PROJECT IDEA PROPOSAL: Crop Yield Prediction for Farmers

1 Project Idea

Problem Statement:

Agricultural producers face issues in forecasted harvest results because environmental elements like temperature patterns and both the quality of soil and their available assets create dynamic conditions. A system combining deep learning networks with machine learning algorithms provides farmers with tools to execute better decisions and manage resources and produce higher yields.

Goal:

An estimation system requires development to predict yields by combining environmental elements which include soil conditions together with weather patterns along with rain records and previous harvest results. The proposed solution includes traditional machine learning approaches with deep learning technologies to achieve better prediction accuracy.

2 Relevance to Sustainable Development Goals (SDGs):

The project supports multiple United Nations Sustainable Development Goals (SDGs) listed below:

SDG 2: The program works toward SDG 2 by utilizing data to make decisions that enhance crop productivity which ensures better food security.

Through SDG 13: Climate Action the program supports agriculture by delivering advanced predictions regarding crop yield adjustments due to climate change.

3 Literature Examples:

1. "Machine Learning Approaches for Crop Yield Prediction and Climate Impact Analysis"

- The analysis investigates regression models together with deep learning approaches to process agricultural information.
- The study establishes that Random Forest and Deep Neural Networks effectively predict crop yield through their testing results.

2. A system uses deep learning technology with remote sensing information to forecast crop production levels.

- Utilizes satellite imagery and Convolutional Neural Networks (CNNs) for crop yield estimation.
- Aerial data with high resolution shows its ability to produce more accurate predictions in this work.

4 About the data

Potential data sources:

- NASA Earth Observation Data
- FAO Crop Production Data
- Local Agricultural Reports
- Kaggle/Open-Source Datasets

Data format:

- CSV files containing structured data (temperature, humidity, rainfall, soil pH, etc.).
- Satellite images for deep learning-based analysis.

Data Preprocessing Steps:

- Handling missing values through imputation techniques.
- Feature scaling (normalization or standardization).
- Encoding categorical data (crop types, soil classification).
- Image preprocessing for deep learning models (resizing, augmentation, etc.).

5 Approach

Our approach will be hybrid**: Machine Learning & Deep Learning.**

Machine Learning Component: Random Forest, Decision Trees.

Deep Learning Component: Convolutional Neural Networks (CNNs) for satellite imagery analysis, LSTMs for time-series forecasting.