

Kriti'24

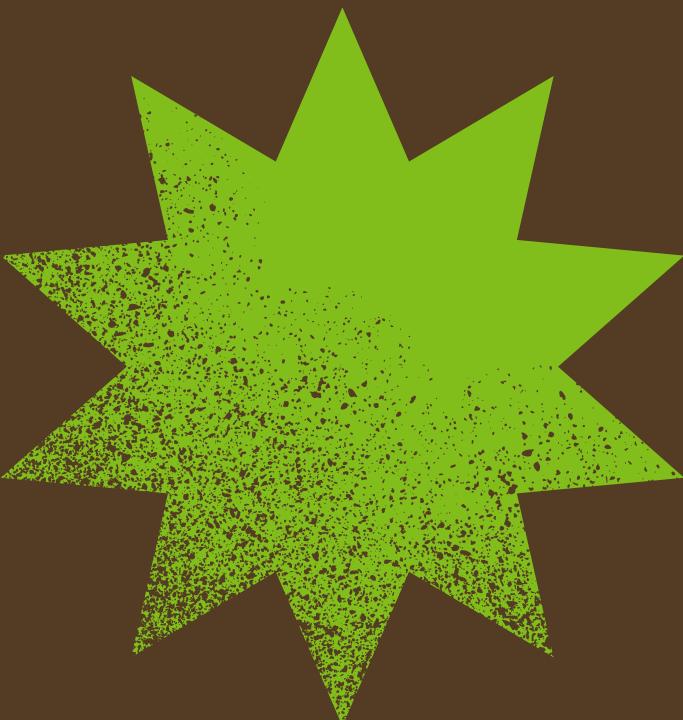
TACKLING FOOD WASTAGE

Building Strategies to optimize the rice wastage of our hostel



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FOOD WASTAGE ON INDIA LEVEL

Food scarcity has become an international topic and therefore it is our prime concern to save food and manage food wastage.

- 74 million tonnes of food was wasted in the 2022-23 period, which is 22% of foodgrain output.
- The loss accounts for roughly 8% of the total 931 million tonnes of food wastage globally.
- In India, 40% of the food wasted is equivalent to nearly 89,000 crore/year. This is equivalent to nearly 1% of the GDP which is depleted in the form of food wastage in India.
- Educational institutions contribute to 3.45% of the overall food wastage volume in India. 2.55 million tonnes of rice get wasted annually within these institutions alone.



