Crop Yield Prediction (SDG 2 - Zero Hunger)

1. Project Idea

- **Title:** Crop Yield Prediction Using Machine Learning for Sustainable Agriculture
- **Objective:** Develop a predictive model to estimate crop yield based on environmental factors such as soil quality, weather conditions, and farming practices.
- **Problem Statement:** Unpredictable crop yields lead to food insecurity, inefficient resource allocation, and economic losses for farmers. An accurate prediction system can help optimize agricultural productivity and contribute to achieving SDG 2 (Zero Hunger).

2. Relevance to Sustainable Development Goals (SDGs)

- **SDG 2 (Zero Hunger):** Ensures food security and sustainable agriculture by improving crop yield prediction, enabling better planning and resource utilization.
- **Impact:** Supports farmers, policymakers, and stakeholders in making data-driven decisions to increase agricultural productivity and reduce food wastage.

3. Literature Review

- Md. Abu Jabed , Masrah Azrifah Azmi Murad . "Crop yield prediction using machine learning: A systematic literature review," *Heliyon*, vol. **9**, no. **3**, p. **e240584**, Dec. 2024. [Online]. Available: https://www.sciencedirect.com/science/article/pii/S2405844024168673. [Accessed: Mar. 29, 2025].
- Banchigize Bazezew Mekecha, Alexander V. Gorbatov, "Crop yield prediction in Ethiopia using gradient boosting regression," *ResearchGate*, [Online]. Available: https://www.researchgate.net/publication/387663559_Crop_yield_prediction_in_Ethiopia_using_gradient_boosting_regression. [Accessed: Mar. 29, 2025].

4. Methodology

- **Data Collection:** Gather historical crop yield data, weather conditions, soil parameters, and remote sensing data.

- **Data Processing:** Clean and preprocess the dataset, handle missing values, and normalize features.
- **Model Selection:** Train and evaluate machine learning models (e.g., Random Forest, XGBoost, Neural Networks) for yield prediction.
- **Evaluation Metrics:** Use RMSE, MAE, and R^2 score to assess model accuracy.
- **Implementation:** Develop a web-based or mobile application for farmers to input data and receive yield predictions.

5. Expected Outcomes

- **Increased Agricultural Efficiency:** Helps farmers optimize resources such as fertilizers, water, and labor.
- **Improved Food Security:** Enables better planning for food production and distribution.
- **Climate Adaptation:** Assists in understanding the impact of climate change on crop yield and suggests adaptive strategies.