**~~Quantitative and Qualitative Analysis of Food Wastes and Assessment and Sustainable Repurposing of Cooked Food Wastes/Leftovers and Peels for Human Consumption~~**

**Assessment and Evaluation of Cooked Food Leftovers, Scraps and Peels for Repurposing into Edible Products**

In Ethiopia rapid urbanization and population growth have increased food consumption, resulting in significant food waste across various sectors. The increasing cost of food and essential utilities has worsened the financial strain on many households, making it harder for them to afford enough nutritious food. The pressing need for innovative and sustainable solutions to address both waste management and food insecurity, aiming to improve food efficiency and availability.

Recent statistics shed light on the intricate connection Ethiopia has with food waste.

Ethiopia's per capita food waste is 92 kg per year, making it one of the highest globally, just behind Nigeria (199 kg) and Mexico (94 kg).

If 60% of the annual food waste could be repurposed, it would result in around 6.18 million tons of usable food. This amount of food could sustain the entire population of the country for approximately 2.3 months. High per capita waste indicates inefficiencies in food handling, leading to preventable losses while many households still face nutritional challenges. This waste represents a lost chance to reduce food scarcity and ease the economic strain from rising food and utility costs.

**Introduction**

Food waste is a growing global concern with profound social, economic, and environmental consequences. In Ethiopia, particularly in urban areas such as Addis Ababa, rapid urbanization and population growth have intensified food consumption patterns, leading to significant food waste generation across multiple sectors. At the same time, the rising cost of food and essential utilities has exacerbated the vulnerability of many households, hindering their ability to afford sufficient and nutritious food. This dual challenge of waste management and food insecurity underscores the urgency of innovative and sustainable solutions to improve food resource efficiency and availability.

Given Ethiopia's history of severe food insecurity and economic misery, this paradox is startling.

Recent data highlights Ethiopia’s complex relationship with food waste. The country generates approximately 10.3 million tons of household food waste annually. While this figure may seem relatively low compared to other countries with larger populations or higher per capita waste, it holds significant potential for addressing food security within Ethiopia itself. The per capita food waste in Ethiopia stands at 92 kilograms per year, placing it among the highest globally, surpassed only by countries like Nigeria (199 Kg/cap/yr) and Mexico (94 Kg/cap/yr). If 60% of this annual waste could be repurposed, it would amount to approximately 6.18 million tons of usable food annually, which could sustain the country’s entire population for about 2.3 months.

This paradox is striking given Ethiopia’s context of widespread food insecurity and economic hardship. High per capita waste suggests inefficiencies in food storage, preparation, and consumption practices, which result in preventable food losses even as many households struggle to meet their nutritional needs. Additionally, this waste presents a significant missed opportunity to mitigate food scarcity and alleviate economic pressures caused by the rising prices of food products and utilities.

This study seeks to address these challenges by estimating the amount, type, and characteristics of food waste generated in Addis Ababa. The research will examine food waste at the household level, as well as in institutions such as hotels, schools, universities, hospitals, and other facilities where food preparation occurs on a large scale. Particular attention will be given to categorizing food waste into leftovers, peels, and other components to identify sustainable options for repurposing waste into alternative food products for human consumption. These efforts aim to mitigate the dual threats of food waste and food insecurity by promoting the efficient use of available resources and fostering resilience in the face of rising costs.

Ethiopia’s high per capita food waste is particularly troubling in the context of rising food prices, which threaten to deepen poverty and malnutrition. Without intervention, these challenges could hinder the population’s ability to purchase sufficient food, leading to a further decline in living standards and increased vulnerability to hunger. Addressing food waste through innovative repurposing solutions offers a practical pathway to alleviate economic burdens, improve nutritional access, and contribute to a sustainable food system. By turning what is often discarded into valuable resources, this research aims to provide actionable insights for policymakers, institutions, and communities to adopt sustainable waste management practices and develop cost-effective, nutritionally beneficial alternatives. The findings will inform strategies to reduce food waste, enhance food security, and ensure a more equitable and sustainable food system for Addis Ababa and beyond.

