# TACKLING FOOD WASTAGE

## OPTIMIZING FOOD CONSUMPTION FOR SUSTAINABLE DINING

–BRAHMAPUTRA HOSTEL

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# FOOD WASTAGE

In the broader context of **global issues** related to **food wastage**, we find a microcosm of this issue at Brahmaputra Hostel, IIT Guwahati. Our hostel encounters a substantial challenge with food wastage, given its extensive subscriber base of approximately **1200** individuals, a figure notably larger than other mess facilities within the institution.

The **magnitude** of this subscriber count poses difficulties in effectively managing food production and results in significant wastage. Specifically, each meal contributes to an estimated **20** kilograms of plain rice wastage, underscoring the pressing need for a more efficient and sustainable approach to address this issue.

# UNDERSTANDING THE CURRENT SITUATION

## BRAHMAPUTRA HOSTEL PLAIN RICE PRODUCTION SYSTEM

The Hostel Caterers order about **1800-2000 kgs** of plain rice every 15 days and store it.

For rice they have a 3 slot system
-> 1st slot (10:30-11:30am) **25 kgs**
-> 2nd slot (11:30am-12:30)**20 kgs**
-> 3rd slot (1 pm )**15 kgs**

For the last slot they boil water and keep it running till they feel it is necessary for the rice to be prepared. The **time and amount of rice** is purely intuition based and leads to errors .

2 chefs are occupied and the mess has one utensil only which has a maximum capacity of cooking **25-27 kgs** of rice only

# IMPLEMENTATION STRATEGY

## A 3 Pillared data driven plan aiming to optimise food production and reduce food waste to zero

# PILLAR 1

# Data Collection & Continuous review

## Data Analysis and Insights on Consumption Patterns

✦Concept ✦ Smart counter ✦Data analytics
✦ Feasibility ✦ Testimonials and Benefits

✦ Concept

# IIT GUWAHATI

# TECHNOLOGY

Brahmaputra Hostel Mess witnesses an abundance of complex consumption patterns, dynamic fooding habits and sudden crowd rush frequently, to understand this complexity well have to closely look at various factors such as **number of individuals consuming rice**, **time of consumption**, **amount of rice cooked**, **time of cooking** and **leftover amount of rice.**

Once we have this data we have solved 1/4th if not half of the problem, we'll be using regression algorithms to optimally predict the amount of rice to be cooked in the last batch so that it exactly caters to the people who are yet to eat thus following an advance **PERIODIC REVIEW MODEL** with an informed **JUST IN TIME** method.

# SMART COUNTER


**Device to be installed at every counter in mess**

A **designated** mess worker will oversee the process, pressing the appropriate **buttons** to record food selections made by **patrons**. Utilising real-time data processing, The **smart counter** will generate estimates regarding the amount of food to be prepared based on **current consumption** patterns using **regression algorithms** to minimise wastage.

# FEATURES

We're **installing** a device to streamline **data collection and analysis** for subscribers of our mess services. This device features **individualised buttons** corresponding to each food item on the daily menu.