FOOD WASTAGE ON EDUCATION INSTITUTE LEVEL

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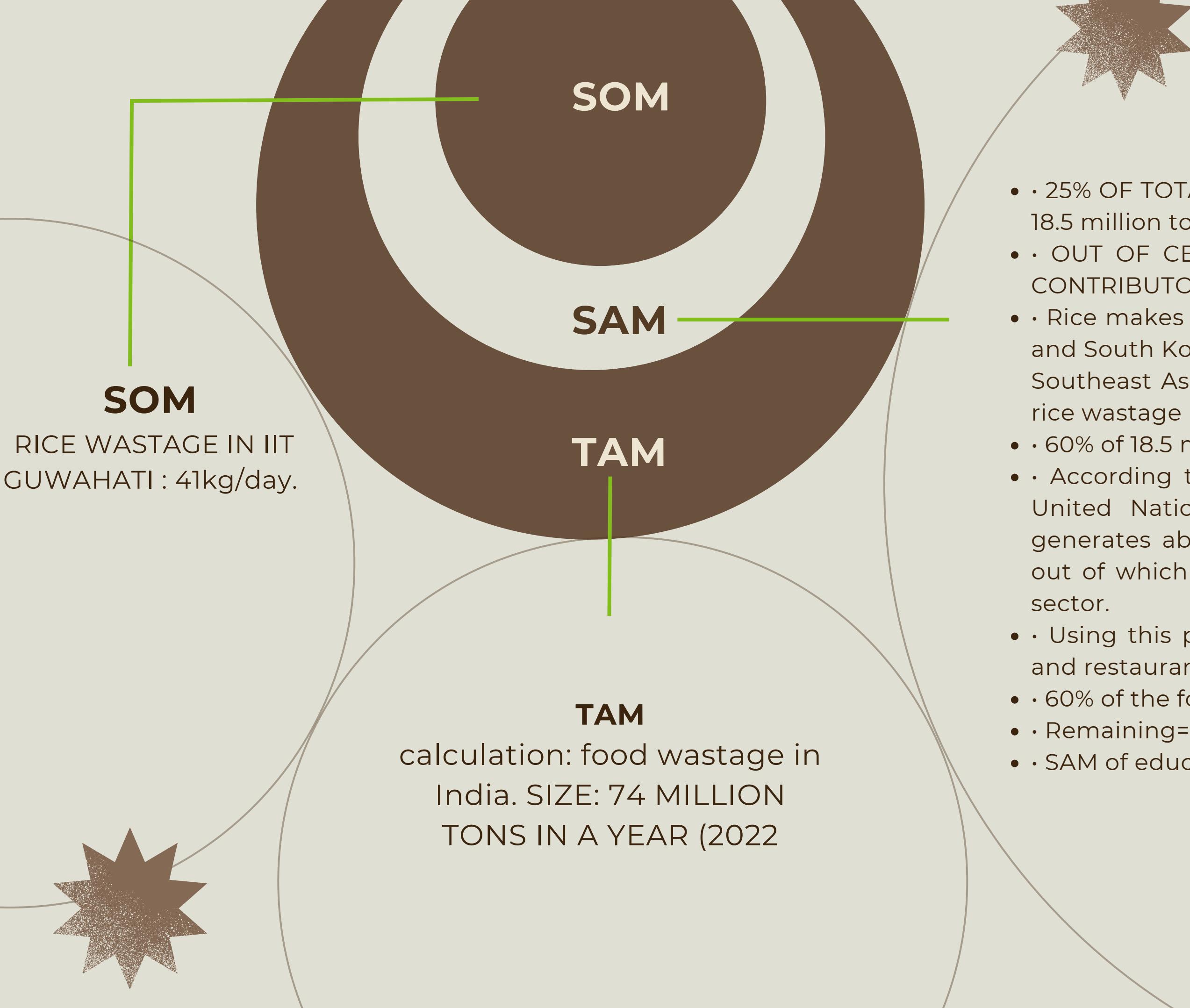
FOOD WASTAGE IN IIT-G

IIT Guwahati generates 41 kg of rice waste daily.

FOOD WASTAGE AT MANAS HOSTEL

The daily rice wastage at Manas Hostel is around 0.75kg per meal.





- 25% OF TOTAL FOOD WASTAGE COMPRISES OF CEREALS: 18.5 million tons
- OUT OF CEREALS, RICE AND WHEAT ARE THE MAJOR CONTRIBUTORS
- Rice makes up over half of wasted cereals in Japan, China and South Korea, and 72% of discarded cereals in South and Southeast Asia— according to the UN.Hence, we took 60% rice wastage in the cereals category
- 60% of 18.5 million ton : 11.1million tons
- According to the Food Waste Index Report 2021 by the United Nations Environment Programme (UNEP), India generates about 68.7 million tons of food waste per year, out of which 11.9 million tons come from the food service sector.
- Using this percentage $(11.9/68.7)*100=17\%$ nearly of hotels and restaurants.
- 60% of the food wastage is due to the household category
- Remaining= 11.1million tons*(1.00-.60-.17)= 2.55 million tons
- SAM of educational institution in india : 2.55 million tons



Problem Identification:

Causes :

- Over-preparation: A lack of accurate demand forecasting leads to excessive rice preparation..
- Incorrect cooking methods: Overcooked or mushy rice becomes unappetizing and less likely to be consumed.
- Temperature: Cold or lukewarm rice loses its appeal and becomes less palatable.
- Student absences: Unplanned student absences/outings often result in excess food prepared at the mess.
- Repetitive Menu: Menu consistency lacking variety may contribute to plate waste.
- Feedback: Lack of channels for residents to provide feedback on the quality and quantity of rice.

