

IoT-X Based Intelli Irrigation and Surveillance Playhouse Farming Environment

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Abstract: *Agriculture looks nothing like it did ten years ago. Almost no one's relying on just old-school methods anymore. Now, smart technology runs the show. AI, sensors, automation they all work together so farmers can handle their crops way more efficiently. Take irrigation, for example. The old ways wasted a lot of water and didn't always reach every plant, which meant smaller harvests. Polyhouse farming changed that, letting farmers manage the growing environment. But here's the catch you need to watch everything, all the time. Checking moisture, temperature, humidity, and plant health by hand is exhausting, and, let's be honest, pretty unreliable.*

That's why we built our Intelligent Irrigation and Surveillance System for polyhouses, running on IoT and AI. Sensors watch over things like soil moisture, temperature, humidity, and pH in real time. All this info gets crunched by a microcontroller and then sent right to a website over Wi-Fi. When the soil dries out, the system waters the plants automatically. You end up saving water and boosting growth. And for keeping an eye on the crops farmers can check what's happening from anywhere. Phone, laptop it's all right there. So, what do you actually get? Live updates on all your crops, automatic watering, crop recommendations based on your own soil, and a lot more efficiency. It's affordable, not hard to use, and fits right into today's farms. Keywords: Smart Farming, IoT, Intelligent Irrigation, Polyhouse Farming, Soil Moisture Sensor, pH Sensor, Surveillance System, Agriculture Automation.

Keywords: *Agriculture*

I. INTRODUCTION

Farming's getting more high-tech every year. You see AI, IoT, and automation just about everywhere. But farmers still fight the same old problems water shortages, wild weather, worn-out soil, and not having info when they need it. Old irrigation methods? They mostly just soak the whole field without thinking about what the soil needs. Polyhouses help a ton. They let you control the environment, so crops get what they need. But to really make them work, you have to watch temperature, humidity, moisture, and nutrients non-stop. Doing that by hand eats up your time and hardly ever gives you the accuracy you want. So, that's why we built a system that takes care of monitoring and watering. It's all through IoT sensors and wireless tech so you can see everything you need on a website, even if you're nowhere near your crops.

This project offers: -

- Automatic watering based on soil moisture Instant checks on temperature and humidity
- pH updates for keeping the soil healthy
- Crop advice tailored to your land
- Access from any device, anywhere
- Water savings and better harvests In short: smarter irrigation, less stress, bigger yields.



II. LITERATURE SURVEY

Researchers have been after better irrigation with tech for years. Back in 2018, people were using moisture sensors and Arduino boards for irrigation, but they couldn't check their crops online or keep a good record of the data. By 2019, greenhouses got wireless sensors for steadier conditions, but those systems were expensive and pretty complicated. By 2020, folks tried using machine learning for smarter watering, but needed heavy computers to make it work. Then in 2021, some systems used mobile apps and dashboards for remote monitoring. Sounds great—except they still skipped nutrient analysis and useful crop advice. What's missing? Tying in soil testing with automation, keeping everything affordable, live monitoring from anywhere, simple control, and actually automating polyhouses from top to bottom. Our System's Contribution That's where our system comes in. We built a setup that delivers: - Automatic watering tied to soil moisture - Real-time tracking of temperature, humidity, and pH - Crop recommendations based on your soil's needs - A dashboard you can use from any web browser - An easy, affordable setup - Water-saving features built for polyhouses We put together IoT sensors, wireless tech, smart automation, and web support so farming becomes simpler and way more data-driven.

III. SYSTEM OBJECTIVE

The goal is simple: a user-friendly IoT system where farmers get instant access to soil and environmental updates. We want better yields, less wasted water, and smarter decisions, all from one website. We use hardware like NodeMCU ESP8266, NPK sensors, soil moisture sensors, DHT11 temperature/humidity sensors, relay modules, and water pumps. Everything connects to a website and database. Sensors shoot data over Wi-Fi, and it gets stored in MySQL with PHP. The website shows live updates so farmers can react on the spot.

IV. PROPOSED SYSYTEM

Here's how it works: sensors, wireless comms, a web platform, and automation all talking together. The NodeMCU ESP8266 reads data from the NPK, moisture, and DHT11 sensors, processes it, and fires it over to a server with Wi-Fi. MySQL collects the info, and farmers see real-time stats on a dashboard. The end result—smarter watering, better nutrient tracking, and unique crop recommendations for each farm.

V. METHODOLOGY

The system works like this:

1. Sensor Data Collection Sensors

run all the time, gathering information from the field.

DHT11 handles temperature and humidity

Soil Moisture Sensor knows when soil's dry, so watering only happens when it's truly needed.

NPK Sensor looks after nutrients—nitrogen, phosphorus, potassium connected with RS485 through MAX485.

2. Data Processing with NodeMCU ESP8266 coordinates the sensors, relays, Wi-Fi and sends what's needed to the website, always staying on schedule.

