INDIAN ACADEMY
Degree College - Autonomous

"Biofeed Production from Urban Food Waste"

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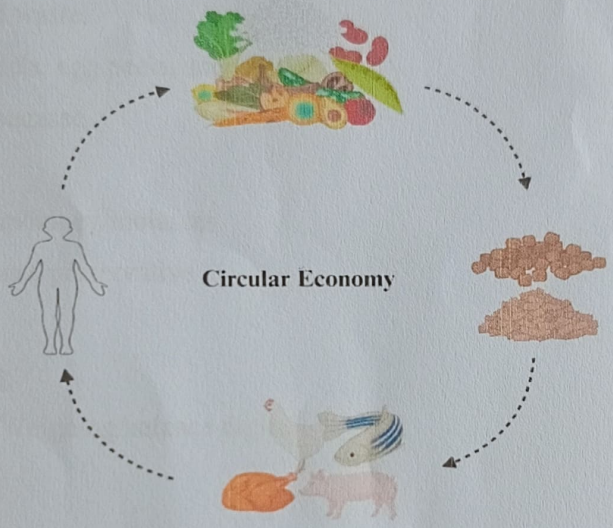
1. INTRODUCTION

- The increase in the population has led to an increase in food consumption and preferential consumption of food has led to the generation of food waste.
- Higher living standards in developed countries also contribute to the production of more food waste to meet the food quality demands. Much of the food waste generated from unused consumable food products, household food waste, and waste products from the food manufacturing and processing industries end up in landfills.
- Biofeed produced from food waste refers to animal feed that is created using leftover food materials that would otherwise be discarded. Its high nutritional content and superior palatability make it a useful tool that can boost feed utilization, improve the health of poultry, fish, pigs, rabbits, and cattle, raise the standard of animal products, and improve breeding conditions.
- The availability of feed is a critical concern for fisheries, cattle, pigs, rabbits, and poultry operations as well as for the productive sector as a whole.
- The productivity of farm animals and poultry depends on the quality of feed they consume between 50 and 60 percent of the time, according to numerous domestic and international studies.
- Arranging biofeed production according to their feed resources, utilizing waste from kitchen sources, waste disposed of from homes, restaurants, marketplaces, the bioprocessing industry, agro-industry, and the food industry, etc., can improve the quality of the feed, and many manufacturers can drastically lower the feed cost.The project aims to effectively utilize food waste, a cost-effective feed option to promote environmental sustainability.
- Proper processing, treatment, balanced nutrition, and packing to store longer periods are crucial to remove any harmful substances and ensure that the feed meets health standards for animals.
- India produces 86.602 million metric tons of fruits and vegetables yearly, with around 5.6 million tons of waste. Annual research performed in Bengaluru revealed that 18% of India's fruit and vegetable output, worth Rs.13,300 crore, is lost. Thus, waste management is a serious concern of every day.
- Waste management is a serious problem shown by the most recent data on cooked food waste in Bengaluru's metropolitan areas. According to research conducted by the University of Agricultural Sciences, Bengaluru, around 20% of prepared food is wasted nationwide, particularly at events held in metropolitan regions.

- Fifty % of food waste in Bengaluru is caused by wedding events, when food is prepared for around 50 lakh guests only about 30 lakhs show up, resulting in the food for about 20 lakh people going to waste without proper planning.
- The magnitude of the issue is demonstrated by the estimated 68.7 million tons of food that is wasted in Bengaluru each year. Furthermore, a study finds that Bengaluru city wastes 943 metric tons of high-calorie food at weddings. These figures highlight how urgently we need to implement practical solutions to cut down on food waste and improve resource efficiency.
- Effectively combating food waste in the city requires addressing these factors through improved planning, awareness programs, and smart food management methods.



