

CBSE SCIENCE EXHIBITION 2025–26

STUDENTS' PROFORMA

Project Title: AgriSense 2.0 – Smart IoT-based Agricultural Monitoring System with Smart Solar System

Name of Student(s)	PRANAV SATHISH, TEJAS MITRA
Class / Section	VIII E , VI Q
Name of School	Delhi Public School Bangalore East
School Address with PIN	43/1B & 45, Sulikunte Village, Dommasandra Post, Sarjapur Road, Bangalore, Karnataka, India – 562125
Name of Teacher-Mentor	Ms. Manjari Pandey
Category of Exhibit	Agriculture & Rural Development

Title of the Project

AgriSense 2.0 – An Affordable IoT-based Smart Farming System for Real-time Soil and Climate Monitoring.

Purpose / Objective

To help farmers monitor soil moisture, temperature, and humidity in real time; promote data-driven irrigation; and provide a sustainable, low-cost IoT-based solution.

Scientific Principle / Working

The whole setup is built upon the Internet of Things (IoT) and data acquisition using sensor principles.

The capacitive soil moisture sensor and DHT22 are examples of sensors that can measure soil moisture, temperature, and humidity. These sensors take the physical parameters (moisture level, temperature, and humidity) and convert them into the respective electrical signals (analog or digital voltage outputs).

The ESP32 microcontroller acquires these signals, checks the data with programmed threshold values, and updates the Blynk IoT dashboard as well as the LCD display with the latest data.

If the soil moisture level is less than the preset threshold, the ESP32 will automatically create a digital output control signal that will activate the relay module to turn on the water pump for

watering the soil. When the soil is at the required moisture level, the ESP32 will disengage the relay, thereby stopping the pump.

Thereby, the system is an example of a closed-loop automation system, where sensor feedback is utilized for real-time irrigation decisions via an IoT-based control logic.

Procedure / Construction

A. Soil Monitoring System Setup

1. Connect sensors to ESP32.
2. Program ESP32 in Arduino IDE.
3. Configure Blynk IoT App.
4. Test system under different soil conditions.
5. Verify alerts and display.
6. Demonstrate data logging and automation.

B. Smart Solar Tracking System Integration

1. Connect Arduino UNO to LDR, resistor and servo motors
2. Stick servo motors to Solar panels
3. Upload the code to Arduino UNO
4. Test under varying sunlight intensities to evaluate tracking efficiency.
5. Add AuREUS coating to improve efficiency

Results / Observations

When we tested the AgriSense 2.0 system, it delivered data that was both accurate and consistent. The Capacitive Soil Moisture Sensor hit an accuracy of about $\pm 3\%$. The DHT22 did even better—temperature readings stayed within $\pm 0.5^\circ\text{C}$, and humidity never strayed more than $\pm 2\% \text{ RH}$.

The automatic irrigation kept soil moisture right where plants like it: between 45 and 55%. There was no uncertainty, only consistent growth.

Switching to solar power bumped energy efficiency up by roughly 25% compared to the usual power sources. In our trials, the system also cut water use by about a third. That's because it only watered when the soil actually needed it—no waste.

All the sensor data and irrigation logs showed up in real time on the Blynk IoT dashboard. Everything synced smoothly, so you always knew what was happening from anywhere.

Conclusion

AgriSense 2.0 is a smart, data-driven solution for small-scale farming that combines sensors, the IoT, and automated irrigation. The system, which is made up of a capacitive moisture sensor for the soil and a DHT22 for the ambient air, by continuously monitoring soil moisture and ambient conditions, allows irrigation to be carried out only when it is strictly necessary. As a result, crop production is improved—plants are watered at the right time, and thus their growth is not hindered, which results in higher yields.

Water and energy use are optimized, which results in less water and energy consumption and thus in cost savings. Accessibility—through the use of affordable components and IoT connectivity, it is accessible to farms of low-income households.

Basically, the system converts the raw data from the sensors into control signals that can be used (for instance, turning on the pump when the soil is dry), and the data is sent live via IoT to the users, who can then remotely check it and make their decisions.

Future Scope

Scalability: The system could be scaled up to larger areas, various sensor regions, or even coupled with weather prediction modules to make irrigation more accurate.

Personalization: The system can be converted into a more advanced precision-agriculture instrument by simply integrating some more sensors (for instance, soil temperature and nutrient sensors).

Education & Outreach: Through device demonstrations, we can easily guide local farmers, students, and agricultural extension services into adopting IoT-based sustainable farming practices.

Resilience: The role of a system like AgriSense 2.0 thus becomes crucial in maintaining the health of crops and lessening the risk in areas liable to unpredictable rainfall and water shortage.

Innovative Features

Combines IoT+ Cloud, solar powered, low-cost, portable, and works in no-Wi-Fi areas.

References

CBSE Circular No. Acad-63/2025, Arduino.cc, Blynk IoT Docs, ICAR reports.