Technical Report – AgriAI

AI-Powered Smart Agriculture Advisory System

1. Introduction

Agriculture is the backbone of Pakistan's economy, contributing ~19% to the GDP and employing over 40% of the workforce. However, farmers face major challenges such as low productivity, crop losses from pests and diseases, water scarcity, climate change, and volatile market conditions. To address these, we propose AgriAI, an AI-powered smart agriculture advisory system that provides farmers with real-time, localized, and data-driven insights.

2. Objectives

- Detect crop diseases and pests early using computer vision.
- Recommend optimal irrigation schedules to conserve water.
- Provide personalized crop selection and advisory services.
- Forecast market prices for better financial decision-making.
- Deliver recommendations via a multilingual chatbot (Urdu, Punjabi, Sindhi, Pashto).

3. System Architecture

AgriAI consists of four core components:
1. Mobile/Web Application – Interface for farmers.
2. AI Engine – Backend models for detection, forecasting, and recommendations.
3. Data Sources – Satellite imagery, weather APIs, crop datasets, market data.
4. Farmer Support Chatbot – Conversational AI in multiple languages.

4. Technical Approach

4.1 Disease & Pest Detection
• Method: CNN models trained on labeled datasets.
• Data: PlantVillage and local research datasets.
• Output: Classification + treatment advice.

4.2 Smart Irrigation Advisory
• Method: Predictive modeling using weather + soil data.
• Data: Meteorological APIs + IoT/manual data.
• Output: Optimized irrigation schedule.

4.3 Crop Recommendation System
• Method: ML algorithms (Decision Trees/Random Forest).

• Data: Yield history, soil, and seasonal data.
• Output: Suitable crop suggestions.

4.4 Market Price Forecasting
• Method: Time Series (ARIMA, LSTM).
• Data: Market history, govt. bulletins.
• Output: Price predictions.

4.5 Multilingual Chatbot
• Method: NLP with transformer-based models.
• Output: Farmer advisory in Urdu and regional languages.

5. Implementation Plan

Phase 1: Dataset collection.
Phase 2: Model development (CNN, ML, LSTM, NLP).
Phase 3: Prototype mobile app.
Phase 4: Pilot testing in Sindh & Punjab.
Phase 5: Deployment & scaling with govt. & cooperatives.

6. Expected Impact

- Yield Increase: 15–20% through early detection.
- Water Savings: Up to 30% via optimized irrigation.
- Income Stability: Improved price forecasts.
- Accessibility: Chatbot ensures inclusivity.
- Sustainability: Supports SDGs on Zero Hunger, Clean Water, Sustainable Communities.

7. Challenges & Mitigation

Challenge: Limited smartphone penetration.
Mitigation: USSD/SMS support.

Challenge: Limited local datasets.
Mitigation: Partnerships with agricultural universities.

Challenge: Building farmer trust.
Mitigation: Local language support + pilot programs.

8. Conclusion

AgriAI leverages AI to provide practical, affordable, and scalable solutions for Pakistan's agriculture. By addressing pest management, irrigation, crop planning, and price forecasting, AgriAI empowers farmers, enhances productivity, and strengthens food security. This initiative aligns with the Uraan AI Techathon 1.0 and demonstrates how AI

can drive socio-economic impact.