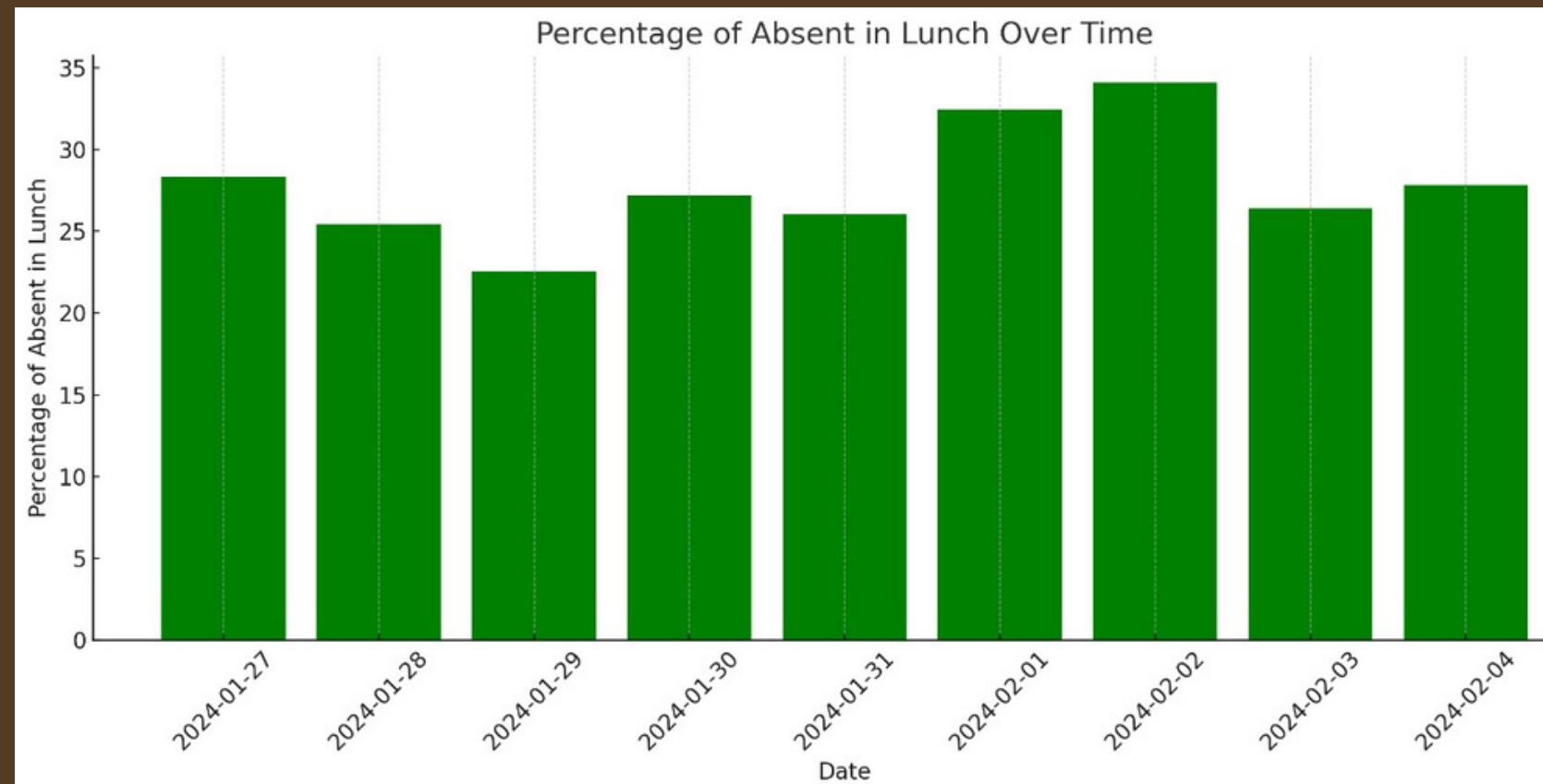
Propagation of Problem:

- Initially the manager orders less quantity that cause food shortage
- Hostellers complain to increase the quantity of food.
- Monotonous menus, poor cooking methods, and lack of catering to diverse dietary needs lead to unappealing food options for students.
- This discourages consumption and students might skip meals or choose unhealthy alternatives like instant food or deliveries.
- this leads to less food being consumed in the mess and resulting in leftover food that goes to waste