- The impact of food waste on the environment in Bengaluru urban is substantial. The wastage of cooked food not only leads to the loss of valuable resources but also contributes to environmental issues.
- Food waste, especially from urban commercial kitchens, can result in the contamination of sewer lines and stormwater drains with fat, oil, and grease (FOG), leading to blockages and environmental harm.
- This can cause raw sewage to spill into streets and homes, creating public health problems and environmental damage. Additionally, the disposal of excess cooked food into landfills contributes to methane emissions, a potent greenhouse gas that significantly impacts climate change.
- Excessive weddings and parties in the city are a major contributor to the overflow of cooked food that is frequently thrown away. In addition, the lack of laws controlling the disposal of extra food and low public knowledge of the consequences of food waste further contribute to the issue's continued existence in Bengaluru metropolitan

2. OBJECTIVES

- To develop a sustainable and efficient method of converting food waste into high quality biofeed.
- To deliver a nutrient-rich biofeed for the animal feed industry and to lessen the environmental impact of disposal of food waste.
- To create a sustainable biofeed reducing urban food waste and to create a circular economy in the management of urban waste of various categories.
- To optimize the Biofeed production process with all the parameters in creating an efficient biofeed.

3. MATERIALS REQUIRED

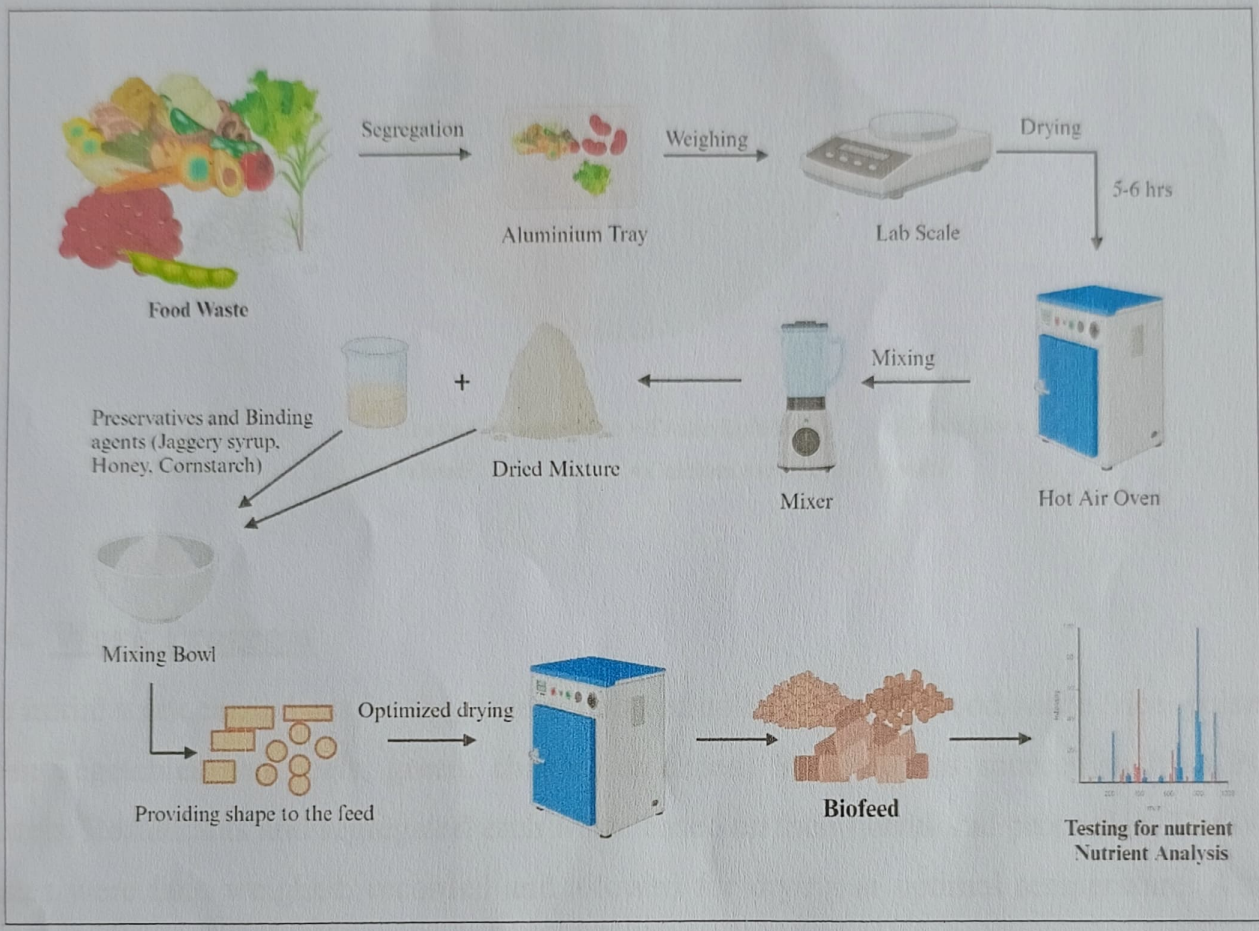
- Food Waste
    1. Cooked food waste.
    2. Vegetable peels, egg peels, and fruit peels.
    3. Sugar cane bagasse.
- Treatment
    - Jaggery syrup/honey/molasses.
    - Salt/Honey as a preservative
- Hot air oven
- Trays for processing
- Moisture Analyzer/Weighing balance digital
- pH meter
- Mixing bowls
- Measuring glassware's
- Blender