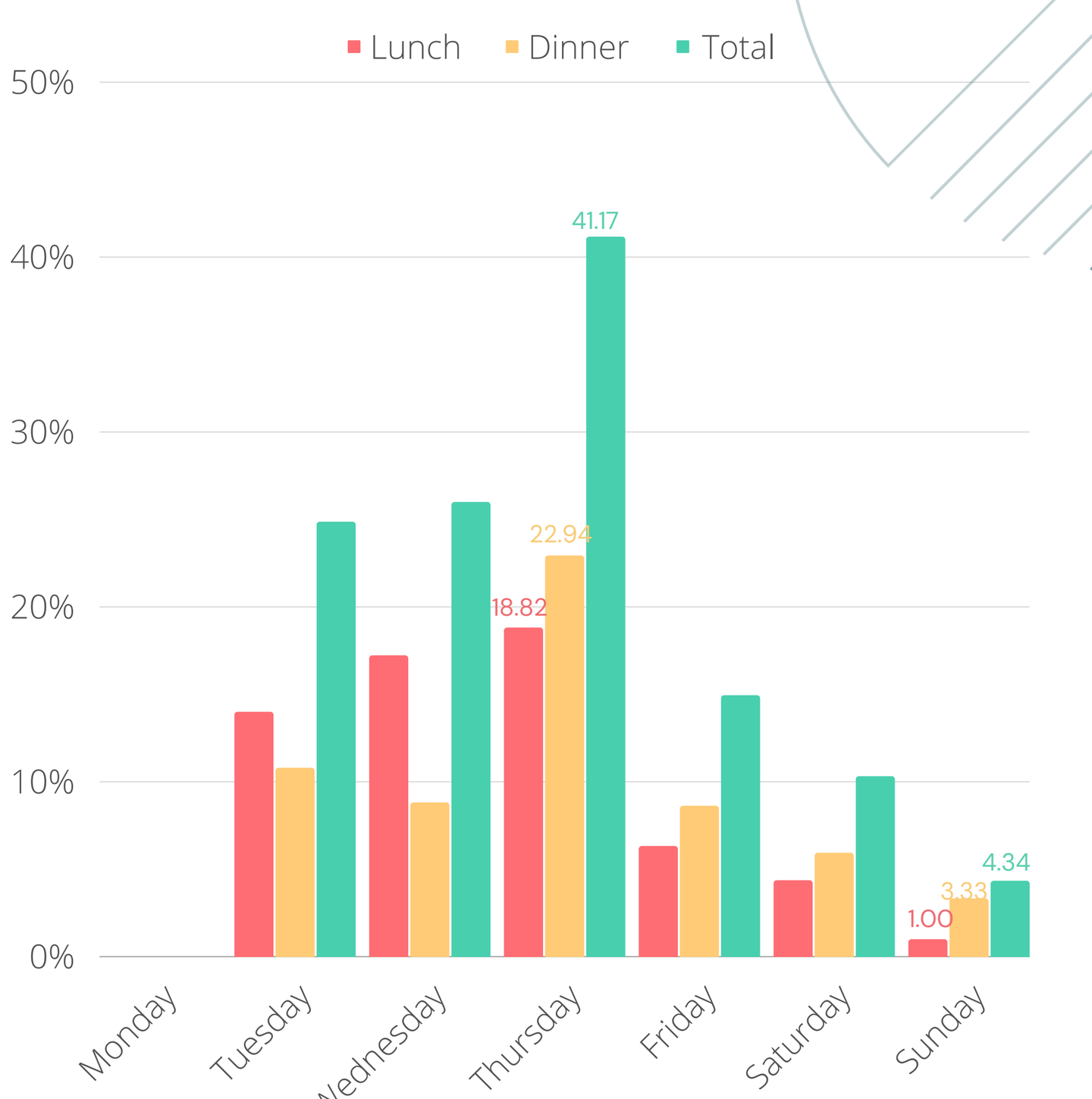
These insights will be conveyed to the mess cook in a straightforward manner, with a **dedicated monitor** installed within the mess premises for easy access. The display will showcase various **parameters**, including **optimized batch preparation times, predicted attendance figures,** and consequently, the anticipated quantity of food required for cooking. Additionally, it will highlight any deviations from **expected consumption patterns**, providing valuable insights for operational adjustments.

# DATA ANALYTICS

Food wastage per mess subscribed user is basically the (total amount of food wasted)/(no. of mess subscribed users).In this instance, the data has been expressed as percentages.