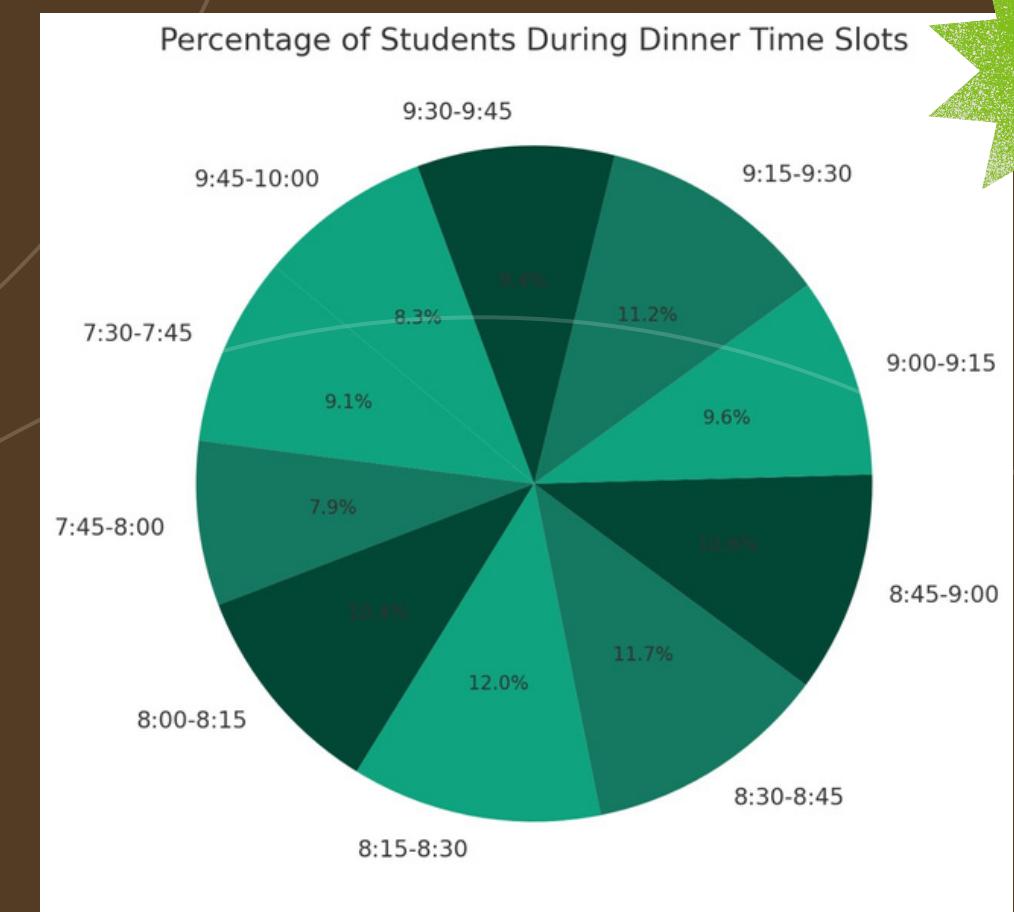