4. PROCEDURE

1. Weighing the collected food waste as per the required measurement.
2. Drying the food waste at 60°C for 2-3 hours until it is completely dry.
3. Preparation of sugar cane bagasse into pulverized form after drying.
4. Mixing with cornstarch to provide texture to the feed.
5. Blending with jaggery syrup/molasses to adhere to the feed.
6. Addition of fruit peels to enhance the nutritional content.
7. Mixing the contents uniformly with the preservatives for the final form.
8. Post-treatment with heating at 60°C for 4-6 hours for drier, moisture-free, and crispier form.
9. Cooling the mixture and then formulate it into the required size for proper palettization.
10. Testing the final feed for pH, solubility, effective release of nutrients, and nutrient analysis.

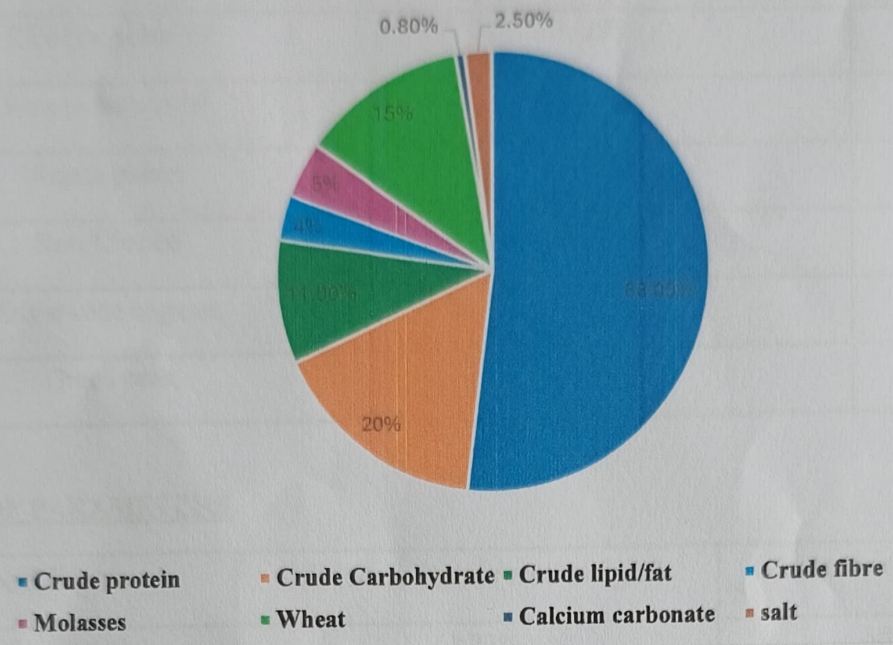
11. Nutrient and quality control of the mixture compared with the commercially available feeds.
12. Storing in an airtight container in a cool place for future analysis and cost-benefit analysis.

