



Advancing sustainability and transparency through mobile-enabled sensor data analytics

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Background & Motivation

**Farmalytic** is a project focuses on improving agriculture in Vietnam in relation to rising global concerns regarding the safety, sustainability, and traceability of food and its supply chains. Traditional methods are still very much reliant on intuition and visual inspections. In light of these issues, we aim to design and create an application which it is hoped would enhance the productivity as well as the competitiveness of Vietnam's agricultural industry.



Objectives

Our aim to further enhance Vietnam’s agriculture abilities by:

- Increase product safety and Quality: Through the use of multiple sensors.
- Save time: Can track through multiple farms from the app.
- Tracking: Receive daily informations about farms to be make better decisions and solutions to tackle any problems.

Methodology

System Design

Establish system architecture with React Native for the UI, FastAPI for the backend, user information with Supabase, InfluxDB for time-series sensor data, and AWS IoT Core for cloud communication. Create a database schema for user verification, sensor data, and system resources. Add Grafana for the real-time environmental data visualization.

App Development

Develop the mobile application with React Native for broader accessibility. Add user verification and a secure log in with Supabase. Design views for the parameters (temperature, humidity, soil pH, UV index). Create navigation from the metrics to detail pages to recommended pages powered by AI (PyTorch).

AI and Recommendation Engine

Generate text-based farming recommendations from the sensor data using PyTorch models. Develop plans for recommended extensions from outside trusted sources in later iterations. Add time-range filters for recommendation (1 day, 7 days, 30 days).

Technology	Tools	Alternatives	Justification
Front End	React Native	Flutter, Native iOS/Android	Selected for cross-platform compatibility and UI responsiveness, particularly for integrating real-time dashboard updates
Back End	Fast API	Node.js (Express), Django	Async support and suitable for ML integration
Database	InfluxDB, Supabase	Firebase, MongoDB	Supabase provides InfluxDB optimized for time-series sensor data, along with PostgreSQL and authentication.
Communication	MQTT	HTTP, CoAP	Reliable and lightweight for real-time communication
AI/ML	PyTorch	TensorFlow, Scikit-learn	PyTorch is flexible, research-friendly, good mobile deployment
Visualization	Grafana	Power BI, Tableau	Grafana is open-source, customizable, and ideal for time-series data. It is good for dashboards used for server-side monitoring
DevOps	Docker	Kubernetes, Vagrant	Docker simplifies deployment and testing
Cloud Deployment	AWS IoT Core	Google Cloud IoT	Scalable cloud architecture and MQTT are seamlessly integrated with AWS IoT Core

Experiment and result

**Coding Result:** Sensors has successfully operated with clear transfer and storages of data received through multiple testing, percise control through either app-based or physical controller. And real-time notifications and adjustment via Wifi.

**Data Observation:** Data sending path and storage are successful and can be observed through Supabase’s web application interfaces.

id	text	created_at	timestamp	sensor_id	value
soil-sensor-001-3342237	soil-sensor-001	2025-08-26 13:40:57.283702+00	77	soil-sensor-001	77
temp-sensor-001-3331193	temp-sensor-001	2025-08-26 13:41:05.898115+00	25	temp-sensor-001	25
ph-sensor-001-3622593	ph-sensor-001	2025-08-26 13:45:41.098508+00	7	ph-sensor-001	7
ec-sensor-001-3635017	ec-sensor-001	2025-08-26 13:45:49.734082+00	10.57031	ec-sensor-001	10.57031
soil-sensor-001-3643608	soil-sensor-001	2025-08-26 13:45:58.625983+00	95	soil-sensor-001	95
temp-sensor-001-3625227	temp-sensor-001	2025-08-26 13:46:07.523182+00	25	temp-sensor-001	25
ph-sensor-001-3926415	ph-sensor-001	2025-08-26 13:50:41.462762+00	7	ph-sensor-001	7
ec-sensor-001-3935099	ec-sensor-001	2025-08-26 13:50:49.049803+00	11.6875	ec-sensor-001	11.6875
soil-sensor-001-3942757	soil-sensor-001	2025-08-26 13:50:57.224534+00	98	soil-sensor-001	98
temp-sensor-001-3951075	temp-sensor-001	2025-08-26 13:51:05.823337+00	25	temp-sensor-001	25
ph-sensor-001-94091	ph-sensor-001	2025-08-27 12:13:18.046475+00	7	ph-sensor-001	7
ec-sensor-001-132168	ec-sensor-001	2025-08-27 12:13:54.857486+00	9.453125	ec-sensor-001	9.453125
soil-sensor-001-168901	soil-sensor-001	2025-08-27 12:14:31.333316+00	45	soil-sensor-001	45
ph-sensor-001-46863	ph-sensor-001	2025-08-27 12:16:30.523787+00	7	ph-sensor-001	7
ec-sensor-001-84676	ec-sensor-001	2025-08-27 12:17:07.508035+00	8.980469	ec-sensor-001	8.980469
soil-sensor-001-121868	soil-sensor-001	2025-08-27 12:17:45.018288+00	40	soil-sensor-001	40
temp-sensor-001-159253	temp-sensor-001	2025-08-27 12:18:21.945974+00	25	temp-sensor-001	25
ph-sensor-001-211681	ph-sensor-001	2025-08-27 12:19:14.563339+00	7	ph-sensor-001	7

