

Fatima Jinnah Women University

Course: Embedded System

Assignment: 1

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Registration No:

BSE-074-2022
BSE-076-2022
BSE-078-2022

Submitted To:

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Date:

11 May 2025

Smart Kitchen Ingredient Monitoring System

1 Initial Project Goal

To build a smart kitchen ingredient monitoring system using embedded components like Arduino, load cell, and sensors. The system will alert users when a stored ingredient (e.g. flour, sugar, rice) drops below a threshold but our focus is on sugar.

2 Problem Statement

Many people especially students, working individuals, and busy families often run out of essential kitchen ingredients without realizing it. Manual checking is time consuming and inefficient, leading to last-minute shortages and inconvenience.

3 Feasibility Study

This project is highly feasible for students, both technically and financially. All required components like Arduino, load cell, and buzzer are easily available in local markets or online.

4 Working Principle

The load cell detects the weight of the ingredient container and sends analog signals to the HX711 amplifier module. The HX711 converts this signal into digital form, which is read by the Arduino. If the detected weight falls below a defined threshold (e.g., 500g), the Arduino activates the buzzer and displays “Low Stock” on the LCD screen. This allows users to be notified before completely running out of an ingredient.

5 Alert Mechanisms

We are showing low ingredient alerts using three methods:

LCD Display: The screen shows a message like “Low Ingredient” when the weight goes below a set level.

Buzzer: A buzzer makes a sound to give a quick audio alert if an ingredient is running low.

Mobile Notification: We are also planning to send a notification to the user’s phone using a Wi-Fi module (like ESP8266).

6 Survey Insights

To validate the idea, we conducted a survey of 37 individuals, including students and home-makers. One key question was:

“Would you buy a small, low-cost ingredient tracking device?”

- 89.2% responded “Yes”

This confirms the strong demand for a system that automates kitchen stock monitoring. Users showed interest particularly in a lightweight, affordable, and easy-to-use system.

7 Meeting Logs

Group Members:

- Zainab
- Urooj
- Iqra
- Faculty Mentor: Sir Haroon

Meeting 1: Initial Brainstorming & Problem Identification

- **Date:** 5 May 2025
- **Agenda:**
 - Share different project ideas
 - Choose a final topic and understand what the project will do
- **Discussion Points:**
 - At first, our group had two ideas: one about smart shoes and the other about a kitchen ingredient monitoring system.
 - After discussing both with our teacher, we all agreed that the kitchen ingredient project is more useful and easier to build.
 - Iqra shared the idea of making something that helps people (especially busy families or students) keep track of what ingredients they have.
 - Zainab suggested we could use simple sensors like a load cell to measure how much ingredient is left.
 - Urooj said it should be affordable and easy to use so that more people can benefit from it.
- **Outcome:**

- We finalized our project: Kitchen Ingredient Monitoring System
- It will check the weight of ingredients and give alerts when anything is running low.
- For our next meeting, we will research the required components and start planning the design.

Meeting 2: Feasibility and Research

- **Date:** 7 May 2025

- **Agenda:**

- Research available components (Arduino, load cell, HX711, etc.)
- Discuss project feasibility in terms of budget and time constraints

- **Discussion Points:**

- Iqra researched the availability of load cells and found them easily available online and at local electronics stores.
- Zainab worked on the budget and created a list of components with their approximate prices.
- Urooj focused on researching the HX711 module and Arduino compatibility.
- Discussed potential challenges in calibration and accurate weight measurement.

- **Outcome:**

- Confirmed that the project is feasible with the given budget and components.
- Agreed to start assembling the components and drafting the circuit diagram for the next meeting.

Meeting 3: Survey Analysis and Validation

- **Date:** 9 May 2025

- **Agenda:**

- Analyze the survey results to validate the project idea
- Finalize component selection and begin the circuit design

- **Discussion Points:**

- Iqra shared the survey findings, highlighting that 89.2% of respondents were interested in purchasing a low-cost ingredient tracking device.
- Zainab presented the finalized list of components needed for the project and confirmed the cost range.

