

# Smart Crop Recommendation System

AI-Powered Agricultural Decision Support

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Technology Stack: Python | Scikit-learn | Random Forest | Gradio | Google Colab



## Slide 2: Problem Statement

Farmers often struggle to choose the most suitable crop due to varying soil nutrients and climatic conditions. Incorrect crop selection leads to reduced yield and financial loss.

**Objective:** To build an intelligent ML system that recommends the optimal crop based on soil and environmental parameters.

# Slide 3: Dataset Description

Source: Kaggle Features Used:

- Nitrogen (N)
- Phosphorus (P)
- Potassium (K)
- Temperature
- Humidity
- pH
- Rainfall

Target Variable:

- Crop Label (Multi-class classification)



## Slide 4: Exploratory Data Analysis

- Checked for missing values and duplicates
- Analyzed feature distributions
- Identified feature correlation
- Verified class balance
- Visualized nutrient impact on crop types

Insight: Clear separability between crop classes enabled high model performance.

## Slide 5: Data Preprocessing

- Feature selection
- Train-test split (80-20)
- Scaling (if applied)
- Proper feature-target separation
- Avoided data leakage

## Slide 6: Model Building

**Algorithm Used: Random Forest Classifier**

Why Random Forest?

- Handles multi-class classification well
- Reduces overfitting via ensemble learning
- Works effectively with structured agricultural data



## Slide 7: Model Evaluation

- Accuracy: **98%**
- No significant overfitting observed
- Stable train vs test performance
- Confusion matrix validated class predictions



## Slide 8: Deployment

- Model saved using Joblib
- Interactive User Interface built using **Gradio**
- Deployed via Google Colab (public shareable link)

Users can:

- Enter soil parameters
- Get instant crop recommendation

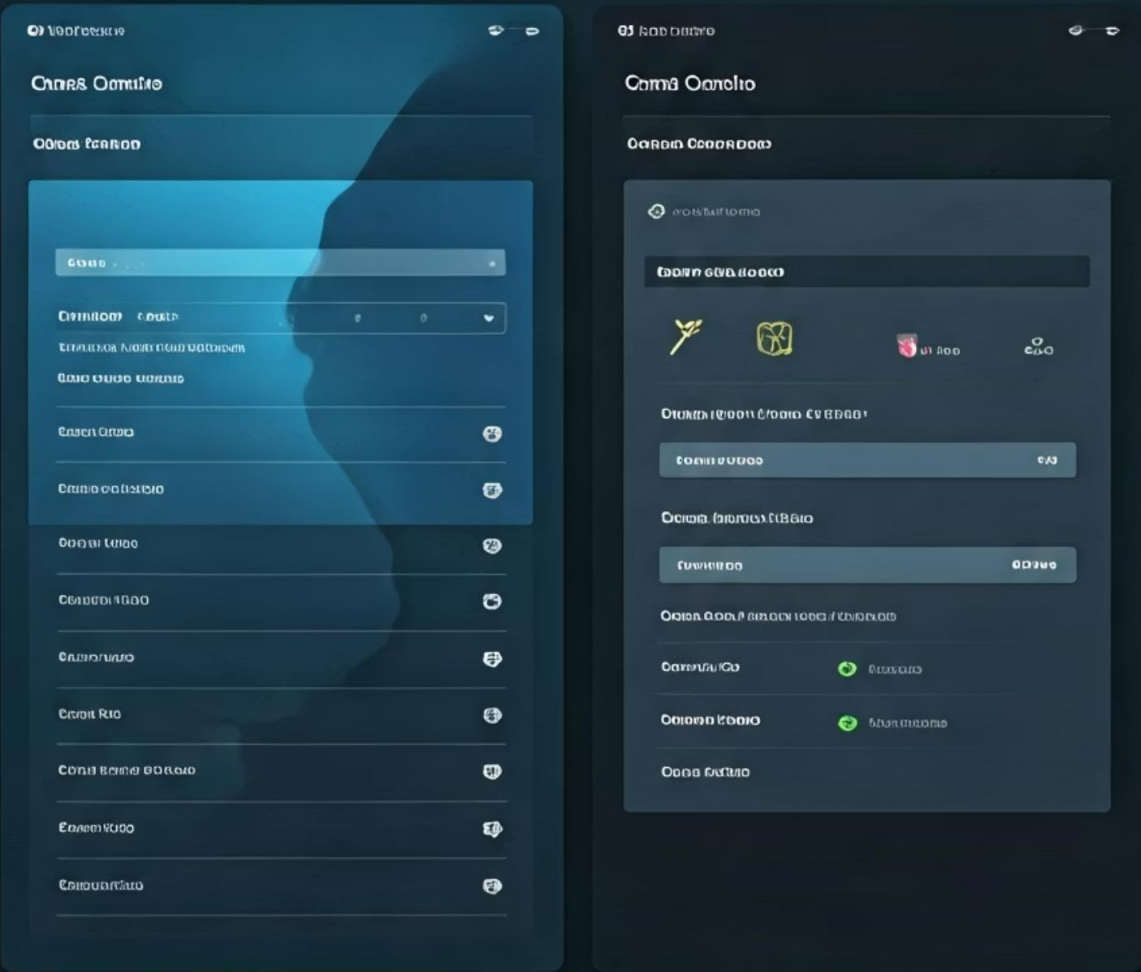


# Slide 9: UI Demonstration

(Insert your attached screenshot here)

## Highlights:

- Clean two-column input layout
- Interactive prediction button
- Real-time output display
- Recruiter-friendly professional design



## Slide 10: Key Learnings

- Importance of avoiding data leakage
- Model selection & evaluation techniques
- UI integration with ML models
- Deployment workflow

## Slide 11: Future Enhancements

- Add crop yield prediction
- Add fertilizer recommendation
- Deploy on Hugging Face Spaces
- Convert into full-stack web app

