

crop_recommendation

February 14, 2025

```
[1]: # Install necessary libraries
!pip install pandas scikit-learn joblib matplotlib seaborn

# Import Libraries
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.model_selection import train_test_split
from sklearn.ensemble import RandomForestClassifier
from sklearn.metrics import accuracy_score, classification_report, confusion_matrix
import joblib

# Load Dataset
crop_data = pd.read_csv("Crop_recommendation.csv")

# Prepare dataset
X = crop_data.drop(columns=['label'])
y = crop_data['label']

# Split Data
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)

# Train Random Forest Classifier
crop_model = RandomForestClassifier(n_estimators=200, random_state=42)
crop_model.fit(X_train, y_train)

# Make Predictions
y_pred = crop_model.predict(X_test)

# **Evaluation Metrics**
accuracy = accuracy_score(y_test, y_pred)
print(f"Crop Recommendation Model Accuracy: {accuracy * 100:.2f}%")

# **Classification Report**
```

```

print("\nClassification Report:\n", classification_report(y_test, y_pred))

# **Confusion Matrix**
conf_matrix = confusion_matrix(y_test, y_pred)
plt.figure(figsize=(12, 8))
sns.heatmap(conf_matrix, annot=True, fmt='d', cmap='Blues', xticklabels=np.unique(y), yticklabels=np.unique(y))
plt.xlabel('Predicted Label')
plt.ylabel('True Label')
plt.title('Confusion Matrix - Crop Recommendation')
plt.show()

# Save Model
joblib.dump(crop_model, "crop_recommendation_model.pkl")
print("Crop Recommendation Model Saved.")

```

Requirement already satisfied: pandas in
 /Users/devashishmudigonda/Desktop/TRANSFER DEV/Plant-Disease-Prediction-main/Plant-Disease-Prediction-main/venv/lib/python3.12/site-packages (2.2.3)

Requirement already satisfied: scikit-learn in
 /Users/devashishmudigonda/Desktop/TRANSFER DEV/Plant-Disease-Prediction-main/Plant-Disease-Prediction-main/venv/lib/python3.12/site-packages (1.5.2)

Requirement already satisfied: joblib in
 /Users/devashishmudigonda/Desktop/TRANSFER DEV/Plant-Disease-Prediction-main/Plant-Disease-Prediction-main/venv/lib/python3.12/site-packages (1.4.2)

Requirement already satisfied: matplotlib in
 /Users/devashishmudigonda/Desktop/TRANSFER DEV/Plant-Disease-Prediction-main/Plant-Disease-Prediction-main/venv/lib/python3.12/site-packages (3.9.2)

Collecting seaborn
 Using cached seaborn-0.13.2-py3-none-any.whl.metadata (5.4 kB)

Requirement already satisfied: numpy>=1.26.0 in
 /Users/devashishmudigonda/Desktop/TRANSFER DEV/Plant-Disease-Prediction-main/Plant-Disease-Prediction-main/venv/lib/python3.12/site-packages (from pandas) (2.1.2)

Requirement already satisfied: python-dateutil>=2.8.2 in
 /Users/devashishmudigonda/Desktop/TRANSFER DEV/Plant-Disease-Prediction-main/Plant-Disease-Prediction-main/venv/lib/python3.12/site-packages (from pandas) (2.9.0.post0)

Requirement already satisfied: pytz>=2020.1 in
 /Users/devashishmudigonda/Desktop/TRANSFER DEV/Plant-Disease-Prediction-main/Plant-Disease-Prediction-main/venv/lib/python3.12/site-packages (from pandas) (2024.2)

Requirement already satisfied: tzdata>=2022.7 in
 /Users/devashishmudigonda/Desktop/TRANSFER DEV/Plant-Disease-Prediction-main/Plant-Disease-Prediction-main/venv/lib/python3.12/site-packages (from pandas) (2024.2)