- Urooj suggested adding an LCD display to show ingredient weight and to trigger an alert when ingredients are low.

- **Outcome:**

- Decided to use the LCD display with I2C to simplify wiring.
- Agreed to start wiring up the breadboard and writing the initial Arduino code for the next meeting.

Meeting 4: Final Proposal and Component Assembly

- **Date:** 10 May 2025

- **Agenda:**

- Finalize project proposal
- Begin assembling hardware and wiring the system

- **Discussion Points:**

- Iqra worked on finalizing the project proposal and included all the necessary details for the project goals, objectives, and components.
- Zainab began assembling the hardware components and wiring the load cell, HX711, and LCD to the Arduino.
- Urooj focused on writing the initial Arduino code to display weight readings and trigger the buzzer when stock is low.

- **Outcome:**

- Project proposal completed and shared with the faculty mentor.
- Hardware setup is in progress, and the team is confident that they will complete the assembly in the next session.

8 Survey Outcomes

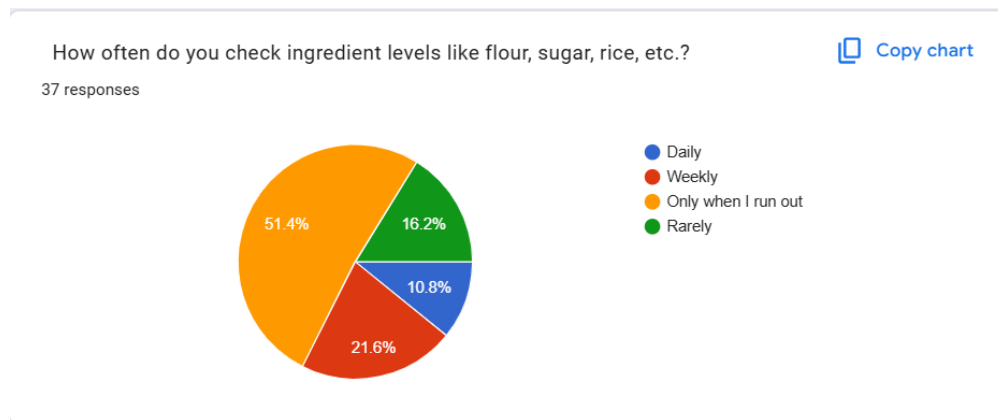


Figure 1: Ingredient Check Frequency: Most people (51.4%) check ingredient levels only when they run out.

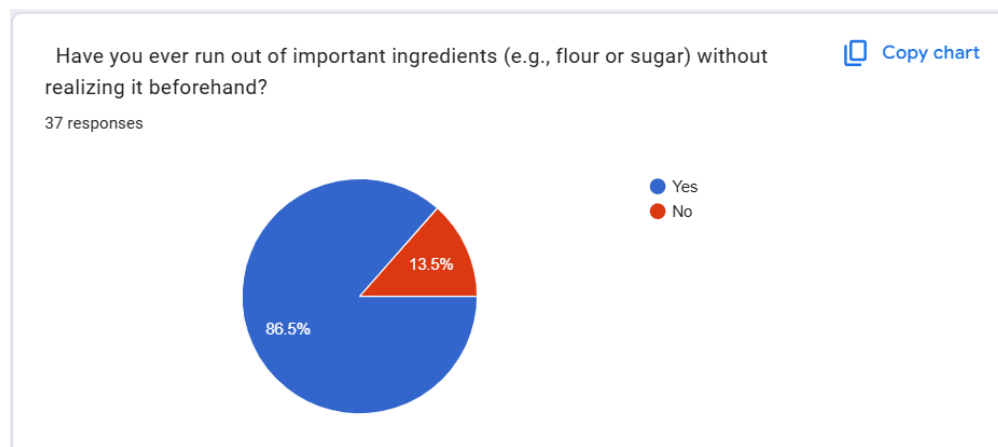


Figure 2: Running Out Unknowingly: 86.5% have experienced running out of important ingredients without realizing it.