**Objectives**

* To assess and quantify food waste generated in households, hotels, schools, universities, hospitals, and other mass food preparation facilities in Addis Ababa, Ethiopia.
* To evaluate cooked food leftovers, scraps and peels for nutritional composition and safety status for human consumption
* ~~To investigate viable methods to repurpose food waste and peels for human consumption, contributing to food security and resource optimization.~~
* ~~To provide alternative solutions to mitigate the impacts of rising food prices, poverty, and malnutrition by utilizing food waste as a valuable resource.~~

**Methodology**

***Study Area and Population:***

The study will involve a diverse range of participants from various food preparation sectors in Addis Ababa, Ethiopia. A total of approximately **200 households** will be randomly selected from different neighborhoods to represent household food waste management practices. **For hotels, 50 participants,** including chefs, kitchen staff, and facility managers, will be purposefully sampled from a variety of hotel categories, ensuring diverse input from luxury, mid-range, and small establishments. **Schools** will include **30 participants** comprising school management, catering staff, and teachers, chosen through **stratified random sampling** to reflect small, medium, and large institutions. **Universities** will be represented by **20 participants**, including facility managers and key staff involved in food services, selected through convenience sampling from institutions with established food waste management initiatives. Additionally, **25 participants** from **hospitals** and **25** from mass food preparation facilities, such as government-run centers, will be included using snowball and purposeful sampling methods, respectively. Local authorities, who play a crucial role in managing food waste at the municipal level, will consist of **10 key** decision-makers selected through purposive sampling to ensure comprehensive representation.

The study will employ both quantitative and qualitative methodologies. Surveys and questionnaires will be used to gather quantitative data on food waste practices, while qualitative methods, such as in-depth interviews and focus group discussions, will provide deeper insights into challenges and effective strategies. Data analysis will involve descriptive statistics for quantitative data and thematic analysis for qualitative data, allowing for a comprehensive understanding of food waste management in Addis Ababa’s diverse food sectors.

***Data Collection:***

Structured surveys and interviews will be conducted with households and food preparation facilities to understand the volume, type, and management of food waste. These surveys will include both closed and open-ended questions to gather quantitative data on waste generation, disposal methods, and factors contributing to food waste. Descriptive statistics will be used to analyze the survey data, providing an overview of food waste trends across different sectors. In addition, on-site observations and waste sampling will be carried out to physically quantify and characterize food waste and peels at various facilities. Sampling methods will involve random and stratified sampling techniques to ensure representative data collection. Waste characterization will be analyzed using statistical methodologies such as frequency distribution and inferential statistics to identify correlations between different types of food waste and factors such as facility type, size, and management practices.

Furthermore, a review of existing studies, reports, and government data on food waste in Ethiopia and comparable regions will be conducted. This review will incorporate meta-analytic techniques to synthesize findings and assess patterns, trends, and gaps in food waste management. Statistical analyses, including chi-square tests and regression analyses, will be employed to evaluate relationships between key variables, such as food waste volume and socio-demographic factors. This comprehensive approach ensures that both qualitative insights and quantitative data contribute to a robust understanding of food waste management practices across various sectors.

***Nutritional and Safety Assessment***

To complement the quantitative and qualitative analysis of food waste, laboratory analysis—including nutritional, microbiological, and chemical testing—will be conducted to evaluate both the nutritional and safety aspects. To assess the nutritional value of discarded foods, food waste samples will be tested to measure key nutrients such as vitamins, minerals, protein, and carbohydrate content following standardized procedures. Additionally, food wastes will be evaluated for the presence of harmful microorganisms, including pathogens such as E. coli, Salmonella, and other foodborne pathogens, to ensure safety and prevent potential health risks. Furthermore, the analysis of food waste samples for contaminants such as heavy metals, pesticides, and other harmful substances will be conducted to ensure compliance with food safety regulations, promoting a safer and more sustainable approach to food waste management.

***Data Analysis:***

Statistical methods will be applied to calculate and analyze interviews, observations and the total volume of food waste generated and its composition by sector; and to identify trends, challenges and opportunities in food waste repurposing. Estimation will be made to know the proportion of food waste that can be repurposed for human consumption.

***Sustainability Assessment:***

Evaluation will be made to assess feasibility, cost-effectiveness, and nutritional potential of repurposing food waste for human consumption. Consultation of stakeholders will be conducted for the validation of results and devising of alternative intervention areas.