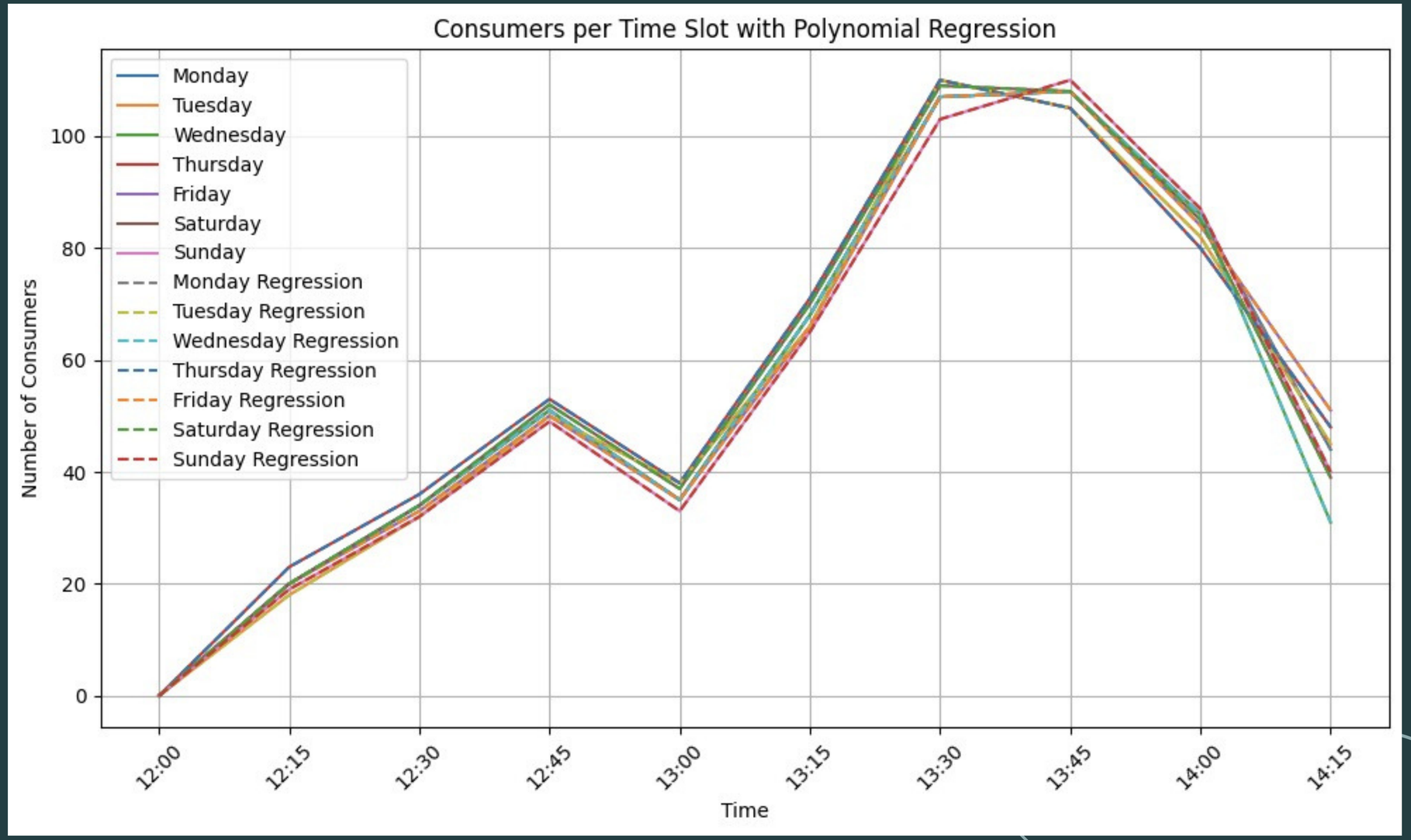
**Average consumption:170g(cooked rice)**
**Average rice wasted per day:14.03kg**

**Based on our data collection we can use ML algorithms to get future optimal predictions.**



Tailoring our approach based on subscriber preferences through meticulous real time analysis

Proactively minimizing rice wastage through subscriber-centric optimization strategies.



# POLYNOMIAL REGRESSION MODEL

In [12]:

```python
import numpy as np

# Data for Monday
consumers_monday = np.array([0, 20, 34, 51, 35, 68, 107, 108, 86, 44])
times = np.arange(len(consumers_monday))

# Polynomial regression
degree = 10  # Degree of polynomial
coeff = np.polyfit(times, consumers_monday, degree)

# Convert coefficients to a polynomial equation
poly_equation = np.poly1d(coeff)

# Display the polynomial equation
print("Number of consumers:")
print(poly_equation)
# here x signifies time in minutes
```

```
Number of consumers:
           10          9          8          7         6         5
0.0003653 x  - 0.01212 x + 0.1324 x - 0.1033 x - 9.887 x + 93.8 x
```

# FEASIBILITY

## WORKFORCE OPTIMISATION

We will not be **hiring or paying** the mess workers operating these smart counters as we are **providing work to people** who were already employed for the whole month by **Aditya Caterers** but lacked meaningful work during mess timings. This will help us use our human resources more efficiently and will be inspected by the mess manager with the SMC of Brahmaputra Hostel.