3. RS485 Communication for NPK Sensor NPK values go from sensor to NodeMCU through RS485. The MAX485 chip manages this, so your soil numbers stay accurate.

VI. MODULE DESCRIPTION

The proposed IoT-based Smart Farming System is divided into different modules to perform specific tasks efficiently. Each module is responsible for monitoring, processing, communication, automation, and displaying real-time agricultural data. The modules used in this project are described below.



1. Soil Moisture Sensor Module

The Soil Moisture Sensor Module is used to measure the water content present in the soil. It helps determine whether the soil is dry or wet and supports automatic irrigation control.

2. DHT11 Sensor Module

The DHT11 module is used to monitor environmental conditions such as temperature and humidity around the agricultural field.

3. NPK Sensor Module

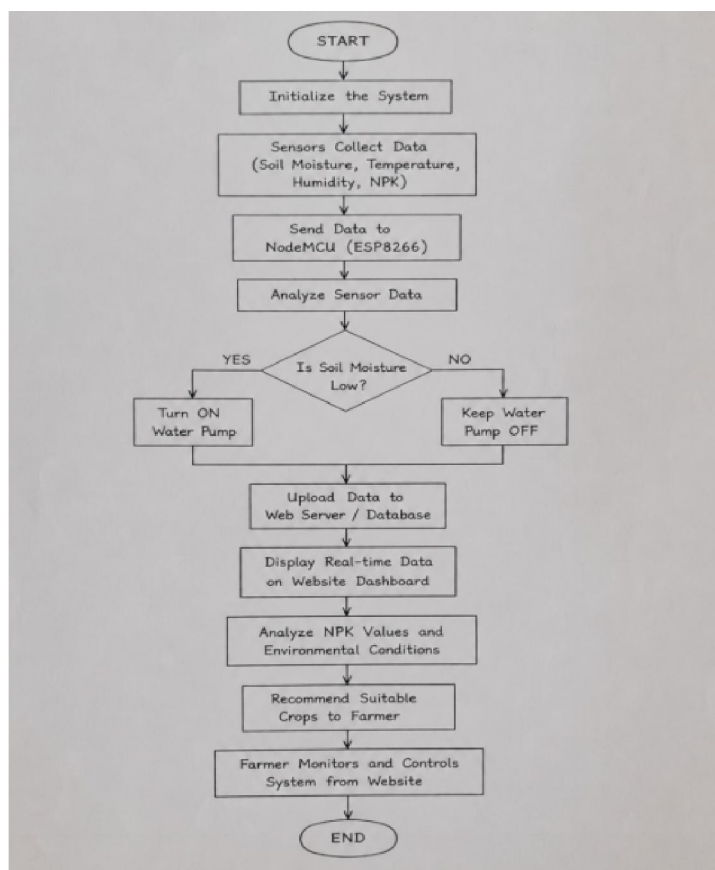
The NPK Sensor Module is used to analyze soil nutrients such as nitrogen, phosphorus, and potassium which are essential for plant growth.

4. Wi-Fi Communication Module

The Wi-Fi module enables wireless communication between the hardware system and the website server.

5. Website Module

The Website Module provides a user-friendly interface for monitoring real-time agricultural data collected from sensors.

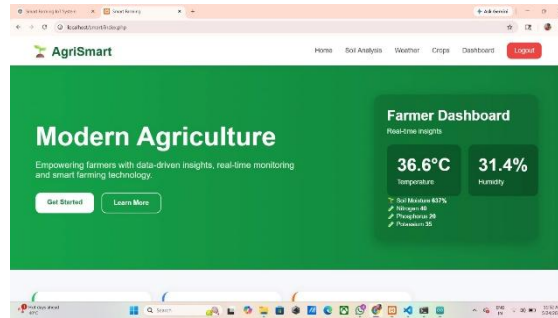


VII. RESULT AND DISCUSSION

We set up the full system: NodeMCU, DHT11, soil moisture sensor, NPK sensor, MAX485, relay module, and a web dashboard. Everything worked as planned—sensor readings showed up live online, and records updated automatically. DHT11 tracked temperature and humidity without a hitch. Soil moisture readings caught dry patches, so the water



pump switched on right away, then shut off when things got wet again. NPK sensor got reliable nutrient data through the RS485 Modbus/Max485 setup. NodeMCU processed everything and sent updates to the site instantly. Wi-Fi held up, so NodeMCU kept the PHP server and MySQL database running smoothly with real-time numbers.



VIII. FUTURE WORK

Next up, we're thinking bigger: -

Bring in AI and machine learning for crop predictions

Add a mobile app for instant updates and control

Hook up weather APIs for live alerts Suggest fertilizers based on NPK sensor data

Go solar for green energy

Put in cameras to check plant health and spot diseases

Use cloud storage for more data and easier backups

Bring in GPS for location-based advice Add more sensors

pH, rain, and light included

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