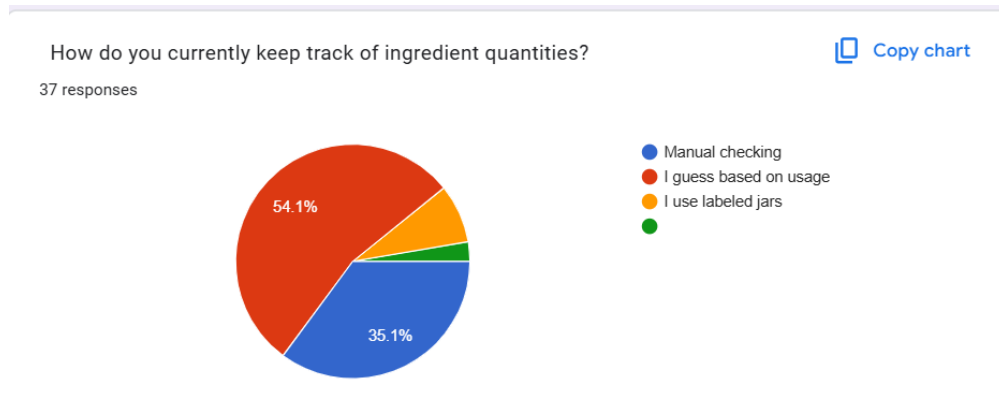


Figure 3: Tracking Method: 54.1% of people guess ingredient quantities based on usage rather than checking manually.

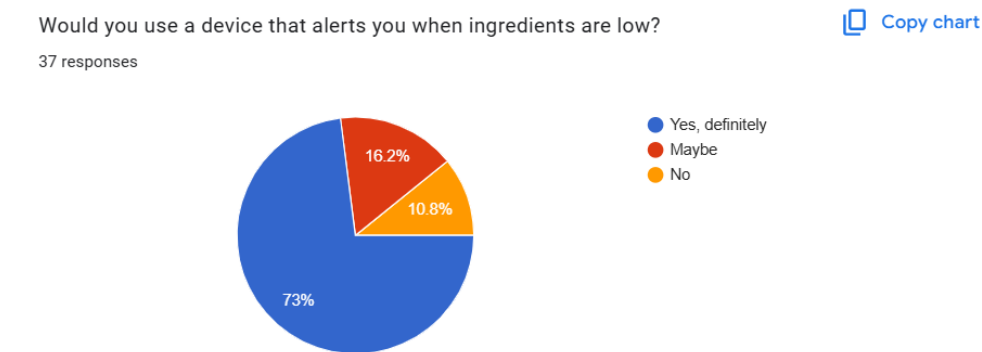


Figure 4: Device Usefulness: 73% of respondents would definitely use a device that alerts them when ingredients are low.

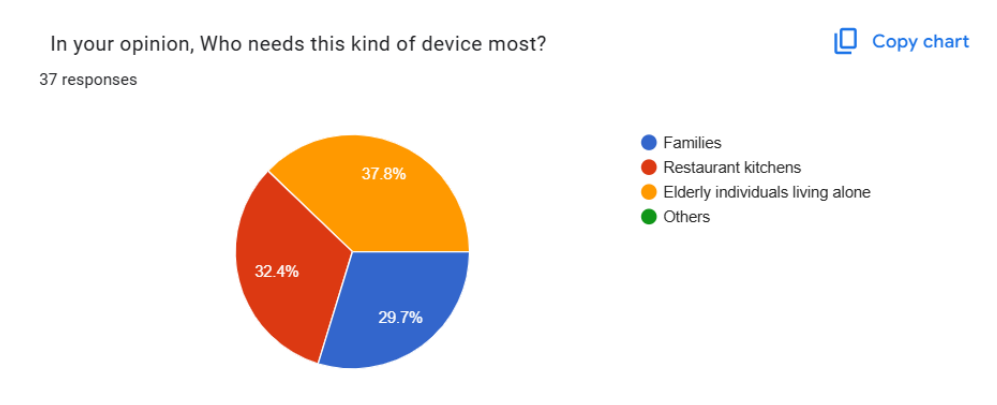


Figure 5: Target Users: Restaurant kitchens (37.8%) are seen as the group most in need of such a device.