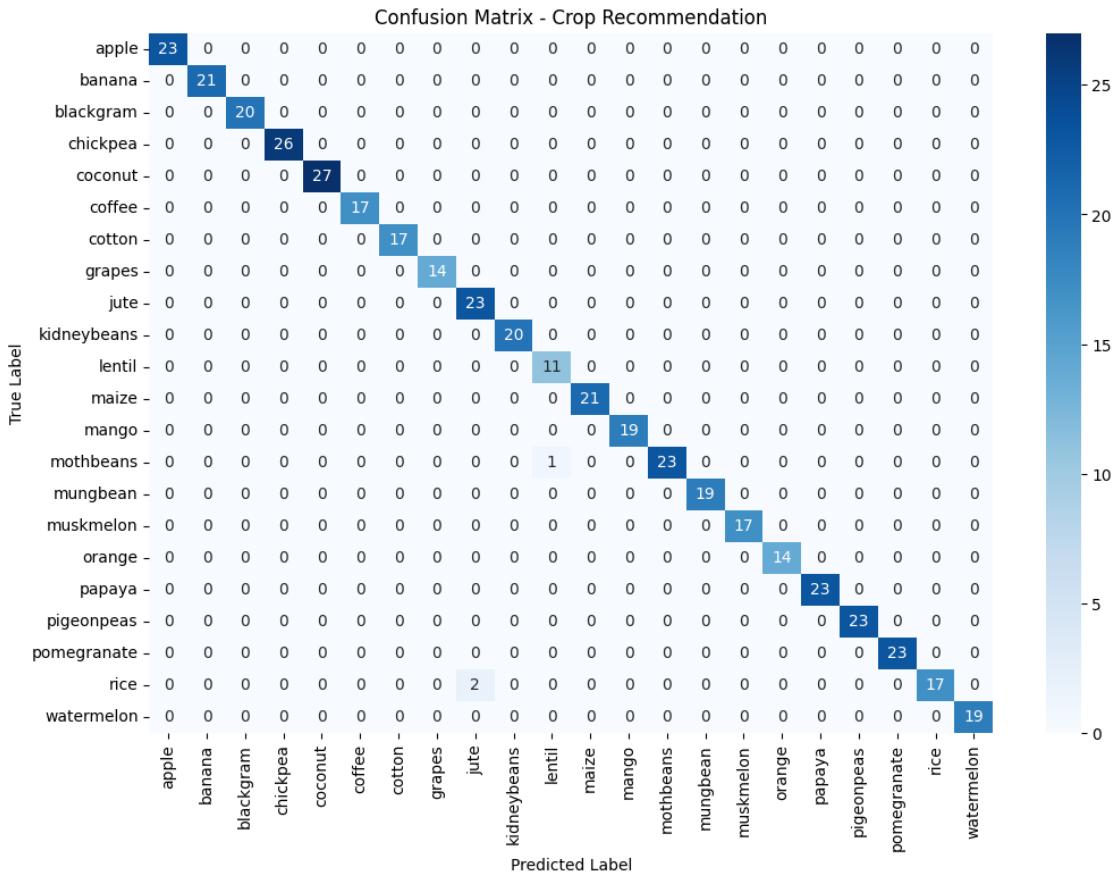
Requirement already satisfied: scipy>=1.6.0 in
 /Users/devashishmudigonda/Desktop/TRANSFER DEV/Plant-Disease-Prediction-

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main/Plant-Disease-Prediction-main/venv/lib/python3.12/site-packages (from
scikit-learn) (1.14.1)
Requirement already satisfied: threadpoolctl>=3.1.0 in
/Users/devashishmudigonda/Desktop/TRANSFER DEV/Plant-Disease-Prediction-
main/Plant-Disease-Prediction-main/venv/lib/python3.12/site-packages (from
scikit-learn) (3.5.0)
Requirement already satisfied: contourpy>=1.0.1 in
/Users/devashishmudigonda/Desktop/TRANSFER DEV/Plant-Disease-Prediction-
main/Plant-Disease-Prediction-main/venv/lib/python3.12/site-packages (from
matplotlib) (1.3.0)
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main/Plant-Disease-Prediction-main/venv/lib/python3.12/site-packages (from
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Requirement already satisfied: fonttools>=4.22.0 in
/Users/devashishmudigonda/Desktop/TRANSFER DEV/Plant-Disease-Prediction-
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matplotlib) (4.54.1)
Requirement already satisfied: kiwisolver>=1.3.1 in
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Requirement already satisfied: packaging>=20.0 in
/Users/devashishmudigonda/Desktop/TRANSFER DEV/Plant-Disease-Prediction-
main/Plant-Disease-Prediction-main/venv/lib/python3.12/site-packages (from
matplotlib) (24.1)
Requirement already satisfied: pillow>=8 in
/Users/devashishmudigonda/Desktop/TRANSFER DEV/Plant-Disease-Prediction-
main/Plant-Disease-Prediction-main/venv/lib/python3.12/site-packages (from
matplotlib) (11.0.0)
Requirement already satisfied: pyparsing>=2.3.1 in
/Users/devashishmudigonda/Desktop/TRANSFER DEV/Plant-Disease-Prediction-
main/Plant-Disease-Prediction-main/venv/lib/python3.12/site-packages (from
matplotlib) (3.2.0)
Requirement already satisfied: six>=1.5 in
/Users/devashishmudigonda/Desktop/TRANSFER DEV/Plant-Disease-Prediction-
main/Plant-Disease-Prediction-main/venv/lib/python3.12/site-packages (from
python-dateutil>=2.8.2->pandas) (1.16.0)
Using cached seaborn-0.13.2-py3-none-any.whl (294 kB)
Installing collected packages: seaborn
Successfully installed seaborn-0.13.2

[notice] A new release of pip is
available: 24.2 -> 25.0.1
[notice] To update, run:
pip install --upgrade pip
Crop Recommendation Model Accuracy: 99.32%
```

Classification Report:

	precision	recall	f1-score	support
apple	1.00	1.00	1.00	23
banana	1.00	1.00	1.00	21
blackgram	1.00	1.00	1.00	20
chickpea	1.00	1.00	1.00	26
coconut	1.00	1.00	1.00	27
coffee	1.00	1.00	1.00	17
cotton	1.00	1.00	1.00	17
grapes	1.00	1.00	1.00	14
jute	0.92	1.00	0.96	23
kidneybeans	1.00	1.00	1.00	20
lentil	0.92	1.00	0.96	11
maize	1.00	1.00	1.00	21
mango	1.00	1.00	1.00	19
mothbeans	1.00	0.96	0.98	24
mungbean	1.00	1.00	1.00	19
muskmelon	1.00	1.00	1.00	17
orange	1.00	1.00	1.00	14
papaya	1.00	1.00	1.00	23
pigeonpeas	1.00	1.00	1.00	23
pomegranate	1.00	1.00	1.00	23
rice	1.00	0.89	0.94	19
watermelon	1.00	1.00	1.00	19
accuracy			0.99	440
macro avg	0.99	0.99	0.99	440
weighted avg	0.99	0.99	0.99	440



Crop Recommendation Model Saved.

