**Crop Recommendation System**

**Abstract**

The Crop Recommendation System leverages soil characteristics—such as soil type, pH level, temperature, water level, humidity, and land size—to recommend suitable crops. By integrating these factors into a machine learning framework, the system adopts a data-driven approach to minimize reliance on manual decision-making and enhance agricultural productivity. In addition to using Python’s dictionary structures for basic lookup operations, an **LDA (Latent Dirichlet Allocation)** model is employed to analyze latent patterns in soil and environmental data, grouping similar conditions to improve crop predictions. This hybrid approach ensures computational simplicity, scalability, and increased precision in crop recommendations.

**Prerequisites**

**Required Packages and Tools**

Core Python: Dictionary structures and logical constructs for basic mapping.

Python Libraries for LDA: Pandas: For structured data handling and preprocessing.

NumPy: For numerical operations.

scikit-learn: For implementing the LDA model.

**Matplotlib/Seaborn**: For visualizing crop recommendations and LDA results.

**Setup:**

* Python 3.8 or above.
* IDE: Jupyter Notebook or VS Code.

**Methodology**

**Data Collection and Preprocessing:**

* 1. Input Features: **Soil Type**: Sandy, loamy, clayey, etc.
  2. **pH Level**: Low, neutral, high.
  3. Temperature: Recorded in Celsius or Fahrenheit.
  4. **Water Level**: Measured in cm or inches, indicating irrigation needs.
  5. Humidity: Percentage indicating moisture in the air.
  6. **Land Size**: Area of the land in hectares or acres.