5. WORK PLAN



Concentration of commercial feed

Ingredient	Crude protein	Crude Carbohydrate	Crude lipid/fat	Crude fibre	Molasses	Wheat	Calcium carbonate	salt
Fish meal	63.0%	15%-20%	11.0%	2%-4%	1%-10%	10%-20%	0.8%	0.5%-2.5%
Poultry meal	58%	20%-30%	11.3%	3.5% -5%	0%-4%	0%-25%	0.2%-0.3%	0.25%
Rabit meal	17.60%	40%-60%	2%-5%	14.12%	4.00%	30.20%	0.20%	0.11%
Piggery meal	12%-18%	30%-50%	3%-10%	2%-7%	2%-5%	5%-20%	0.5%-1.5%	0.5%-1.5%



6. Work Progress

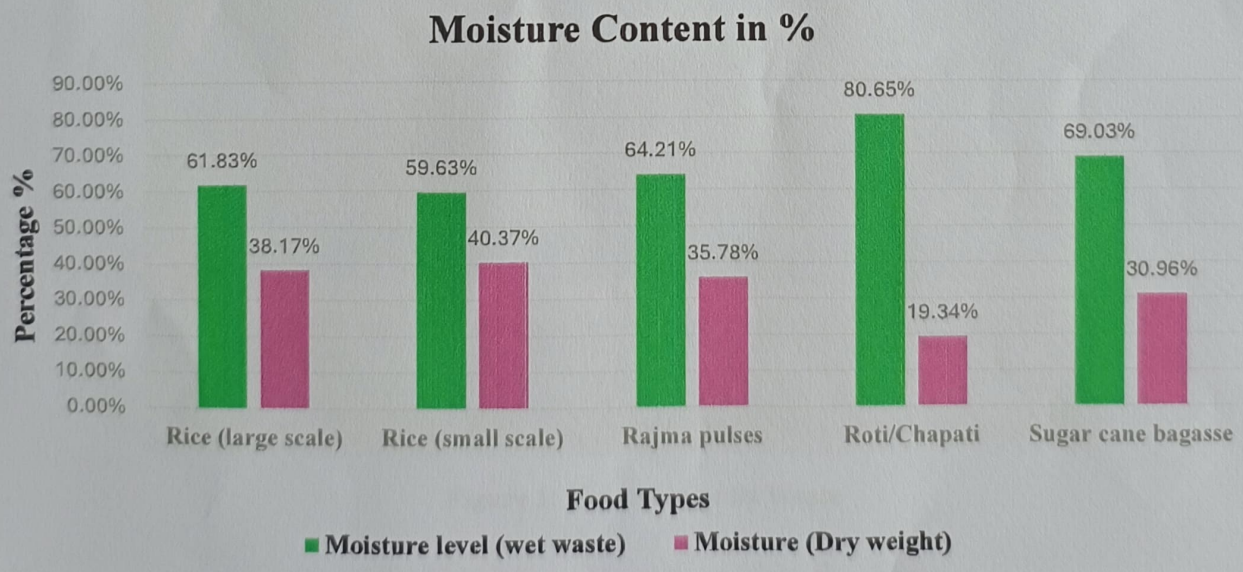
The initial work carried out for the project involved collection of the food waste (rice, pulses, green vegetables and peels, green, chapati, chickpea) from various sources such as PG, Hostels, Restaurants and segregated each waste based on their nutritional properties. The wet wastes were then weighed, recorded and allowed for drying at optimal temperature. After incubation the weight of the dry waste were recorded to determine the moisture content in it and was crushed into fine particles to give a final dried waste mixture. Binding agents and preservatives were added for adherence and to provide a crispy texture to the final mixture. Then the mixture was given various shapes and left for drying under low optimized temperature. After the drying process the mixture had solidified and was ready to send for nutrient analysis.

Food Waste	Wet weight	Dry weight
Rice (large scale)	235	89.70
Rice (small scale)	100	40.37
Rajma pulses	50.61	18.11
Roti/Chapati	100.19	80.81
Sugar cane bagasse	60	41.42
Green peas	300	123.40

