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HACK VISION

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TECHNOLOGY
USED

AgroSense



PROBLEM
STATEMENT

NOIΛTOS

PROBLEM STATEMENT



BRIDGING THE GAP IN SMALL SCALE FARMING

Traditional irrigation methods waste large amounts of water and fail to account for varying soil and weather conditions.

Farmers manually decide when to irrigate, leading to:

- Over-irrigation (water wastage, root rot)
- Under-irrigation (low yield, dry soil)
- Poor soil health due to unmonitored pH and moisture levels

There is a lack of affordable, data-driven systems for small and medium-scale farmers to optimize irrigation and monitor soil conditions in real-time.



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AgroSense

SOLUTION

ARCHITECTURE

SOLUTION



AgroSense: PROACTIVE & INTEGRATED CROP HEALTH

AgroSense is an IoT-based system that continuously monitors soil moisture, temperature, humidity, and pH and automatically manages irrigation through intelligent control.

Goal: To create an accessible, end-to-end system that helps conserve water, optimize fertilizer use, and provide farmers with timely, actionable intelligence via web and SMS.

Key Features:

- **Real-Time Monitoring:** Dashboard displays live sensor data (moisture, temp, humidity) and simulated matrices (pH, N-P-K).
- **Automated Irrigation & SMS Alerts:** Low moisture triggers automatic irrigation (via Firebase) and an SMS alert (via Twilio).
- **AI-Powered Diagnosis (Prototype):** A simulated ML model diagnoses crop diseases from photos and recommends cures.
- **Integrated Recommendations:** Combines live sensor data (e.g., humidity) with the AI diagnosis (e.g., fungus) for more accurate treatment plans.

SOLUTION

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End-To-End Automated Work Flow

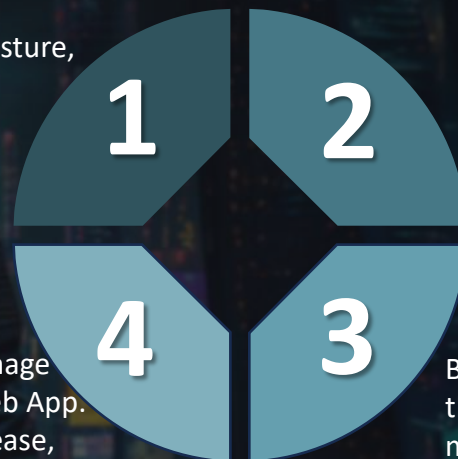
Sensors read Soil Moisture, Temp, Humidity.

Farmer uploads leaf image via the mobile-first Web App. Backend identifies disease, checks sensor data, provides a **Smart Recommendation** back to the app.

Data streams to Firebase DB; Python Backend analyzes in real-time.

Backend detects critical thresholds (e.g., low moisture):

- Sends Automated Irrigation 'ON' signal (via Firebase).
- Sends Twilio SMS Alert to farmer's phone.



ARCHITECTURE

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MODERN – ACCESSIBLE TECH STACK

- **Frontend:** HTML5, CSS3, JavaScript, Chart.js
- **Backend & Logic:** Python (Flask framework, pyrebase4, twilio, Flask-CORS, python-dotenv)
- **Cloud Database:** Google Firebase (Realtime Database & Authentication).
- **Communication:** Twilio API (for SMS Alerts)
- **Hardware (Simulated):** C (AgroSense1.ino), Python (sensor_simulator.py) emulating ESP32 sensor readings, Arduino (C++)

HARDWARE COMPONENTS

- ESP32 Development Board
- DHT11 (Temp/Humidity Sensor)
- Capacitive Soil Moisture Sensor

AgroSense – KEY INNOVATIONS

1. **All-in-One Soil Intelligence System:** Monitors multiple key soil parameters in one compact device consisting -
 - **Integrated Smart Diagnosis:** Combines AI vision with live sensor data for superior accuracy.
 - **Proactive Disease Risk Alerts:** Predicts potential outbreaks based on environmental patterns (not just reacting to visible symptoms).
 - **Holistic Soil Health:** Tracks moisture, simulated pH, and simulated NPK for complete fertilizer and watering recommendations.
 - **Mobile-First & Accessible:** Designed for ease of use on smartphones, with critical alerts via SMS for wider reach.
2. **Smart Automated Irrigation:** Automatically regulates water flow through a relay-controlled pump based on real-time soil moisture data.
3. **Cloud-Connected Dashboard:** Live monitoring made easy — view soil data and irrigation status anytime via the Blynk app or web dashboard.
4. **Data-Driven Efficiency:** Sensor analytics help optimize irrigation schedules and cut water wastage by up to 40%.
5. **Scalable & Affordable Design:** Developed using low-cost, open-source hardware — making it practical for small and mid-scale farmers.
6. **Built for Sustainability:** Encourages water conservation and supports long-term soil health — advancing precision and sustainable farming.

REFERENCE LINKS

- GitHub repo link – <https://github.com/PrabhnoorSingh-IITM/AgroSense>
- Value DataSet Link - <https://www.kaggle.com/datasets/siddharthss/crop-recommendation-dataset>
- Core Technologies & APIs
 - Firebase (Cloud Database & Auth): <https://firebase.google.com/>
 - Twilio (SMS API): <https://www.twilio.com/>
 - Flask (Python Backend Framework): <https://flask.palletsprojects.com/>
 - Chart.js (Frontend Graphing): <https://www.chartjs.org/>



THANK YOU