```
[2]: # Load the trained model
import joblib
crop_model = joblib.load("crop_recommendation_model.pkl")

# Example input values for prediction (Modify these values based on your
# dataset range)
sample_input = [[50, 30, 20, 25.5, 80.2, 6.5, 200]] # [N, P, K, Temperature,
# Humidity, pH, Rainfall]

# Predict the recommended crop
predicted_crop = crop_model.predict(sample_input)[0]

print(f'Recommended Crop: {predicted_crop}')
```

Recommended Crop: coconut

/Users/devashishmudigonda/Desktop/TRANSFER DEV/Plant-Disease-Prediction-main/Plant-Disease-Prediction-main/venv/lib/python3.12/site-packages/sklearn/base.py:493: UserWarning: X does not have valid feature names,

```

but RandomForestClassifier was fitted with feature names
warnings.warn(
[2]: # Install necessary libraries
!pip install pandas scikit-learn joblib matplotlib seaborn

# Import Libraries
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.model_selection import train_test_split
from sklearn.ensemble import RandomForestClassifier
from sklearn.metrics import accuracy_score, classification_report,
    confusion_matrix
import joblib
from sklearn.tree import plot_tree # Import for decision tree visualization

# Load Dataset
crop_data = pd.read_csv("Crop_recommendation.csv")

# Prepare dataset
X = crop_data.drop(columns=['label'])
y = crop_data['label']

# Split Data
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2,
    random_state=42)

# Train Random Forest Classifier
crop_model = RandomForestClassifier(n_estimators=200, random_state=42)
crop_model.fit(X_train, y_train)

# Make Predictions
y_pred = crop_model.predict(X_test)

# **Evaluation Metrics**
accuracy = accuracy_score(y_test, y_pred)
print(f"Crop Recommendation Model Accuracy: {accuracy * 100:.2f}%")