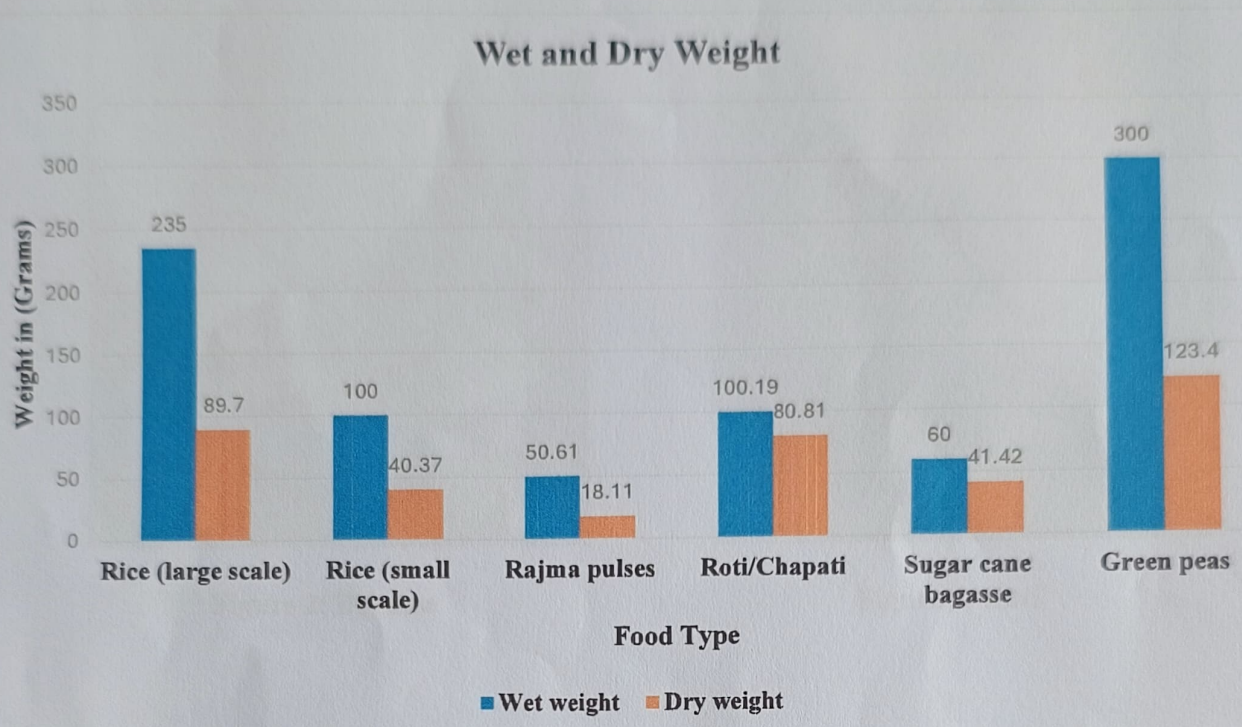
RATIOS OF PARAMETERS

Food Waste	Moisture level (wet weight)	Moisture (Dry weight)
Rice (large scale)	61.83%	38.17%
Rice (small scale)	59.63%	40.37%
Rajma pulses	64.21%	35.78%
Roti/Chapati	80.65%	19.34%
Sugar cane bagasse	69.03%	30.96%

