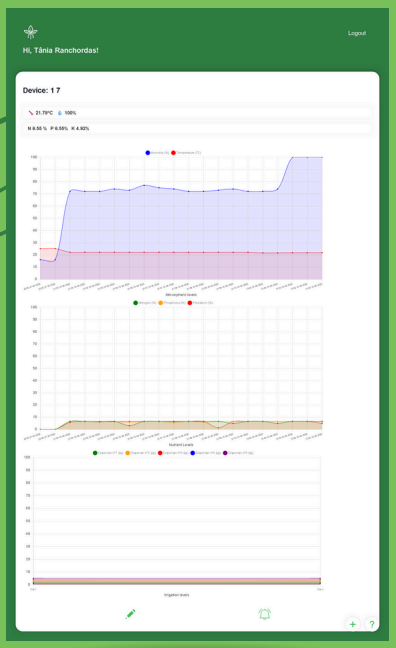
SoilSense

Automated irrigation and fetilization

Automated irrigation and nutrient distribution based on collected data and crop profiles



Real-time monitorization

Use the WebApp to track watering and nutrient readings

LIST OF FUNCTIONALITIES

Functional Requirements

- Real-time monitoring of soil moisture, temperature, and NPK levels.
- Automated irrigation and nutrient distribution based on collected data and crop profiles.
- Data storage in database accessible via web app.
- Display daily irrigation data and historical charts.
- Configuration of crop-specific nutrient requirements by growth stage.
- Send alerts for system failures or abnormal readings.
- Track water and nutrient usage per irrigation cycle.

Non-Functional Requirements

- Intuitive, responsive and accessible interface for mobile and desktop.
- Real-time processing with low detection-to-action latency.
- Reliable system with high availability operating continuously, even in demanding agricultural environments.
- Accurate sensor performance through routine calibration (e.g., NPK, humidity).
- Secure web app with authentication and profile management.

Business Requirements

- Reduced water and fertilizer waste through precise and automated management.
- Increased crop productivity via resource optimization.
- Compatibility with different agricultural production scales (small to industrial).
- Align with sustainability and precision agriculture principles.
- Partner integration for real-world validation and testing.

LIST OF FUNCTIONALITIES

Technical Requirements

- Soil humidity, temperature, and NPK sensors.
- ESP32 microcontroller with RS485 converter and 12V power supply.
- Distribution system with solenoid valves and motors for mixing and irrigation.
- 30L reservoir with level sensor and relay-controlled pump.
- Connectivity to the partner organization's Wi-Fi network.
- Web app with front-end monitoring and back-end account management.

User Requirements

- Users: farmers, agricultural technicians, and engineers.
- Web app with three main sections: data visualization, crop setup, and alerts.
- Account creation functionality, secure login, and password input.
- Graphical crop evolution tracking throughout growing season.
- Real-time mobile alerts.

Maintenance Requirements

- Periodic sensor calibration, particularly the NPK sensor.
- Regular nutrient refilling.
- Easy replacement of modular components (valves, sensors).
- Remote system updates via web app.
- System monitoring.

LIST OF FUNCTIONALITIES

Environmental Requirements

- Sensors and components resistant to temperature, humidity, and dust variations.
- Reliable outdoor operation.

Constraints

- Budget constraints imposed by the need for low-cost solutions for farmers.
- Dependency on partner Wi-Fi network during the testing phase.
- Compatibility with existing agricultural infrastructure (tanks, dispensers, etc).
- Adaptation of sensors to different soil types and crops.

Assumptions and Dependencies

- User access to mobile phones or computers with an Internet connection.
- Active collaboration with agricultural partners for field testing.
- Continued interest of the partner company following the initial phase.
- Dependency on commercially available sensors compatible with the microcontroller used.
- The database must store irrigation data and associate it with crop growth phases.
- The interface must be available in English to ensure greater international accessibility.
- The system must allow users to view data history grouped by crop.