CROP DISEASE DETECTION & ADVISORY SYSTEM FOR SMALLHOLDER FARMERS IN LIBERIA

BY FTL LIBERIA GROUP 10

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PROJECT TITLE: CROP DISEASE DETECTION & ADVISORY SYSTEM FOR SMALLHOLDER FARMERS IN LIBERIA

Project Background

Agriculture in Liberia suffers from significant yield loss due to late detection of crop diseases, particularly in cassava, rice, and pepper farming. This project aims to develop a machine learning–powered system that identifies crop diseases from leaf images and provides farmers with locally relevant treatment and prevention advice. The goal is to enable timely intervention, reduce losses, and improve food security.

Relevance to Sustainable Development Goals (SDGs)

This project supports **SDG 2: Zero Hunger** by increasing crop productivity and reducing food insecurity. It also contributes to **SDG 13: Climate Action** by promoting early detection and targeted treatment, which minimizes excessive pesticide use and environmental impact.

Literature Review

- **Study 1:** *"PlantVillage: A Public Dataset for Disease Classification in Crops"* – A mobile app that detects cassava, maize, and potato diseases using AI. This shows the feasibility of using image classification for crop disease detection in low-resource settings.

- **Study 2:** *"Cassava Leaf Disease Classification Using Convolutional Neural Networks"* – An AI model that classifies images of cassava leaves into healthy or diseased categories. Showed the feasibility of using CNNs for cassava disease detection, achieving accuracy above 90% and highlighting the potential for mobile deployment in low-resource settings.

Project Data Description

- **Primary Sources:**
  I. PlantVillage Dataset – multi-crop images in JPG format.
  II. Cassava Leaf Disease Dataset – cassava-specific JPG images.
- **Local Data Collection:** 300–1,000 leaf images from Liberian farms for fine-tuning.
- **Format:** Images (JPG/PNG), resized to 224×224 pixels for training.
- **Preprocessing:** Image resizing, normalization, data augmentation (rotation, flipping, brightness/contrast adjustments), train/validation/test split.

Approach:

A **deep learning** approach will be used due to the unstructured nature of image data. **Transfer learning** with a lightweight **Convolutional Neural Network** (e.g., MobileNetV3 or EfficientNet-B0) will allow efficient training and deployment on mobile devices. The model will classify leaf images into "Healthy" or specific disease classes, with an advisory module mapping predictions to treatment recommendations. Confidence thresholds will trigger an "Unsure" output to reduce misclassification risk.