# **Classification Report**
print("\nClassification Report:\n", classification_report(y_test, y_pred))

# **Confusion Matrix**
conf_matrix = confusion_matrix(y_test, y_pred)
plt.figure(figsize=(12, 8))

```

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sns.heatmap(conf_matrix, annot=True, fmt='d', cmap='Blues', xticklabels=np.unique(y), yticklabels=np.unique(y))
plt.xlabel('Predicted Label')
plt.ylabel('True Label')
plt.title('Confusion Matrix - Crop Recommendation')
plt.show()

# **Visualizing Multiple Decision Trees for Different Crops**
unique_crops = np.unique(y)
num_trees_to_display = min(len(unique_crops), len(crop_model.estimators_)) # ↴
# Display up to the number of crops or trees

for i in range(num_trees_to_display):
    plt.figure(figsize=(20, 10))
    single_tree = crop_model.estimators_[i] # Get one tree from the Random Forest
    dominant_class = unique_crops[i] # Assign each tree to a unique crop class

    plot_tree(single_tree,
              feature_names=['Rainfall', 'Temperature', 'Humidity', 'pH', 'N', 'P', 'K'],
              class_names=np.unique(y),
              filled=True,
              rounded=True,
              fontsize=8)
    plt.title(f"Decision Tree {i+1} for Crop: {dominant_class}")
    plt.show()

# Save Model
joblib.dump(crop_model, "crop_recommendation_model.pkl")
print("Crop Recommendation Model Saved.")

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Requirement already satisfied: pandas in
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Requirement already satisfied: seaborn in
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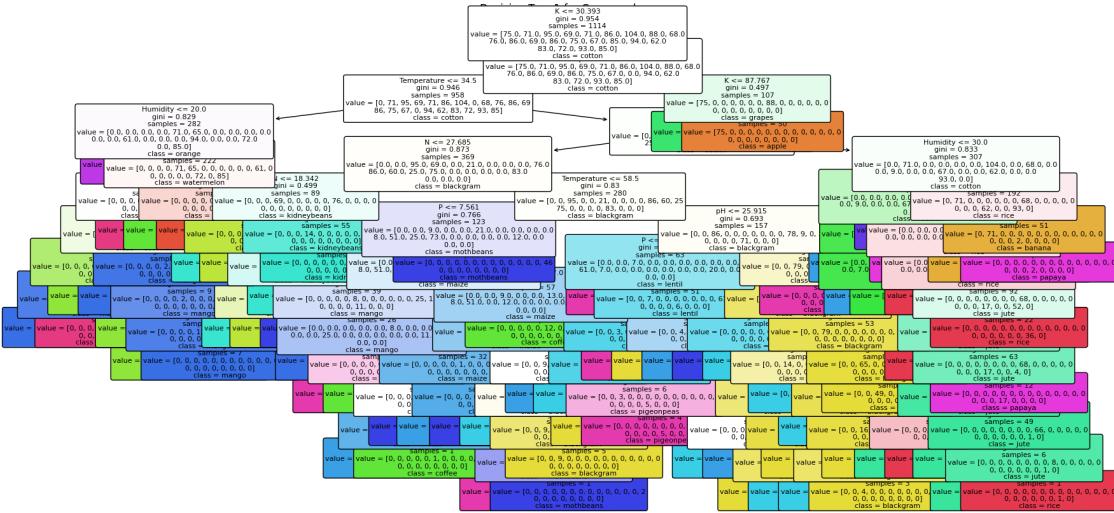
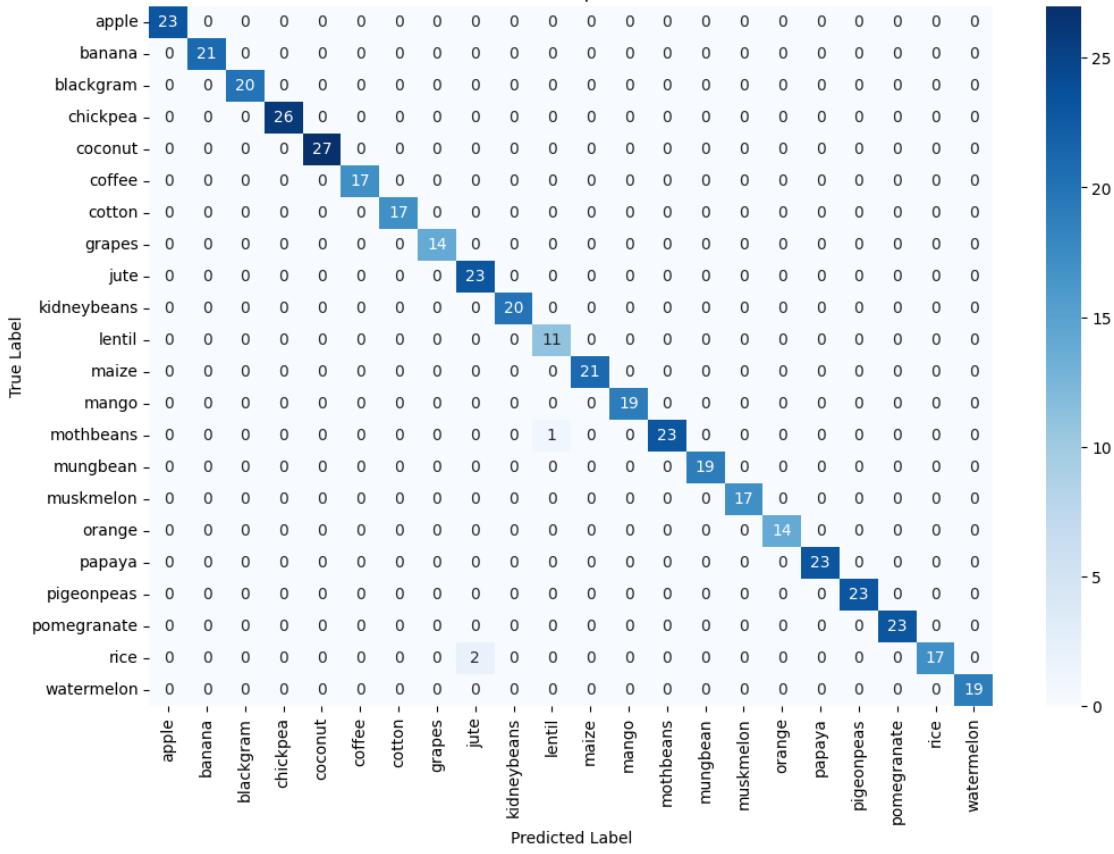
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/Users/devashishmudigonda/Desktop/TRANSFER DEV/Plant-Disease-Prediction-
main/Plant-Disease-Prediction-main/venv/lib/python3.12/site-packages (from
python-dateutil>=2.8.2->pandas) (1.16.0)
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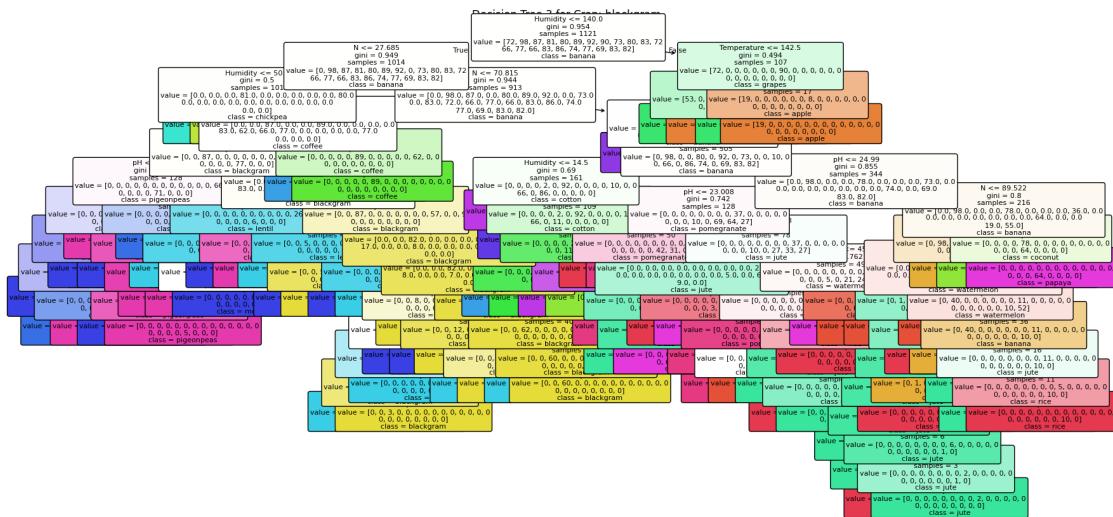
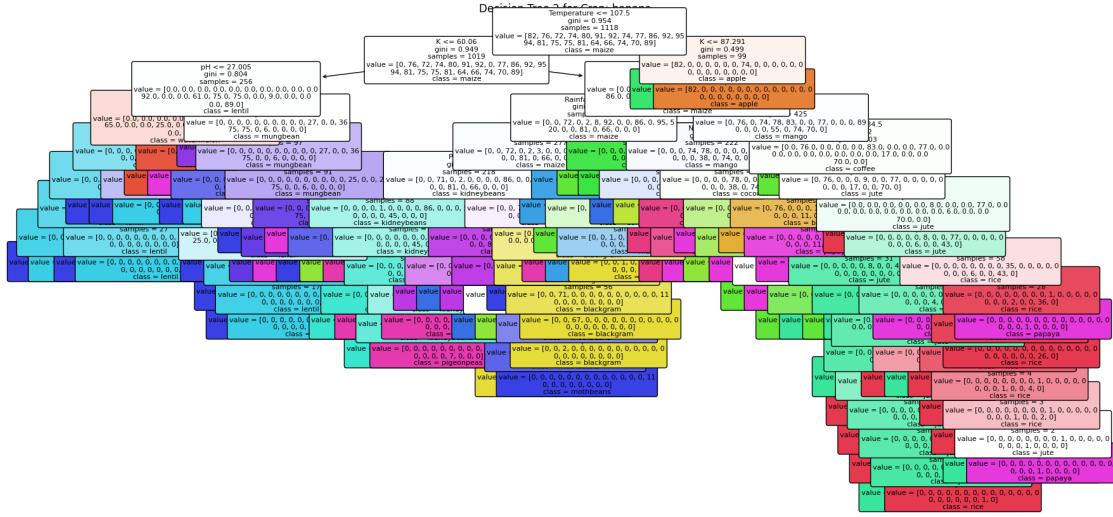
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[notice] A new release of pip is
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[notice] To update, run:
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Crop Recommendation Model Accuracy: 99.32%
```