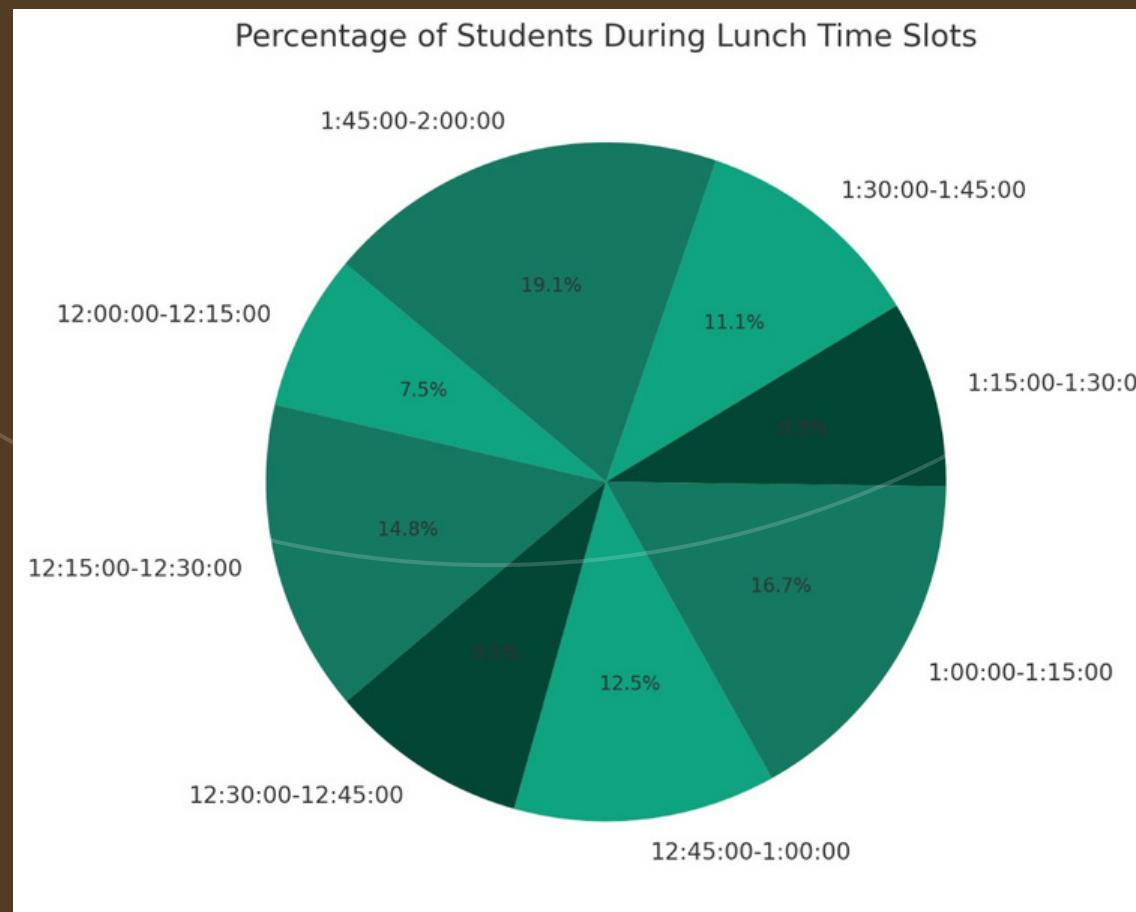
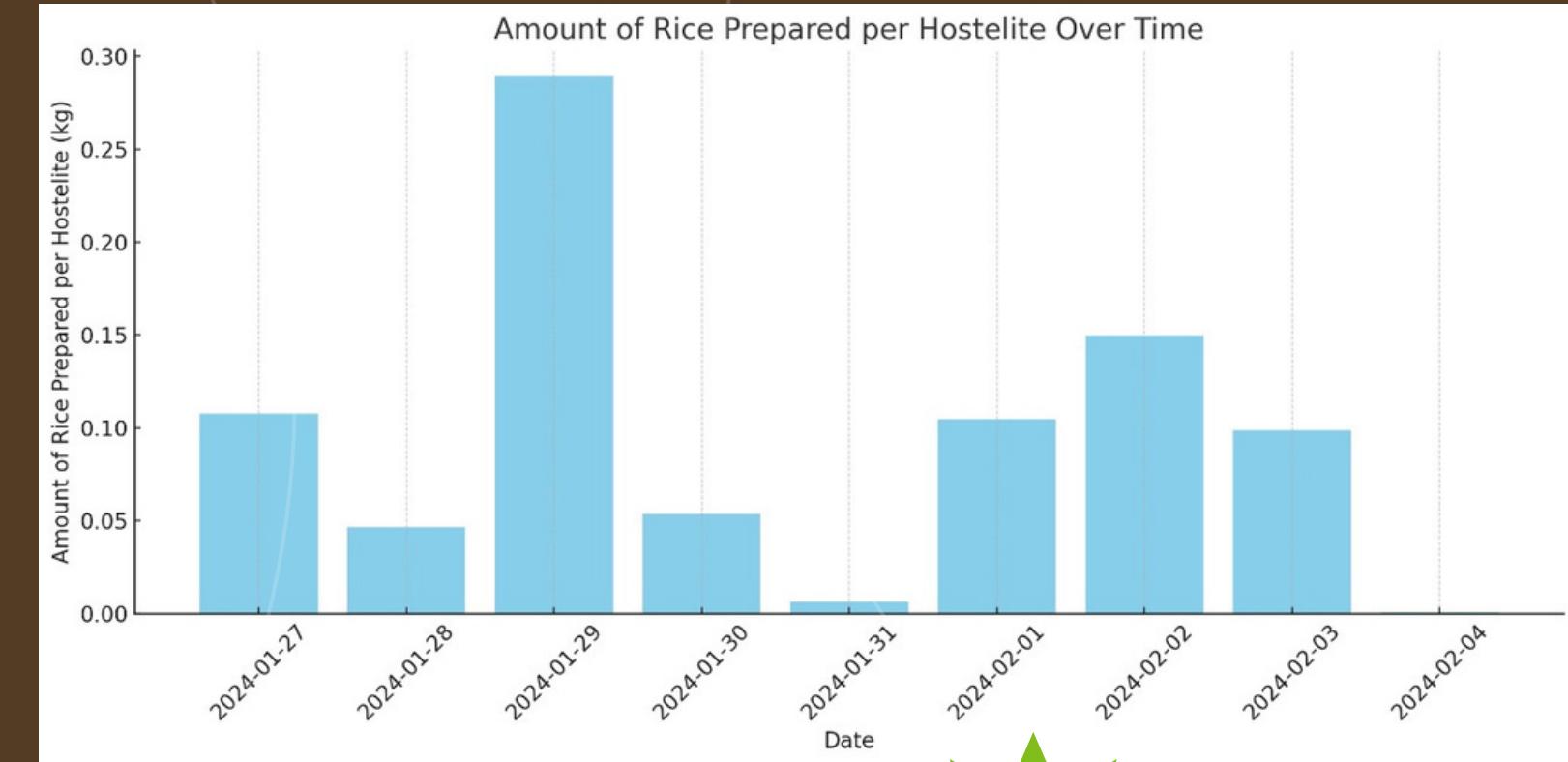
