DEPARTMENT OF INFORMATION TECHNOLOGY

Project-Based Learning (PBL)

Course: IT in Agricultural Systems (ITAS)
Faculty: Dr. G. A. Senthil
Semester: VII (2024–2025)
Mode: Project-Based Learning (PBL)
Topic: Smart Irrigation System Using Iot And Data Analytics
Date: 27.03.2025
No of Students Participated:50

Introduction

Agriculture continues to be the backbone of India's economy, yet it faces persistent challenges such as unpredictable rainfall, over-irrigation, groundwater depletion, and inefficient water usage. The integration of Information Technology (IT) and Internet of Things (IoT) in agricultural systems presents innovative solutions to improve productivity and resource efficiency.

This project, Smart Irrigation System using IoT and Data Analytics, focuses on automating the irrigation process using real-time soil moisture data, environmental parameters, and predictive analytics. This innovation ensures precise water delivery, reducing wastage and optimizing crop growth.

Problem Statement

Traditional irrigation methods rely heavily on manual monitoring and assumptions, often leading to:

- Excess water consumption
- Crop damage due to under- or over-irrigation
- Poor utilization of groundwater resources
- Dependence on farmer availability and climatic guesswork

To address these issues, an automated, data-driven irrigation system is essential.

Objective of the Project

The project aims to:

1. Develop a low-cost IoT-based automated irrigation system.
2. Enable real-time monitoring of soil and environmental conditions.
3. Utilize data analytics to predict irrigation needs.

4. Reduce water consumption by optimizing irrigation timing and quantity.
5. Provide farmers with mobile alerts through cloud integration.

Literature Review

Previous studies show that:

- IoT sensors improve irrigation accuracy and reduce water wastage by 30–50%.
- Automated drip irrigation systems enhance crop yield by 20–25%.
- Data analytics and machine learning models drastically improve decision-making for water scheduling.

This project builds upon these technologies and customizes them for small-scale and mid-scale Indian farms.

System Architecture

Components Used

- Soil Moisture Sensor (Capacitive)
- DHT11 Temperature & Humidity Sensor
- ESP32/NodeMCU Microcontroller
- Relay Module
- Water Pump
- Cloud Database (Firebase or Thing speak)
- Mobile/Web Dashboard

Workflow

1. Sensors collect soil and climate data.
2. Data is sent to the microcontroller.
3. The system checks whether the soil moisture level is below the threshold.
4. If yes, the relay turns on the water pump.
5. Data is uploaded to the cloud for remote access.
6. A dashboard displays analytics and sends alerts.

Methodology

1. **Requirement Analysis**
   Study of crop water needs (e.g., paddy vs. groundnut vs. horticulture crops).
2. **Hardware Implementation**
   - Integrating sensors with ESP32
   - Setting moisture threshold levels

- Configuring the relay and pump

3. **Software Development**
    - Arduino IDE for programming
    - Firebase/Thing speak API integration
    - Dashboard creation
4. **Data Analytics**
    - Recording parameters over time
    - Predicting best irrigation intervals using trend analysis
    - Implementing basic ML regression model (optional)
5. **Testing and Validation**
    - Field-level testing
    - Comparing automated vs. manual irrigation performance

Students explaining their project done related to ITAS on 27.03.2025 to faculty Dr. G. A. Senthil

Expected Outcomes

- Accurate water control
- Reduced manual labor
- Lower electricity and water usage

- Higher crop yield
- Actionable insights using data analytics
- Technology adoption for sustainable agriculture

Innovation in the Project

- Real-time IoT-based monitoring instead of traditional methods.
- Data-driven irrigation decisions instead of guesswork.
- Cloud-connected dashboard for remote farm management.
- Scalability for multiple crop fields.
- Integration of predictive analytics for future irrigation planning.

Applications

- Small and large agricultural farms
- Greenhouses
- Horticulture plantations
- Precision farming initiatives
- Water-scarce regions needing smart resource management

Conclusion

The Smart Irrigation System demonstrates how IT and innovative technologies can revolutionize agricultural practices. By integrating IoT, cloud computing, and data analytics, farmers gain the ability to automate irrigation, conserve water, improve productivity, and make informed decisions. This innovation-based learning project highlights the transformative potential of technological solutions in modern agriculture and supports the vision of digital farming in India.

LIST OF STUDENTS ATTENDED

IV STUDENTS LIST

S.NO	REGISTER NO	STUDENTS NAME
1.	312821205001	Aravind R
2.	312821205002	Aravinth R
3.	312821205003	Ashika Jubi S
4.	312821205004	Dharshan K
5.	312821205005	Dinakaran Sa
6.	312821205006	Gokulakrishnan M

7.	312821205007	Gowtham G
8.	312821205008	Gowtham M
9.	312821205009	Harini V
10.	312821205010	Jagadeesh D
11.	312821205011	Jerlin Ida J
12.	312821205012	Jeshina K
13.	312821205013	Karthikeyan S
14.	312821205014	Keerthana V
15.	312821205015	Kirubanithi S
16.	312821205016	Lakshmi Priya P
17.	312821205017	Mahima Sree S
18.	312821205018	Mohamed Alifdeen R
19.	312821205019	Mohamed Ruwaid A
20.	312821205020	Monesha G
21.	312821205021	Nandha Kumar A
22.	312821205022	Nanthini Priya R
23.	312821205023	Neha M
24.	312821205024	Nethaji M
25.	312821205025	Nishaanth S
26.	312821205026	Pradeep Kumar Y
27.	312821205027	Prashanth B
28.	312821205028	Praveen M
29.	312821205029	Preethi M
30.	312821205030	Premlatha S
31.	312821205031	Pugazhenthi D
32.	312821205032	Rahul N
33.	312821205033	Ramkumar K S
34.	312821205034	Ramya Devi P
35.	312821205035	Rexlin Felix S
36.	312821205036	Rukmangathan D
37.	312821205037	Santhosh G
38.	312821205038	Saran S K
39.	312821205040	Sasikumar R
40.	312821205041	Silambarasan M

41.	312821205042	Sivaranjini R
42.	312821205043	Siva Saradhe R
43.	312821205045	Sri Ranjani K
44.	312821205046	Surya Prakash S
45.	312821205047	Tarun S
46.	312821205048	Venu Aravind M
47.	312821205301	Karan Kumar B
48.	312821205302	Kotipatruni Tirumala Rao
49.	312821205303	Vishal B
50.	312821205701	Yokesh B

Course Handling Faculty

HOD

Dr.S.GEERTHIK, B.E, M.E, PhD,
Head of the Department,
Information Technology,
Agni College of Technology,
Chennai - 600 130.

Feedback link:https://forms.gle/ZK1QpfCC95WLsjUr7