# 🌾 AgroMesh Development Plan

## 🔹 Phase 1: Planning & Research

Objectives:

• Identify key pain points (e.g., irrigation timing, crop disease, fertilizer misuse).  
• Choose one target crop and community (e.g., maize or cassava in Northern Ghana).  
• Select 2–3 critical sensor metrics (e.g., soil moisture, pH, temperature).

Tasks:

• Interview farmers, agricultural extension officers, and NGOs.  
• Research agronomic best practices for the chosen crop.  
• Finalize hardware list and data requirements.

## 🔹 Phase 2: Hardware & Firmware MVP

Objectives:

• Build a low-cost, solar-powered sensor node that logs soil and weather data.

Hardware:

• Controller: Arduino Nano or ESP8266/ESP32 (for Wi-Fi)  
• Sensors:  
 - Soil moisture (capacitive sensor)  
 - pH sensor  
 - DHT11 or BME280 (for temperature/humidity)  
 - Optional: rain sensor, solar power system  
• Power: Solar panel + lithium battery with charge controller

Firmware:

• Arduino IDE for sensor readings  
• Store data locally (SD card) or send via Wi-Fi to Firebase/REST API  
• Add simple logic for LED or buzzer-based alerts (optional)

## 🔹 Phase 3: Backend + AI Setup

Objectives:

• Build cloud data pipeline and dashboard  
• Integrate AI for smart irrigation suggestions

Tasks:

• Create Firebase or FastAPI backend to receive and store data  
• Build dashboard (Streamlit or React) for real-time visualization  
• Train a basic AI model:  
 - Use past sensor + weather data  
 - Model moisture trends → recommend irrigation times  
 - Use scikit-learn or TensorFlow (Colab or local)  
• Integrate SMS alerts using Twilio:  
 - “Soil moisture is low. Please irrigate tomorrow morning.”

## 🔹 Phase 4: Community Testing

Objectives:

• Deploy AgroMesh in one real-world farm and observe results

Tasks:

• Train one farmer or extension officer to use the system  
• Test sensor accuracy and solar battery life in the field  
• Collect feedback on dashboard accessibility, language needs, SMS clarity  
• Document success stories and failure points

## 🔹 Phase 5: Iteration + Open Launch

Objectives:

• Finalize MVP version, prepare for open-source release, and share findings

Tasks:

• Refine sensor enclosure (e.g., waterproof casing)  
• Improve model accuracy with field data  
• Polish documentation (setup guides, videos)  
• Launch GitHub repo and project website  
• Pitch project to schools, NGOs, or competitions

## 🧠 Stretch Goals (Post-MVP)

• Add yield forecasting using historical + live sensor data  
• Support multiple sensor nodes in a mesh or cluster  
• Build a mobile app or PWA (Progressive Web App)  
• Translate dashboard + SMS into local languages  
• Include NPK soil nutrient sensors (advanced)