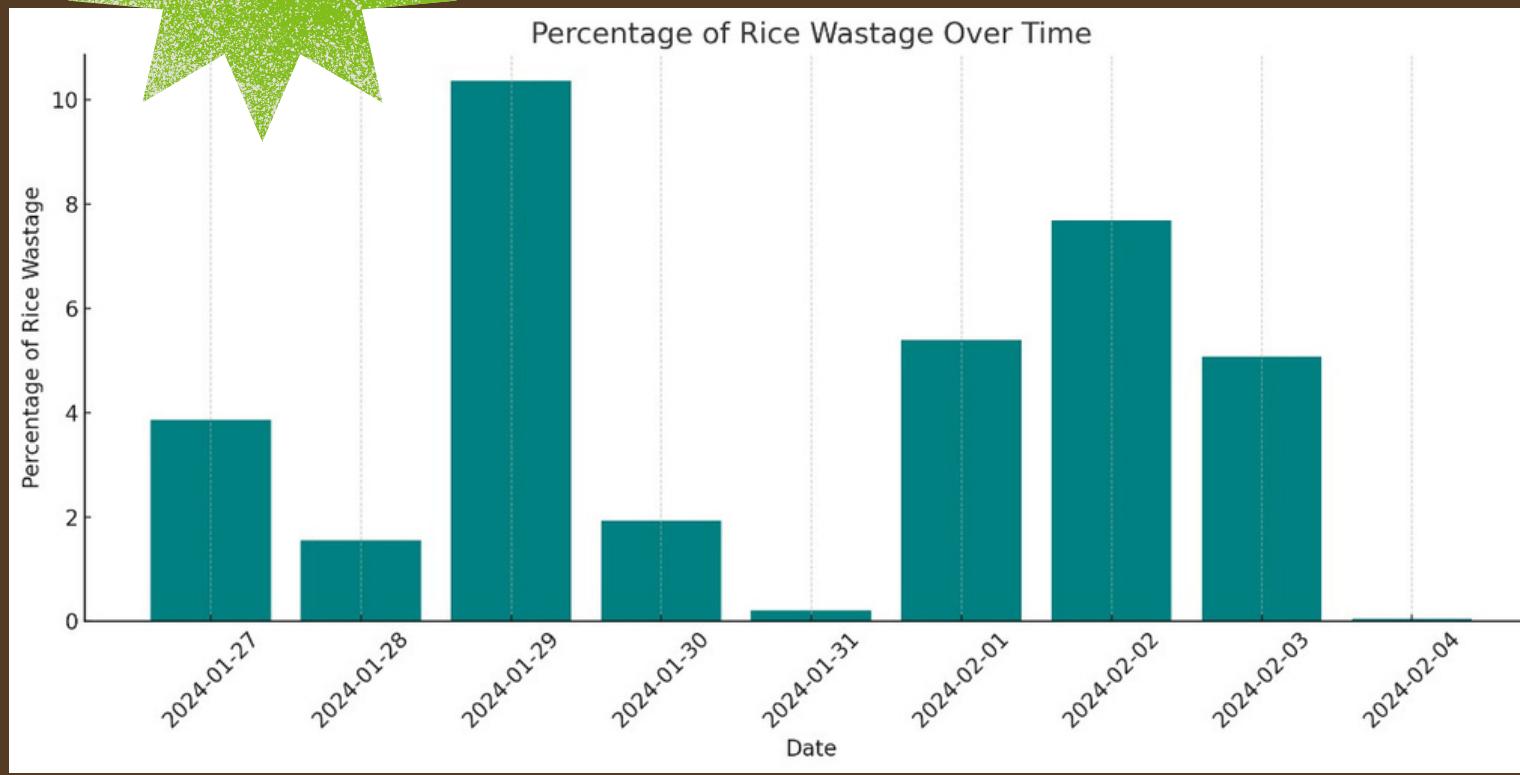


