AgriMicroX – Smart Microgreens Cultivation System

Tools & Technologies Used:

ESP32 Microcontroller, DHT11 Temperature & Humidity Sensor, Soil Moisture Sensor, SMPS (Switched Mode Power Supply), Level Shifter, Potentiometer, 16x2 LCD Display, Water Pump, Water Nozzle, and IoT-based Sensor Network.

Project Description:

AgriMicroX is an IoT-based smart cultivation system developed to automate and optimize the growth of microgreens through continuous environmental monitoring and intelligent control. The system utilizes an ESP32 microcontroller as the central processing unit, interfacing with various sensors to gather real-time data on temperature, humidity, and soil moisture levels.

Using the readings from the DHT11 and soil moisture sensor, the system intelligently decides when to activate the water pump and nozzle mechanism, ensuring that the plants receive optimal hydration without manual intervention. This automation minimizes human effort and reduces water wastage, promoting sustainable farming practices.

An LCD display is integrated to provide instant feedback on environmental parameters, while level shifters and SMPS modules handle voltage regulation and safe power distribution across components. The potentiometer is used for calibrating display contrast and sensor thresholds.

The system was implemented in a tray-based microgreens cultivation setup, designed to simulate commercial-scale smart agriculture. Through this project, the cultivation process becomes more efficient, scalable, and data-driven, representing a step toward precision agriculture using IoT technologies.

Demo Video link:

https://drive.google.com/file/d/12DKppbE9is4ECzTfIqRdtnRsYFa6LQb9/view?usp=drive_link

Participation:

Presented the AgriMicroX project at the Manthan FKCCI Startup Program 2025 for agri-startups.