly suitable for farmer , restaurant , ordinary people and it also can be indoor and outdoor . This Machine makes it easy to compost food waste into fertilizer quickly . As you can see , the Food Waste Fertilizer Machine is made very environmentally friendly and also multifunctional outputs which is convert food waste into fertilizer , liquid

fertilizer and also can be animal food . It also Eco-friendly , helps reduce food waste , supporting environmental sustainability .

5.5 GANTT CHART PROJECT 2



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APPENDIX A : QUESTIONNAIRE QUESTION

Does food waste have a negative effect on the environment ? *

- ○ yes
- ○ no

What is one of the negative effects of food waste on the environment? *

- ☐ at increase air pollution
- ☐ it produce methane gas , a greenhouse gas
- ☐ it takes up space in landfills
- ☐ all of the above

Which of the following materials can a food waste fertilizer machine process? *

- ○ plastic
- ○ metal
- ○ glass
- ○ food scraps

What is the main purpose of a food waste fertilizer machine? *

- ○ To burn food waste
- ○ To convert food waste into fertilizer
- ○ To store food waste
- ○ To transport food waste

How can using a food waste fertilizer machine benefit agriculture?

- ○ By improving soil health with organic fertilizer
- ○ By reducing the need for plants
- ○ By making food grow without soil
- ○ By preventing plant growth

How can we reduce food waste? *

- ○ Throwing away more food
- ○ Buying more food than needed
- ○ Planning meals and storing food properly
- ○ Eating out every day

What can individuals or businesses do to reduce food waste using a fertilizer machine? *

- ○ Throw more food into landfills
- ○ Use the machine to turn food scraps into fertilizer
- ○ Stop recycling
- ○ Increase the amount of food they buy and waste

APPENDIX B : LIST OF RESPONDENTS

Does food waste have a negative effect on the environment ?

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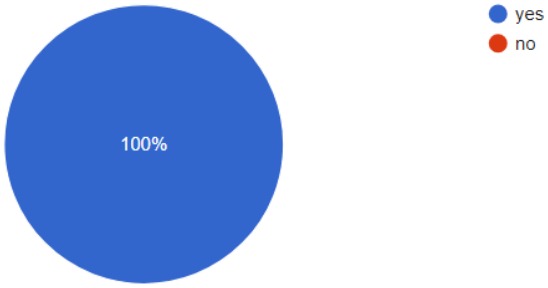
18 responses



What is one of the negative effects of food waste on the environment?

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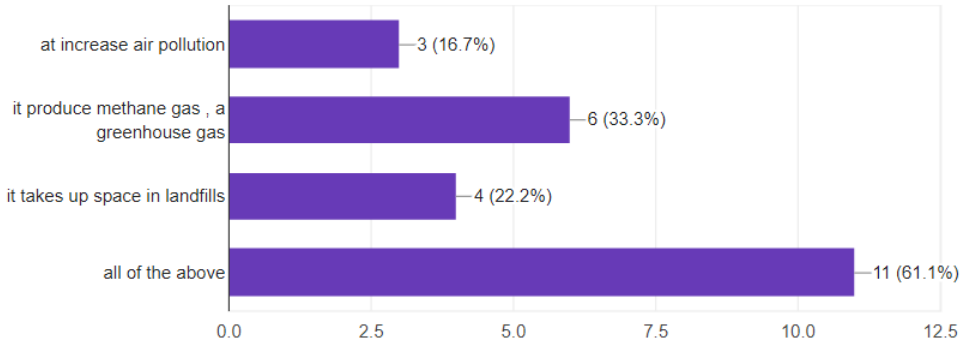
18 responses



Which of the following materials can a food waste fertilizer machine process?

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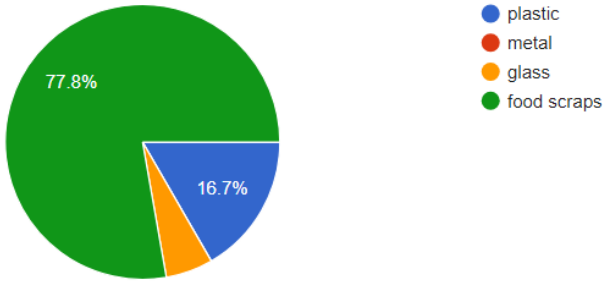
18 responses



What is the main purpose of a food waste fertilizer machine?

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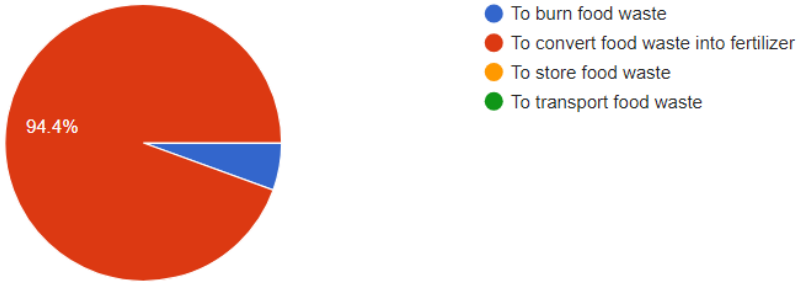

How can using a food waste fertilizer machine benefit agriculture?

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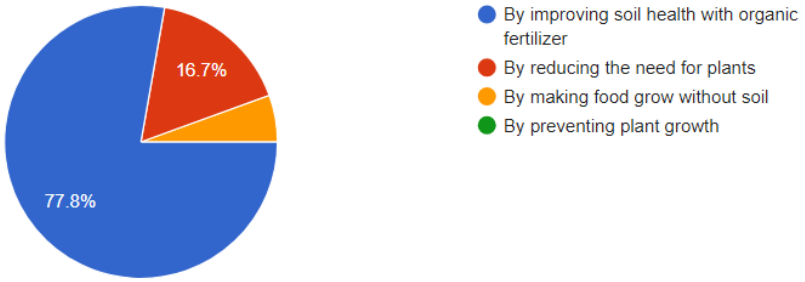

How can we reduce food waste?

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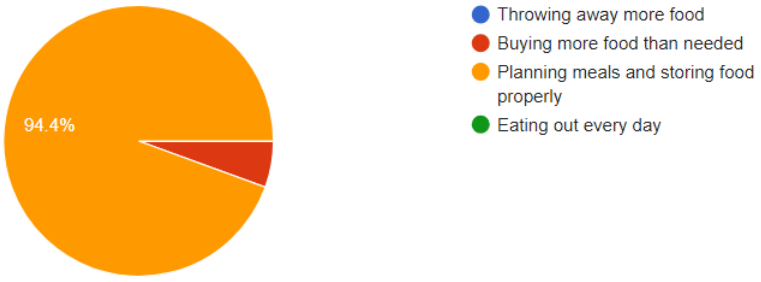
18 responses



What can individuals or businesses do to reduce food waste using a fertilizer machine?

Copy chart

18 responses