Special cases:-

- Unplanned student absences during long weekends
- Attendance fluctuations during hostel events and parties affect meal demand.
- Preference over external food stalls during fests.
- Fluctuating dining habits during festivals.
- Exam periods and project deadlines may prioritize studying over mealtime attendance.
- Non-alignment of mess schedule with events affects student participation.
- Inclement weather conditions may hinder other hostellers' ability to attend mess meals.



ANALYSIS



Current Status of Mess

Total people subscribed = 498

Current Scenario:

- Food served for 2 hours per meal, with rice production time of 30 minutes.
- Mess uses a 2-slot strategy: 18kg initial batch and additional batch if necessary.
- Predicted demand: 23kg for regular meals, 25kg for special dinners.

Current Strategy:

- Initial batch: 18kg before mealtime.
- Assess demand an hour before meal end.
- Prepare additional 4-7kg if necessary based on observed demand.
- The strategy has significantly reduced rice wastage

Next Steps:

- While the current model has shown effectiveness in waste reduction, exploring alternative optimization models could offer further improvements.
- We would look to modify this model, because of its past performance, but we'll look for any better opportunity.

Choosing Model

Model	Demand Variability	Lead Time Variability	Inventory Costs	Operational Simplicity	Supplier Involvement	Demand Visibility	Response Time
EOQ	Low	Low	High	High	Low	Low	Slow
JIT	Low	Low	Low	High	High	High	Low
EPQ	Low	Low	High	High	Low	LOW	Slow
MEIO	High	High	Low	Low	High	High	Fast
DLS	High	High	Low	Low	Low	High	Fast
BEMM	High	High	Low	Low	Low	High	Fast
Slm	High	High	Low	Low	Low	High	Fast
VMI	High	High	Low	High	High	Low	Fast
CRM	High	High	Low	High	Low	High	Fast

Continuous Review Model

The Continuous Review System, also known **as the Reorder Point System or R,Q system**, is an inventory management **approach where inventory levels are monitored continuously**. **An order for a fixed quantity Q** is placed whenever the inventory level falls to a predetermined threshold known as the reorder point R. This system is characterized by its dynamic response to inventory levels, ensuring that stock **is replenished** just in time to meet demand.

Key points

- Reorder Point (R): The inventory level that triggers a new order.
- Order Quantity (Q): The fixed amount of inventory ordered when R is reached.
- Lead Time: The time between placing an order and receiving the inventory.
- Demand Rate (λ) and Variability (σ): Used to calculate R to ensure sufficient stock during lead time.

Thus, Continuous Review System is the Best Fit for Hostel Mess Operations as it aligns with its strategies

Optimization Techniques

Assumptions:

- Demand variability: 21 to 25 kgs
- Ordering Cost (k) = 4.05
- Holding Cost (h) per student = 0.405
- Shortage Cost (p) per student = 5.0625
- Average Demand Rate (λ) = 23 kgs
- Lead Time (t) = 0.5 hour
- Standard Deviation of Demand (σ) = 2 kgs
- Service Level = 99%, corresponding Z-score (Z) based on normal distribution
- Rice consumption per person = 81 grams = 0.081 kgs
- Mess operation hours = 2 hours

RESULTS

Reordering Point (R): Approximately 14.79 kg.

Z-score (Z) for a 99% Service Level / SAFETY Stock: Approximately 2.33.