Moisture Data



Wet Weight Data



Collection of waste

Figure 1: Vegetable peels Waste

Figure 2: Bagasse

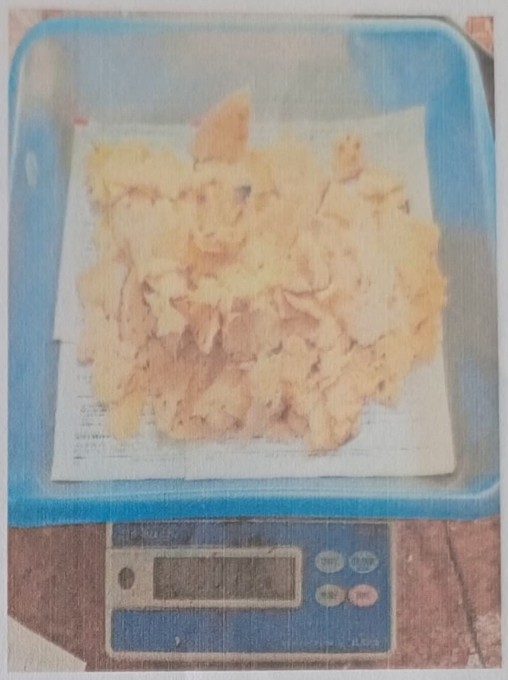


Figure 3: Roti

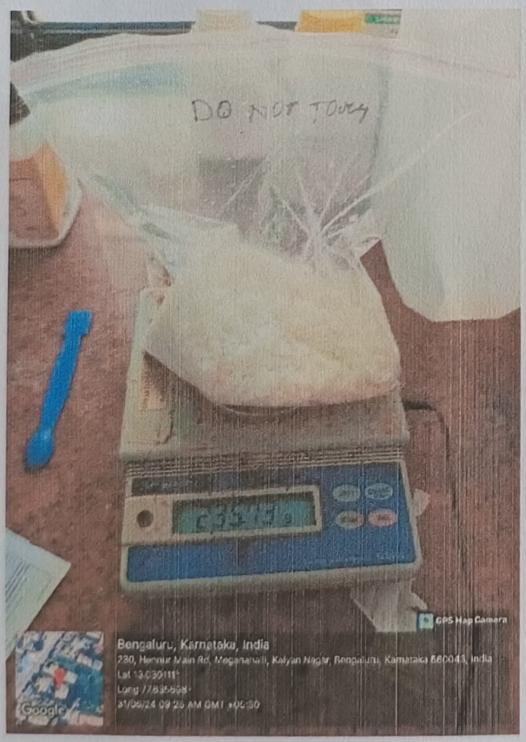


Figure 4: Rice

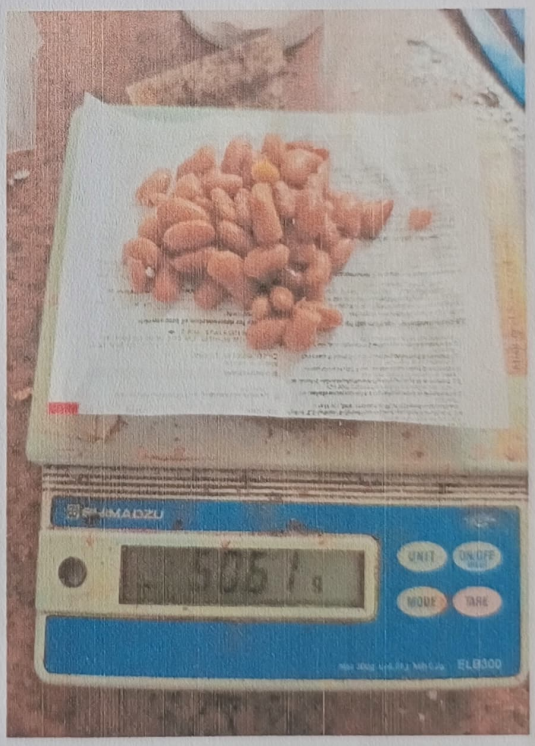


Figure 5: Pulses (Rajma)

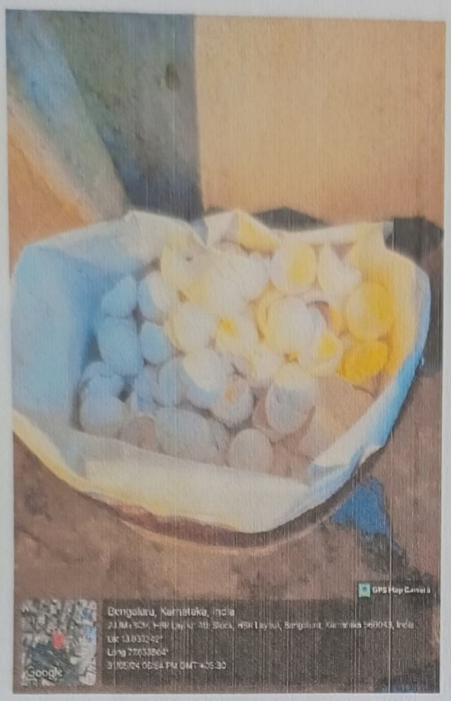


Figure 6: Egg shells

Figure 7: Mortar and Pestle

Post Drying Treatment

Figure 8: Rajma (Dry)

Figure 9: Rice (Dry)

Figure 10: Roti (Dry)

Figure 11: Green Pea (Dry)