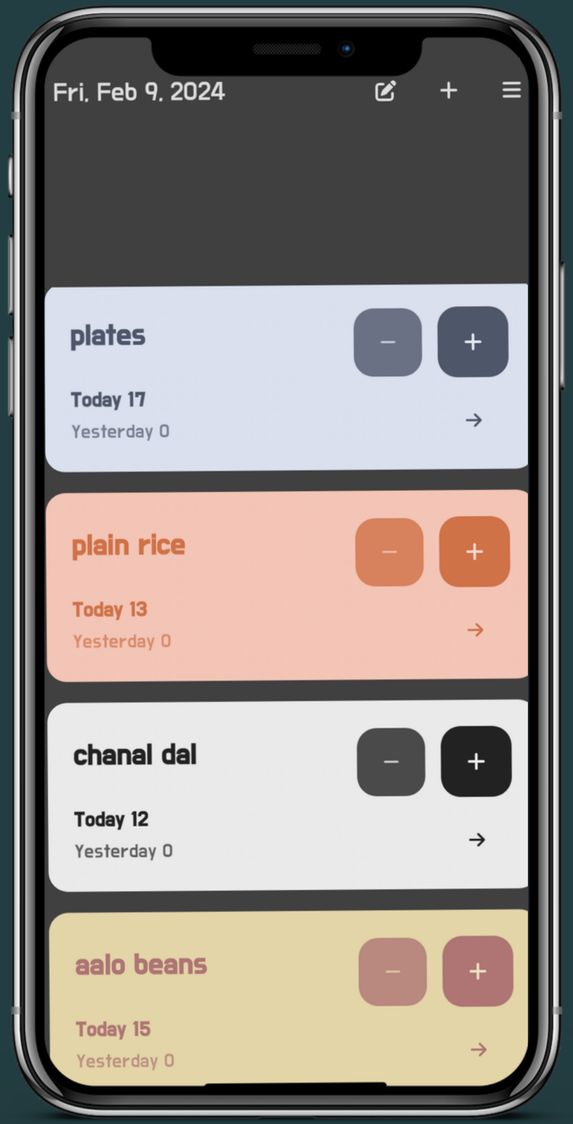
## FINANCIAL FEASIBILITY

The API of our ideated smart counter will be very similar to the app **'Daily Counter'** so the technology interface we need is already available in the market. We'll need **3 tablet devices** programmed with a similar API which will function as our whole smart counter upgrade. Assuming the devices to be good quality tablets, the whole upgrade **wont cost us more than INR 30,000.**

# FEASIBILITY

## WORKING EFFICIENCY

Initially we **questioned** that the efficiency and difficulty of work might be affected **due to rush or due to human error**, but when we practically tested our mode for **full mess timings,** we found it to be **non-chaotic** even during a rush and very manageable, we even interacted with the mess workers and told them how this device functions and they were also able to use it **without any difficulty.**




# TESTIMONIALS

Our **interaction** with Sourav Das held his positive review for the model and how it would be **very beneficial** to the working of **Mess Management**

**SOURAV DAS - MESS SECRETARY**

We discussed with the **Mess manager** how they predicted the food to be cooked and what type of help will benefit them and chose our model considering those factors

**MESS MANAGER**

# BENEFITS

**Decreases rice wastage to 0-2%**

**Capable of reducing all types of food waste**

**Easily adoptable in the ongoing functioning**

**Additionally Helps MMC in devising mess menu**

**Empowers Aditya Caterers with informed data**

# PERIODIC REVIEW SYSTEM*

## 01 - OBJECTIVE

Ensure optimal resource utilization through a **periodic review system** for the hostel mess's inventory, with a specific focus on cooked rice

## 02 - PROCEDURE

- Weekly Assessment:
  - Utilize Smart Counter for data collection.
  - Evaluate the current stock of cooked rice weekly.
- Monthly Ordering Review:
  - Extend the assessment model to monthly rice orders.
  - Ensure adjustments in order quantity based on consumption patterns.

## 03 - OPTIMIZATION

- Ensure the ordered quantity aligns with the optimal amount needed for cooking.
- Maintain a balance between ordered and cooked rice for efficiency.

## 04 - OUTCOME

- Achieve optimal resource utilization by aligning ordered quantities with actual consumption patterns for both weekly assessments and monthly orders.