Short Term Solution

- Introduce more different types of rice like pulao, biryani in menu to varied preferences and prevent monotony.
- Variety of rice served in extra live counter menu can be increased to increase consumption, hence Decreases the unserved quantity rice.
- Promote using unserved rice creatively, like in fried rice, rice pudding, or rice balls, through posters, recipes, or cooking demonstrations.
- Properly store cooked rice to maintain its quality and freshness for longer periods.





Long Term Solution

- Replace Mess card with RFID(Radio Frequency Identification) cards.
- RFID cards need to be scanned in machine to get the plate for serving and maintain record of individual student in database.
- We can have a platform in which student can mark their absent/present at the start of mess time. Upon marking absent their card gets deactivated for the meal.
- The mess wont make the rice for them during the reordering point.



Proposal for Attendance-Based Meal Optimization:

Benefits:

- Rice is prepared only for attending students, minimizing leftovers.
- Optimized rice production aligns with actual demand.

Platform Features:

- Secure login system for student authentication.
- User-friendly interface for quick attendance marking.
- Real-time synchronization with mess operations for immediate impact on rice preparation.

Implementation Considerations:

- Collaborate with IT department for platform development and integration.
- Conduct training sessions to familiarize students with the attendance marking process.
- Ensure smooth coordination between platform operation and mess management.

Monitoring and Evaluation:

- Regularly monitor attendance patterns and rice consumption data.
- Collect feedback from students and mess staff for continuous improvement.

Timeline:

- Phase 1: Platform development and testing - 1 month.
- Phase 2: Pilot implementation and feedback collection - 1-2 weeks.
- Phase 3: Full-scale implementation and ongoing monitoring - continuous.

KPI's

1. Percentage of Unserved Rice:

- Measures the **percentage of cooked** rice that remains unserved at the end of each meal.
- A lower percentage indicates better management of rice preparation and serving.

2. Unserved Rice per Person:

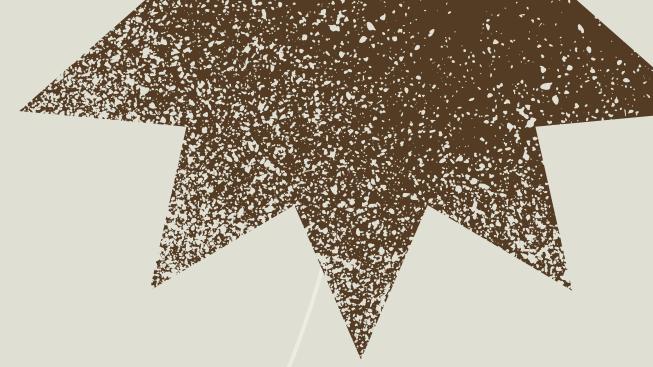
- Measures the average amount of **unserved rice per person**.
- A lower amount indicates more efficient portion control and less wastage.

3. Cost of Unserved Rice:

- Measures the **cost** of the unserved rice.
- Tracking this KPI helps quantify the financial impact of rice wastage and emphasizes the need for improvement.

4. Feedback and Complaints:

- This KPI measures the complaints over rice portion sizes, quality or wastage.
- A decrease in such complaints over time indicates improvements in rice management practices.



Appendix

1) The Times of India:

<https://timesofindia.indiatimes.com/india/74-million-tonnes-of-food-amounting-to-22-of-foodgrain-output-wasted-in-india-every-year/articleshow/104875206.cms?from=mdr>

2) United Nations Environment Programme (UNEP):

<https://www.unep.org/resources/report/unep-food-waste-index-report-2021>

3) Data Collection:

https://drive.google.com/file/d/1B4u8_jKjDHZOXUNWBse7VqhbGkIfqBVM/view
https://docs.google.com/spreadsheets/d/1aypp4uJ_aC6EqUHxGgr9ZVdrx4OpyzMB/edit?usp=drive_link&ouid=107593313881064717006&rtpof=true&sd=true
https://docs.google.com/spreadsheets/d/1Y-Own9Udit_ambNnpC81uZ0fp0hpXDEg/edit?usp=drive_link&ouid=107593313881064717006&rtpof=true&sd=true

4. Model calculation: https://docs.google.com/document/d/1LEafI534_ZTKYSUyMz2osloTYx6XQocK_jotUJ4OUEs/edit?usp=sharing





thank you