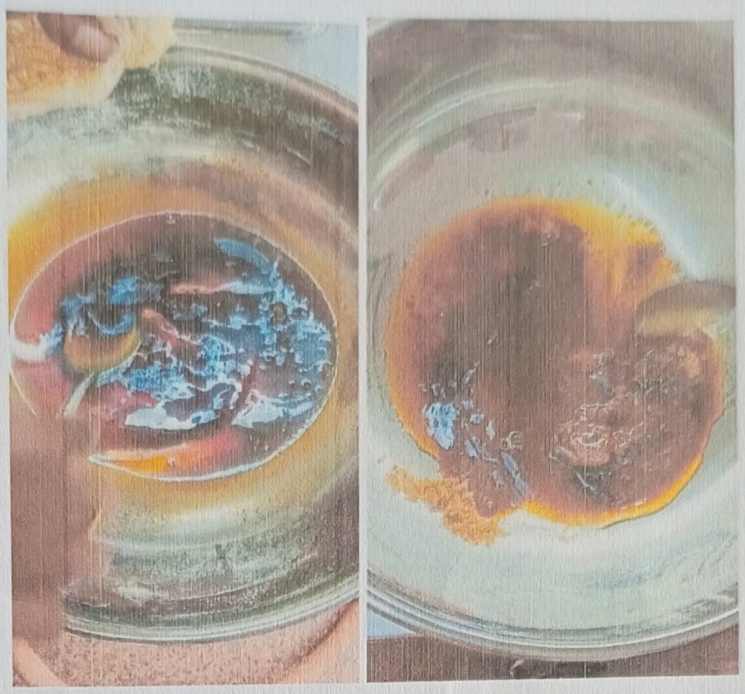


Figure 12: Jagerry Syrup

Figure 13: Biofeed

Biofeed to Mealworms

Figure 14

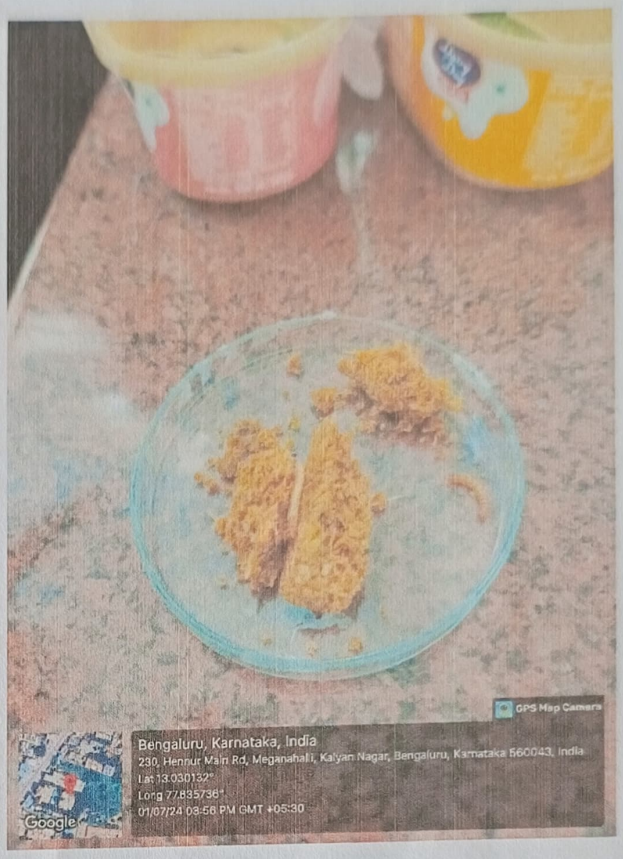


Figure 15

7. Result and Conclusion

Through our project, we have successfully converted the leftover food wastes into a viable biofeed. The biofeed, derived from diverse food residues, underwent rigorous processing to ensure its safety and sustainability for animal consumption. Preliminary observations indicate that the biofeed has the potential benefits, including cost-effectiveness and a reduction in environmental waste. The biofeed has being prepared for nutrient analysis to determine its nutritional composition and confirm its efficacy. This analysis will provide critical data on the protein, fat, carbohydrate, and micronutrient content, ensuring it meets the dietary needs of the targeted livestock. Simultaneously we have fed a small quantity of biofeed to meal worms and Assel breed chicken to study the growth. The positive feedback from initial trials suggests that our biofeed could serve as a sustainable alternative to traditional feeds, promoting eco-friendly

practices in the agricultural and aquaculture sectors. As we wait for the growth results and nutrient analysis results, the projects progress highlights the promise of transforming food waste into valuable resources, contributing to both economic and environmental sustainability.

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