W2P (When & What to Plant)

AI for Agriculture | BeOrchid Africa Developers Hackathon 2026

Executive Summary

W2P is an AI-powered agricultural intelligence platform built to remove uncertainty from planting decisions. It combines climate forecasting, machine learning, and localized environmental data to guide farmers on when to plant, what to plant, and the level of yield risk they face. The system transforms raw climate data into practical, actionable guidance for African smallholder farmers.

Problem Statement

Growing up on a farm, planting season always felt like a gamble. Before planting, the first concern was whether the seeds would germinate. We questioned soil moisture levels, rainfall stability, temperature, and humidity. Planting requires financial commitment in clearing land, plowing, purchasing seeds, and labor. If germination fails, those investments are lost. Even when crops germinate, farmers remain uncertain whether weather conditions will sustain growth through flowering and seed production. Across Africa, traditional planting calendars no longer align with shifting climate patterns. The challenge is not lack of effort but lack of accessible, localized climate intelligence.

Proposed Solution

W2P analyzes historical rainfall trends, seasonal forecasts, temperature patterns, and soil inputs to predict optimal planting windows. Using time-series forecasting models such as Prophet or LSTM, the system estimates rainfall onset stability and growing season reliability. Machine learning classifiers such as Random Forest or XGBoost evaluate crop suitability and generate germination probability scores and yield risk estimates. Farmers receive clear recommendations tailored to their location, helping them reduce financial risk and improve productivity.

Technical Architecture

Backend: FastAPI built in Python with PostgreSQL for structured climate and crop data storage. The system is containerized using Docker for portability and cloud deployment readiness.

Machine Learning Layer: Time-series forecasting for rainfall prediction, supervised learning models for crop suitability classification, feature engineering based on rainfall averages, temperature variability, and seasonal indices.

Frontend: React-based interface designed to be mobile-first and low-bandwidth compatible. The interface provides planting recommendations, risk visualization dashboards, and yield projection

summaries.

Scalability and Impact

W2P is designed as a scalable cloud-ready platform that can serve individual farmers, cooperatives, and government advisory bodies. The architecture supports expansion to multiple regions and crop types. Future integration can include SMS advisory systems, satellite vegetation indices, and insurance risk modeling.

Recommended Supporting Diagrams

For technical validation and judging clarity, it is recommended to include: 1. System Architecture Diagram showing data ingestion, ML pipeline, API layer, and frontend interaction. 2. Machine Learning Workflow Diagram illustrating feature engineering, training, validation, and inference stages. 3. User Flow Diagram showing farmer input to AI recommendation output.