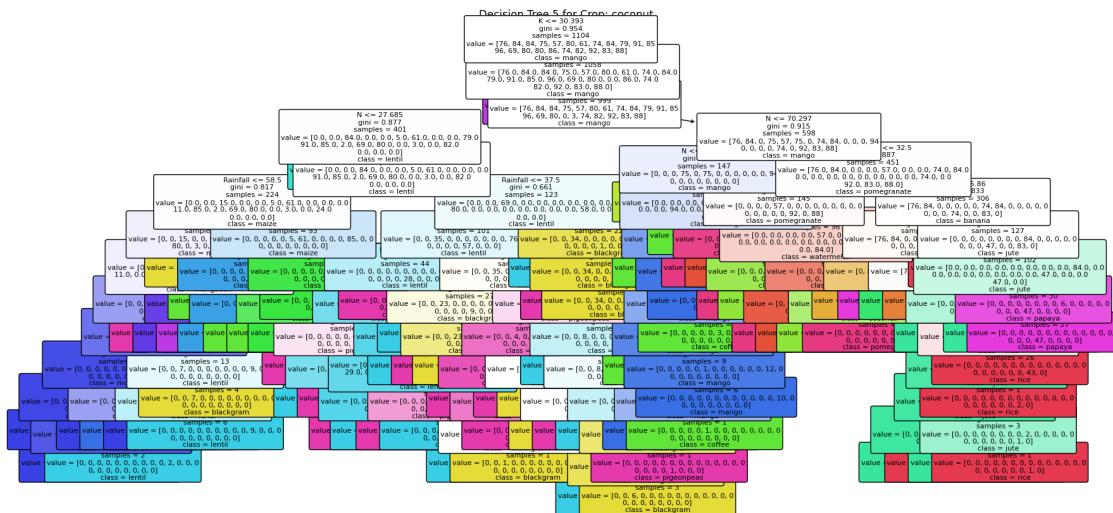
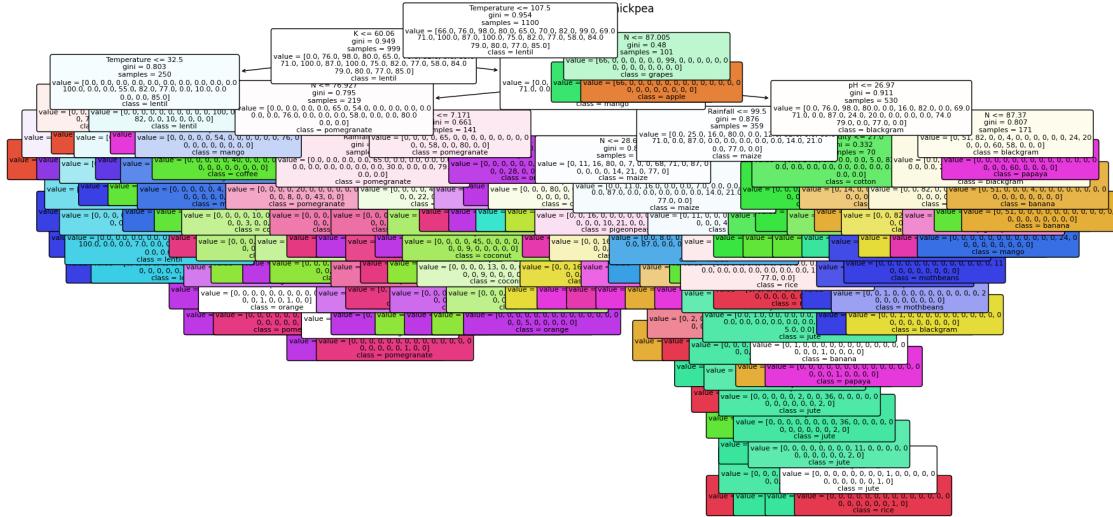
Classification Report:

	precision	recall	f1-score	support
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banana	1.00	1.00	1.00	21
blackgram	1.00	1.00	1.00	20
chickpea	1.00	1.00	1.00	26
coconut	1.00	1.00	1.00	27
coffee	1.00	1.00	1.00	17
cotton	1.00	1.00	1.00	17
grapes	1.00	1.00	1.00	14
jute	0.92	1.00	0.96	23
kidneybeans	1.00	1.00	1.00	20
lentil	0.92	1.00	0.96	11
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mango	1.00	1.00	1.00	19
mothbeans	1.00	0.96	0.98	24
mungbean	1.00	1.00	1.00	19
muskmelon	1.00	1.00	1.00	17
orange	1.00	1.00	1.00	14
papaya	1.00	1.00	1.00	23
pigeonpeas	1.00	1.00	1.00	23
pomegranate	1.00	1.00	1.00	23
rice	1.00	0.89	0.94	19
watermelon	1.00	1.00	1.00	19
accuracy			0.99	440
macro avg	0.99	0.99	0.99	440
weighted avg	0.99	0.99	0.99	440

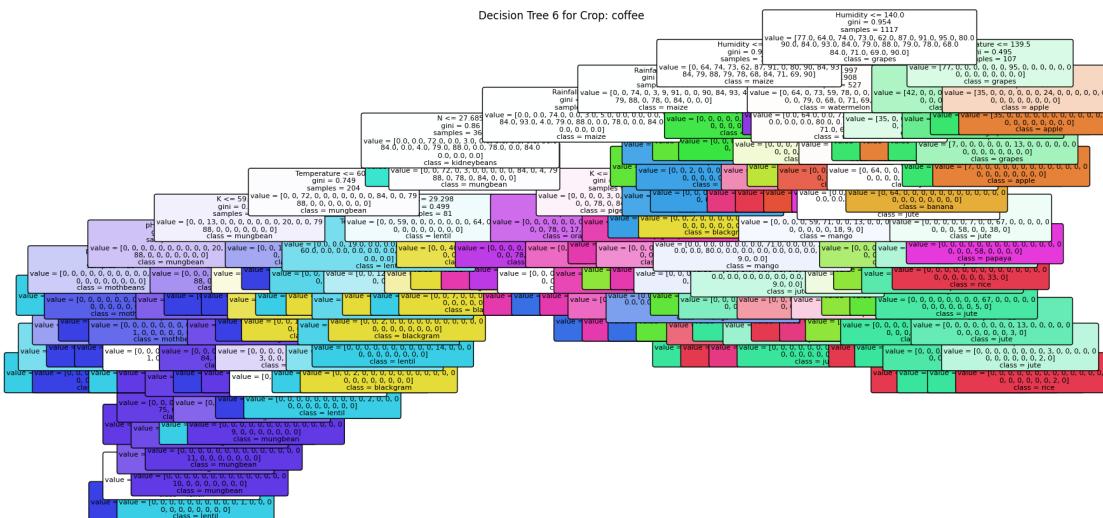
Confusion Matrix - Crop Recommendation



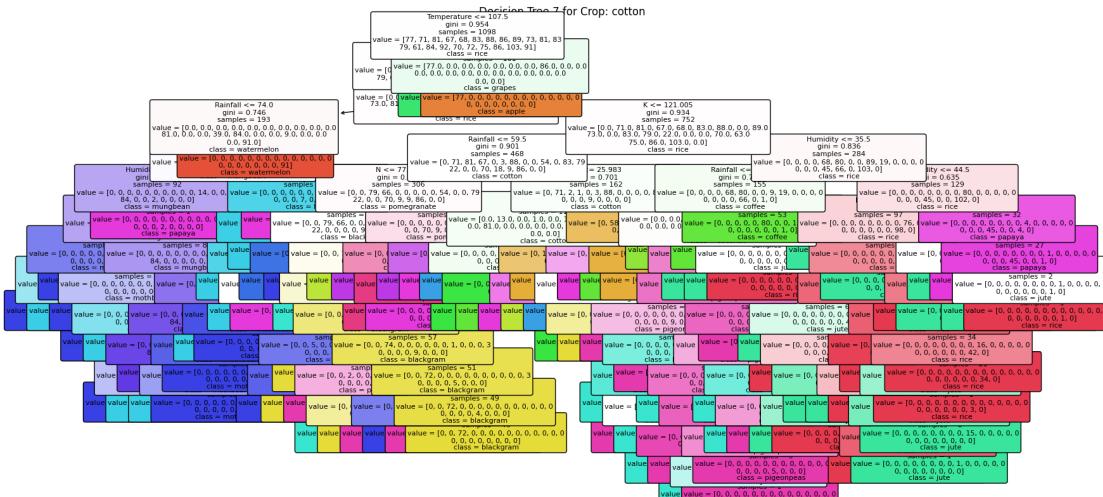




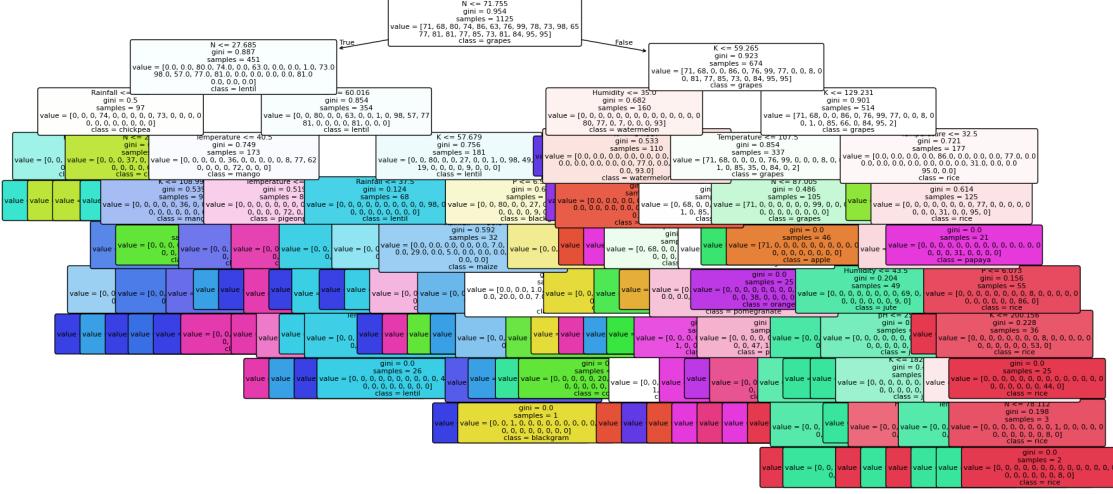
Decision Tree 6 for Crop: coffee



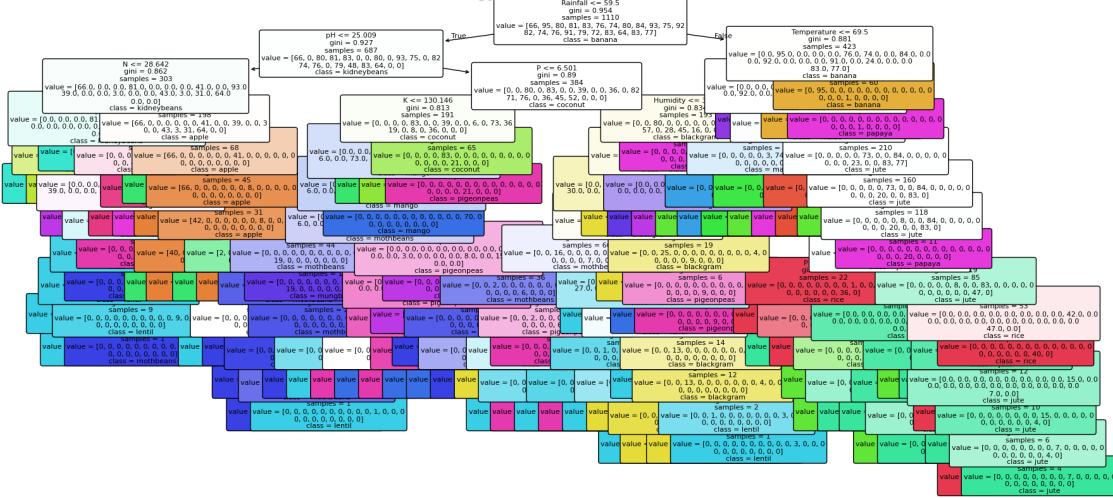
Decision Tree 7 for Crop: cotton

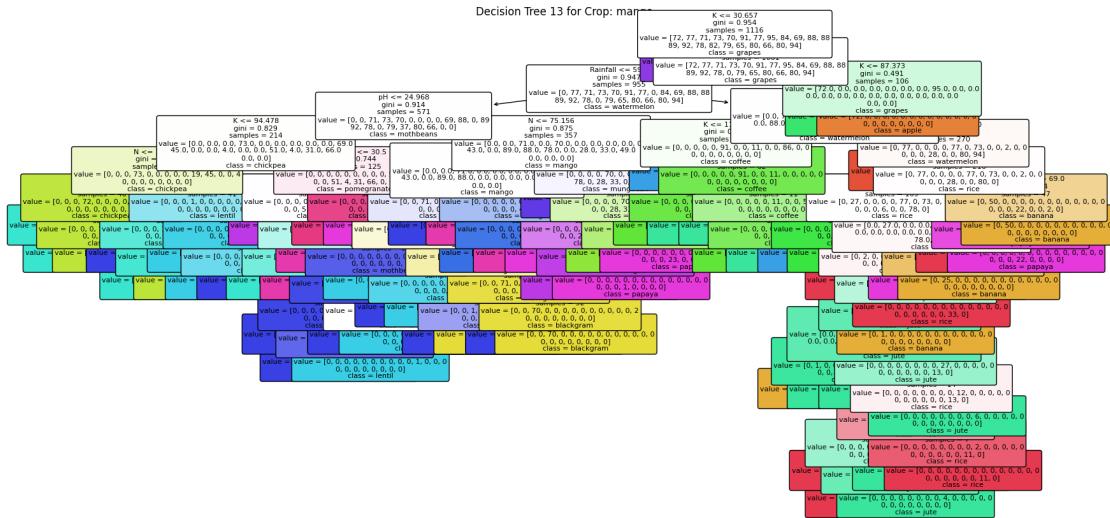
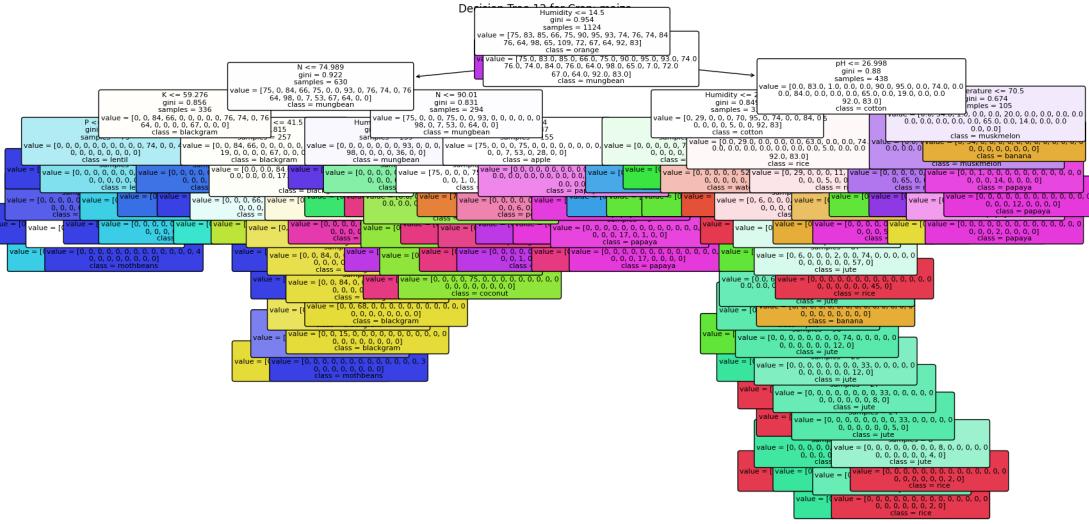


