Software Requirements Specification (SRS)

Project: AgroSense

Version: 1.0

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# 1. Introduction

## 1.1 Purpose

To optimize agricultural practices and increase crop yields

## 1.2 Scope

- soil health monitoring

- irrigation optimization

- pest risk assessment

## 1.3 Intended Audience

- farmers

# 2. System Overview

An IoT + AI platform providing real-time insights on soil health, irrigation needs, and pest risks via satellite imagery and sensors.

# 3. Functional Requirements

## 3.1 User Authentication [0]

**Description:**

The platform securely authenticates users through various methods, such as email/password, social login, or biometric authentication.

**Priority:**

High

**Subtasks:**

- Implement email/password authentication using secure hashing algorithms.

- Integrate social login options (e.g., Google, Facebook) for user registration and login.

- Explore and implement biometric authentication (e.g., fingerprint, face recognition) for enhanced security.

- Ensure compliance with industry best practices for authentication security (e.g., OAuth 2.0, multi-factor authentication).

## 3.2 User Profile Management [1]

**Description:**

Users can create profiles to manage their farm information, such as location, crops, and soil types.

**Priority:**

High

**Subtasks:**

- Create a new user profile with farm details (location, crops, soil type)

- Edit existing profile information

- View and manage multiple farm profiles

- Securely store user data and farm information

## 3.3 Sensor Data Integration [2]

**Description:**

The platform integrates with existing sensor networks to collect real-time data on soil moisture, nutrient levels, and temperature.

**Priority:**

High

**Subtasks:**

- Establish API connections with popular sensor network protocols (e.g., MQTT, CoAP).

- Implement real-time data ingestion pipeline for handling sensor data streams.

- Develop data validation and quality control mechanisms for incoming sensor data.

## 3.4 Satellite Imagery Analysis [3]

**Description:**

Satellite imagery data is processed and analyzed to provide insights on crop health, pest infestations, and irrigation needs.

**Priority:**

High

**Subtasks:**

- Develop algorithms for crop health analysis.

- Implement pest detection models using machine learning techniques.

- Create irrigation scheduling algorithms based on satellite data and weather forecasts.

- Design a user interface for visualizing satellite imagery and analysis results.

## 3.5 Insight Generation and Recommendations [4]

**Description:**

The platform generates actionable insights and recommendations for farmers based on the collected sensor and satellite data.

**Priority:**

High

**Subtasks:**

- Analyze sensor data (temperature, humidity, soil moisture) to identify anomalies and patterns.

- Process satellite imagery to assess crop health, growth stage, and potential pest infestations.

- Develop algorithms to generate insights based on combined sensor and satellite data.

- Create personalized recommendations for irrigation scheduling, fertilizer application, and pest control.

- Implement a user interface to display insights and recommendations clearly and concisely.

## 3.6 Real-Time Dashboard and Reporting [5]

**Description:**

Farmers can access real-time dashboards and reports to monitor their farm's progress and performance.

**Priority:**

High

**Subtasks:**

- Display real-time soil moisture levels for each field

- Visualize irrigation needs based on soil moisture and weather forecasts

- Generate reports on pest risks identified by AI algorithms

- Allow users to filter and customize reports based on specific criteria

## 3.7 Automated Irrigation Scheduling [6]

**Description:**

The platform enables farmers to automate irrigation schedules based on soil moisture data and weather forecasts.

**Priority:**

High

**Subtasks:**

- Collect real-time soil moisture data from sensors.

- Integrate weather forecast data from a reliable API.

- Develop an algorithm to analyze soil moisture and weather data to determine irrigation needs.

- Generate customized irrigation schedules based on crop type, soil type, and weather predictions.

- Display irrigation schedules clearly to the user with options to adjust or override.

## 3.8 Pest and Threat Alerts [7]

**Description:**

Early warning alerts are issued to farmers about potential pest infestations or other threats to their crops.

**Priority:**

High

**Subtasks:**

- Develop an algorithm to detect pest infestations from satellite imagery.

- Integrate sensor data (e.g., temperature, humidity) into the alert system.

- Create a user interface for farmers to view and manage alerts.

- Implement a notification system (e.g., SMS, email) to alert farmers of potential threats.

## 3.9 Historical Data Analysis and Trend Tracking [8]

**Description:**

Farmers can track historical data and trends to make informed decisions about their farming practices.

**Priority:**

High

**Subtasks:**

- Display historical weather data (temperature, rainfall, humidity) for a selected period.

- Visualize historical soil moisture levels and irrigation data.

- Identify trends in pest outbreaks over time.

- Generate reports summarizing key historical data points and trends.

- Allow farmers to compare historical data with current conditions.

## 3.10 Educational Resources and Support [9]

**Description:**

The platform provides educational resources and support to help farmers understand the insights and recommendations.

**Priority:**

High

**Subtasks:**

- Create interactive tutorials explaining key platform features and functionalities.

- Develop FAQs addressing common user questions and concerns.

- Design video demonstrations showcasing the application of platform insights to real-world farming scenarios.

- Establish an online forum for farmers to connect, share knowledge, and seek support from each other and platform experts.

## 3.11 Data Security and Privacy [10]

**Description:**

The platform ensures data security and privacy through robust encryption and access control measures.

**Priority:**

High

**Subtasks:**

- Implement end-to-end encryption for all data transmission between clients, sensors, and the platform.

- Securely store sensitive user data with access controls based on user roles and permissions.

- Conduct regular security audits and vulnerability assessments to identify and mitigate risks.

- Comply with relevant data privacy regulations such as GDPR and CCPA.

# 4. Non-Functional Requirements

**realtime\_processing**: The system should provide real-time insights within 5 seconds of data acquisition.

**high\_availability**: The platform should be accessible 24/7 with 99.9% uptime.

**data\_security**: The application should be secure and protect user data from unauthorized access.

**scalability**: The platform should be scalable to accommodate a growing number of users and data points.

**usability**: The application should be user-friendly and intuitive for farmers with varying technical expertise.