

AI-Driven Smart Agriculture System Proposal

Title: Precision Agriculture using AI-Enabled IoT for Crop Yield Prediction

Theme: Pioneering Tomorrow’s AI Innovations

Prepared by: Alois Maingi Mbithi

1. Overview

This proposal presents a concept for an **AI-driven smart agriculture system** that leverages IoT sensors and machine learning models to **monitor farm conditions in real-time and predict crop yields**. The system supports sustainable farming practices, reduces resource wastage, and enhances food security.

2. Sensors Required

The following sensors will be deployed in the field to collect critical agricultural data:

Sensor Type	Purpose
Soil Moisture Sensor	Measures water content in soil
Temperature Sensor	Monitors ambient farm temperature
Humidity Sensor	Captures atmospheric moisture levels
Light Sensor (LDR)	Measures sunlight intensity
pH Sensor	Detects soil acidity or alkalinity
CO ₂ Sensor	Monitors carbon dioxide levels
Crop Health Camera	Captures images of crops for AI analysis

3. AI Model: Crop Yield Prediction

An **XGBoost Regression Model** is proposed due to its high performance in handling structured data and non-linear relationships.

Inputs:

- Soil moisture, temperature, pH, sunlight, humidity, CO₂, NDVI (from images)

Output:

- **Estimated crop yield (kg/acre)**

Model Justification:

- XGBoost handles missing data well
- Low inference time (ideal for IoT edge devices)
- Compatible with TensorFlow Lite or ONNX for edge deployment

4. System Workflow

Key Processes:

1. Sensors collect data continuously from the farm
2. Data is transmitted to an edge device (Raspberry Pi or NVIDIA Jetson)
3. Edge device preprocesses the data
4. Preprocessed data is fed into the trained AI model
5. Predicted crop yield is displayed on a dashboard or sent via SMS to farmers
6. Alerts for irrigation/fertilization are auto-triggered based on AI insights

5. Benefits

- **Sustainability:** Minimizes over-irrigation and fertilizer use
- **Smart Decision Making:** AI-driven insights to guide farming
- **Remote Monitoring:** Real-time farm status accessible from anywhere
- **Cost Reduction:** Efficient use of resources

6. Data Flow Diagram

- Shows how sensor data flows from the farm to the AI model and back to the user
- Includes edge device, AI model, and output endpoints