***Ethical Considerations:***

Throughout the study, informed consent will be obtained from all participants, ensuring they are fully aware of the study's purpose and their rights. Confidentiality of all collected data will be strictly maintained, and all activities, including surveys and waste sampling, will adhere to established ethical standards.

**Expected Outcome:**

Practical recommendations for sustainable food waste management and repurposing strategies, with an emphasis on addressing food security challenges in Ethiopia.

**Responsible researchers:**

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**Duration:** 2025 ~ 2027

**Time table:**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Activity** | **Description** | **year** | | | | | | | | | |
| **2025** | | | | **2026** | | | | | |
| **Q1** | **Q2** | **Q3** | **Q4** | | **Q1** | **Q2** | **Q3** | **Q4** |
| Literature Review | Conduct comprehensive literature review on food waste management. |  |  |  |  | |  |  |  |  |
| Planning & Design | Finalize research design, methodology, and data collection tools. |  |  |  |  | |  |  |  |  |
| Ethical Approval | Obtain ethical approval from relevant boards. |  |  |  |  | |  |  |  |  |
| Recruitment | Select participants including households, food facilities, and local authorities. |  |  |  |  | |  |  |  |  |
| Pilot Study | Conduct pilot study to refine survey instruments and data collection methods. |  |  |  |  | |  |  |  |  |
| Sampling & Data Collection | Begin data collection from households and food facilities. |  |  |  |  | |  |  |  |  |
| Training | Train research assistants on data collection and laboratory analysis methods. |  |  |  |  | |  |  |  |  |
| Data collection | Actual data and sample collection |  |  |  |  | |  |  |  |  |
| Data Analysis | Perform initial quantitative analysis using descriptive statistics. |  |  |  |  | |  |  |  |  |
| Laboratory Testing | Begin nutritional, microbiological, and chemical testing of food waste samples. |  |  |  |  | |  |  |  |  |
| Focus Group Discussions | Organize focus group discussions for qualitative insights. |  |  |  |  | |  |  |  |  |
| Data Consolidation | Complete data analysis and draft preliminary findings. |  |  |  |  | |  |  |  |  |
| Workshop | Present preliminary findings to stakeholders at a workshop. |  |  |  |  | |  |  |  |  |
| Data Synthesis | Combine and analyze results using advanced statistical methods (e.g., regression, correlation). |  |  |  |  | |  |  |  |  |
| Publication | Prepare manuscripts and presentations for dissemination. |  |  |  |  | |  |  |  |  |
| Policy Development | Collaborate with local authorities to draft policy recommendations. |  |  |  |  | |  |  |  |  |
| Stakeholder Engagement | Conduct follow-up interviews and discussions with stakeholders. |  |  |  |  | |  |  |  |  |
| Final Report | Finalize comprehensive report integrating all findings. |  |  |  |  | |  |  |  |  |

**Budget:**

**References**

Ian Tiseo (2024). Per capita household food waste of selected countries worldwide 2020. <https://www.statista.com/statistics/933059/per-capita-food-waste-of-selected-countries/>

Comments given:

* Review post-harvest strategy to align the activity with it
* ~~The second objective need to be specific to the repurpose options~~
* ~~The second and third objective can be merged~~
* ~~The safety issue need to be mentioned in the objective of the proposal~~
* Justification need to be given to the methodology
* The timeline is dependent on the objective, if it is only assessment one year might be enough, but if we consider experiments additional two years might be needed
* ~~Cabbage and other vegetable wastes are not categorized under peels, we need to have terminology for such…~~
* Can we incorporate animal feed/ consumption (human and animal consumption)
* If this activity can be taken as a project, animal feed can be considered, otherwise the food science
* Household might be difficult to engage, we better devise
* Parameters need to be included in the methodology
* ~~Potential products need to be mentioned in the proposal,~~
* We need to decide either to focus on the assessment or repurposing. If we are going to ~~have idea to repurpose, those products need to be mentioned~~
* We need to include socioeconomic researchers in the activity
* Hospital is included in the survey (Nosocomial infection), how are we going to manage this?
* The sampling methodology need to be clearly stated (formula need to be mentioned in the methodology)