REQUIREMENT GATHERING

Date: 11-12-2025

1. **Project Overview**:

NutriRoot is an IoT-enabled fertilizer suggestion system designed to improve soil health monitoring and nutrient management. The system analyzes key soil parameters such as Nitrogen (N), Phosphorus (P), Potassium (K), pH, moisture level, temperature, and crop type. These inputs are collected through sensors and processed by a web-based software platform.

Problem Solved:
Farmers often apply incorrect or excessive fertilizer due to lack of real-time soil data, leading to reduced crop yield, soil degradation, and financial loss.

Objective:
NutriRoot aims to provide accurate fertilizer recommendations, display real-time soil readings, generate alerts, suggest suitable crops, and offer historical analysis through a cloud-connected web dashboard.

2. **System Scope**:

- The NutriRoot system is developed as an academic prototype, integrating IoT hardware and a functional web application.
- Real-time sensor data collection
- Secure cloud storage
- Fertilizer recommendation engine
- Historical data visualization
- User login and report generation
- The scope is limited to soil nutrient and environmental monitoring for demonstration and educational research purposes.

3. **Target Audience**:

- **Farmers** who need fertilizer guidance
- **Agriculture students/researchers** conducting soil studies
- **Agricultural officers** monitoring field data

4. Modules:

1. IoT Data Collection Module

Captures soil readings (NPK, pH, moisture, temperature) from sensors and sends them to the server.

2. User Authentication Module

Handles user login, registration, and basic profile management.

3. Real-Time Dashboard Module

Displays live soil parameters retrieved from the IoT system.

4. Fertilizer Recommendation Module

Generates nutrient-based fertilizer suggestions based on soil values and crop type.

5. Crop Suggestion Module

Suggests suitable crops based on soil nutrient profile and pH.

6. Historical Data & Graph Module

Shows previous readings in graphical form for data comparison.

7. Alerts & Notifications Module

Notifies users when soil parameters reach abnormal levels.

8. Report Generation Module

Generates downloadable PDF reports summarizing soil health and fertilizer needs.

5. User Roles:

1. User/Farmer

- View dashboard
- View fertilizer recommendation
- Download reports

- View historical data
- Receive alerts

2. Admin

- Add/remove crops
- Manage fertilizer rules
- View all user data
- Monitor IoT device status

6. **System Ownership**:

   NutriRoot is owned by the developer, who retains full rights over the system's design, architecture, and functionality. Although created for academic purposes, the institution may use it for evaluation, while all intellectual property and system control remain with the developer.

7. **Industry/Domain**:

   Agriculture Technology (AgriTech)

   This project falls under smart farming, IoT-based precision agriculture, and soil nutrient management systems.

8. **Data Collection Contacts**:

   Mr. Sabu P. S
   Role: Assistant Agriculture Officer
   Contact: +91 9745642204

9. **Questionnaire for Data Collection**:

1. How do farmers currently check soil fertility or nutrient levels (NPK, pH)?

   Most farmers rely on **traditional experience**, visual crop symptoms, or **occasional laboratory soil testing**, which is time-consuming and not done regularly.

2. What challenges do farmers face in deciding the correct type and amount of fertilizer?

   Farmers often lack **accurate soil data**, leading to **overuse or underuse of fertilizers**, increased costs, and reduced crop yield.

3. How often do farmers test their soil for nutrient content?

   Soil testing is usually done **once a year or once per crop cycle**, and in many cases, not done at all due to cost and accessibility issues.

4. Which fertilizers do farmers commonly used for their crops?

   Commonly used fertilizers include **Urea, DAP, SSP, and MOP**, along with organic fertilizers such as **cow dung and compost**.

5. Do they track soil moisture and temperature during crop growth?

   Most farmers do not actively track soil moisture and temperature and instead depend on weather conditions and manual observation.

6. Would a real-time dashboard showing soil parameters be useful for farming activities?

   Yes, a real-time dashboard would be highly useful as it helps farmers make timely and informed decisions regarding irrigation and fertilizer application.

7. Are they comfortable using a mobile/website-based platform to view soil data?

   Many farmers are **willing to use digital platforms**, especially if the interface is simple, mobile-friendly, and available in local languages.

8. Which soil parameters are most important for crop growth?

   Farmers consider **Nitrogen, Phosphorus, Potassium (NPK)** as most important, followed by **soil moisture and pH**.

9. What type of recommendations would they prefer—organic fertilizers, chemical fertilizers, or both?

   Most farmers prefer a combination of organic and chemical fertilizers to maintain soil health while ensuring good crop yield.

10. Have they experienced crop failure due to incorrect fertilizer usage?

   Yes, many farmers have experienced reduced yield or crop damage due to incorrect fertilizer selection or excessive application.

GEOTAGGED PHOTO

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Gvqp+fhm, Mundakayam, Kerala 686513, India
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