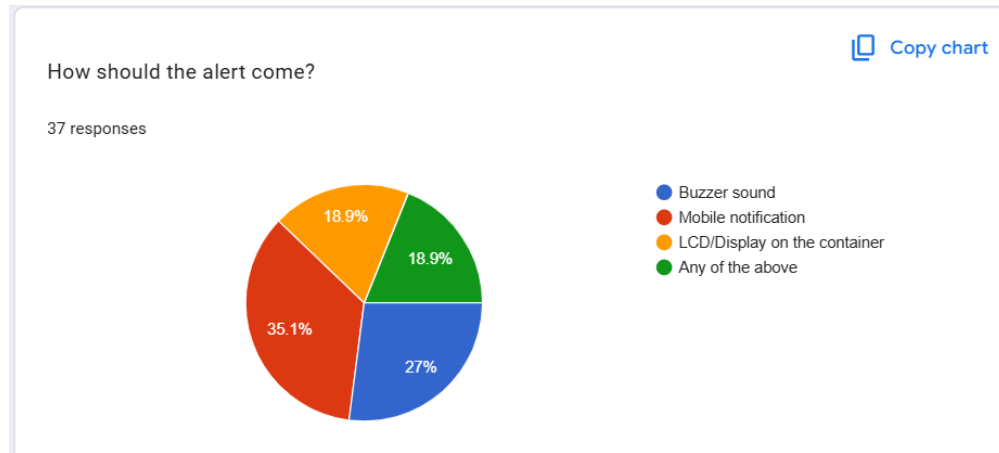


Figure 6: Alert Preference: 35.1% prefer receiving alerts through a display on the container.

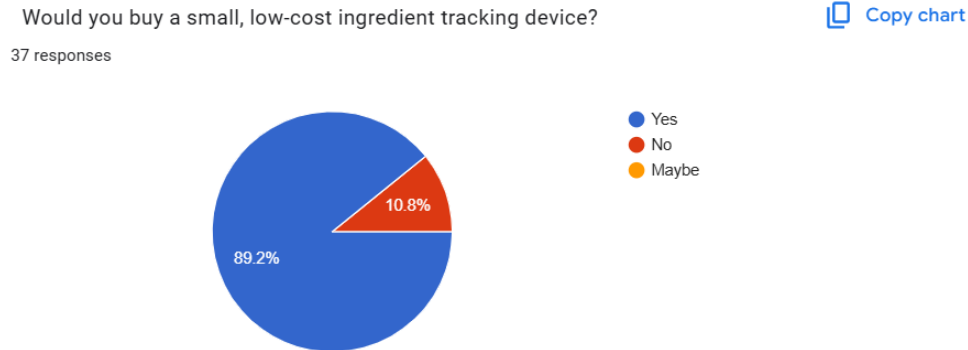


Figure 7: Willingness to Buy: A large majority (89.2%) would buy a small, low-cost ingredient tracking device.

9 Future Enhancements

This project can be expanded in several ways:

- Add Wi-Fi module (ESP8266) to send mobile notifications.
- Monitor multiple containers using multiple load cells.
- Add a companion mobile app with visual graphs of usage.
- Replace the buzzer with a voice assistant or LED indicator system.

10 Testing and Validation

The system will be tested using known weights to calibrate the load cell. We'll simulate "low ingredient" levels and verify if the buzzer and LCD respond correctly. Testing will ensure that the alert system is accurate and responds at the correct threshold.

11 Conclusion

This project provides a practical and low-cost solution to a common kitchen problem. It helps users monitor their ingredient stock automatically and prevents last-minute shortages. The system uses basic embedded hardware and can be enhanced with IoT features in the future (e.g. mobile notifications via Wi-Fi).