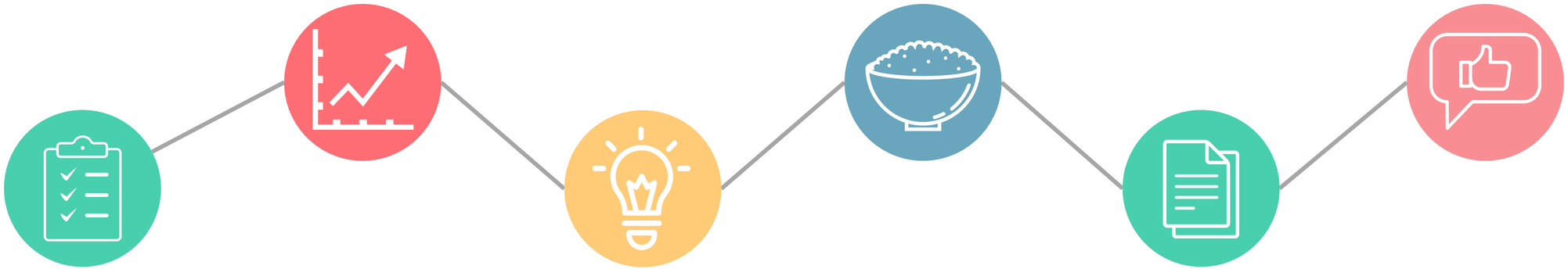
*A Better Alternative to Continuous Review System as Weekly review perfectly suits the System

# JUST IN TIME REVIEW SYSTEM

**Real Time Data Collection:** The tracking device provides real time data on how many people had food and how many are left

**Minimize overproduction:** JIT model minimizes the chances of overproduction, ensuring that rice is prepared just in time to meet demand.

**Continuous Improvement:** Regularly analyze the data collected to identify opportunities for further optimization and improvements



**Continious Tracking:** Use Smart Counter to track rice consumption during mess hours.

**Informed Decision making with precise timing of batches:** Empower mess management with real-time information to make informed decisions on the timing of the next rice batch preparation.

**Efficient Resource Utilization:** Optimize the utilization of resources such as rice, water, and energy by cooking only what is necessary

# PILLAR 2

## Installation Of Boiler

### Data Analysis and Insights on Consumption Patterns

- Concept
- About boiler
- Suggested Boiler
- Investment

# Rice Boiler/Steamer

**Inventory management** plays a crucial role in **minimizing** food wastage by optimizing the storage, distribution, and utilization of food resources. After a week of **surveillance**, we were able to conclude that the inventory of our mess was **inadequately** managed with next to no upgradation since a very long time. By buying **Boilers,** we will be able to bridge this gap.

# FEATURES

**CONTAINER SIZE**
Increased to 50 kg from 27 kg.
**COOKING TIME**
reduced to 15-20 minutes from 55-70 mins

**ENERGY EFFICIENT**
Designed to heat water quickly and maintain consistent temp throughout the cooking process which cuts the energy usage.

**WORKFORCE REDUCTION**
Previously required two individuals
Now can be regulated by one person.

**RISK IRRADICATION**
Solves the problem of cases of large, sudden influx of people in the mess as a result of time reducation

**COST: 72,000**

Break Even attained in 180-200 days

# PILLAR 3

## Utilising leftover food

✦ Food utilised is food not wasted

# Utilising leftover food

## TAKE AWAY CONTAINERS :

Provide reusable or compostable **takeaway containers** for students who wants to take food back to their rooms, that encourage responsible use of takeaway containers to avoid unnecessary waste.

## COMPOSTING :

Composting helps **divert organic waste** from landfills and **reduces greenhouse gas emissions.**

## RECYCLING :

Recycling food typically refers to the process of **diverting food waste** from landfills and instead utilizing it for beneficial purposes.

## ANIMAL FEED :

Some food waste can be repurposed as **animal feed**. This practice helps waste while providing a **source of nutrition** for livestock.

## DONATION PROGRAMS:

Establish partnerships with **local charities** or **food banks** to donate excess food. Ensure compliance with food safety regulations when donating surplus food.

# THANK YOU

## OUR TEAM

ADITYA KANAGALEKAR

ARCHCHISMAN BANERJEE

DHRUV KHICHI

AKASH IYER

ARPIT RANJAN

KAHAAN SONI