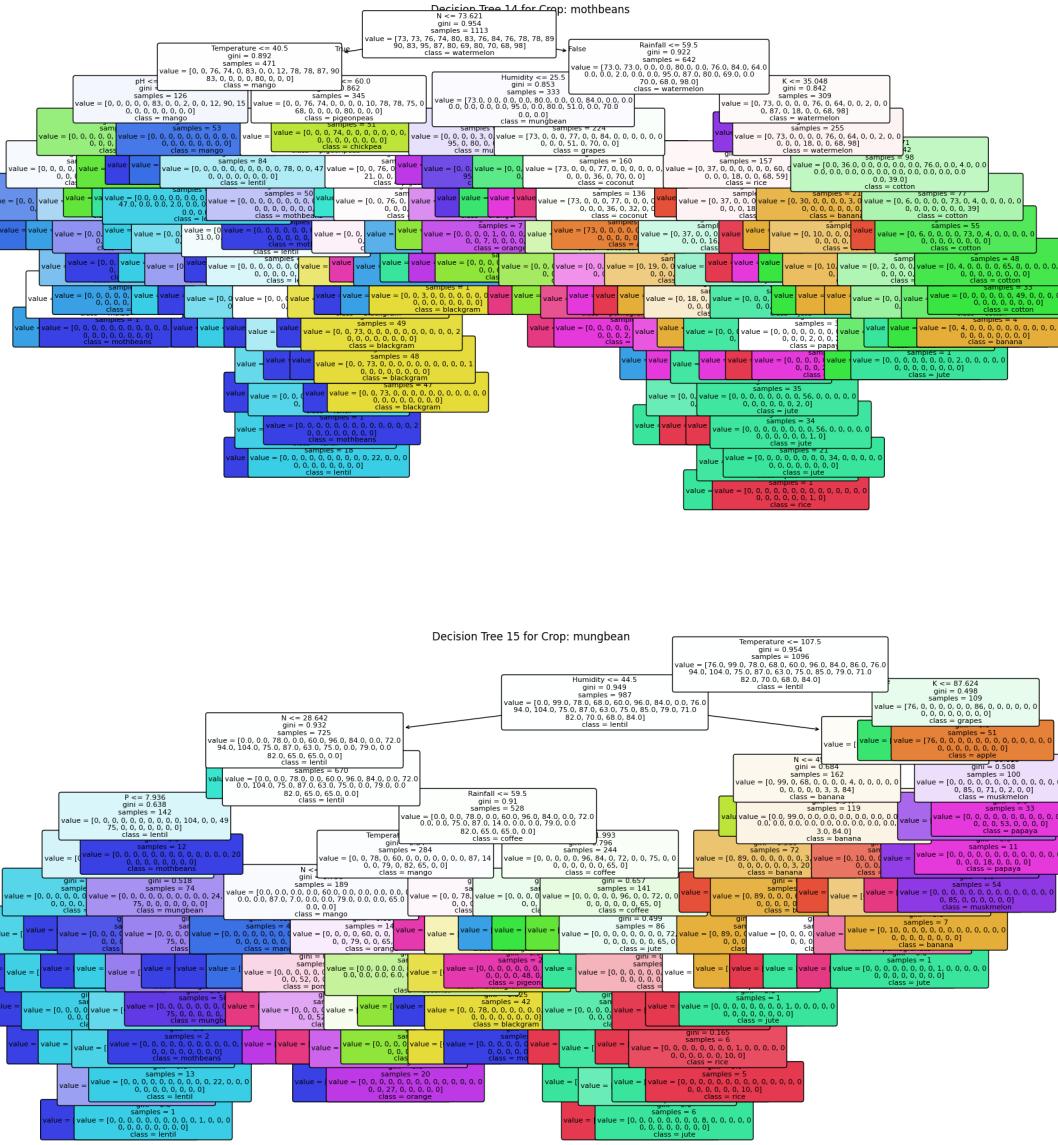
Decision Tree 10 for Crop: kidneybeans

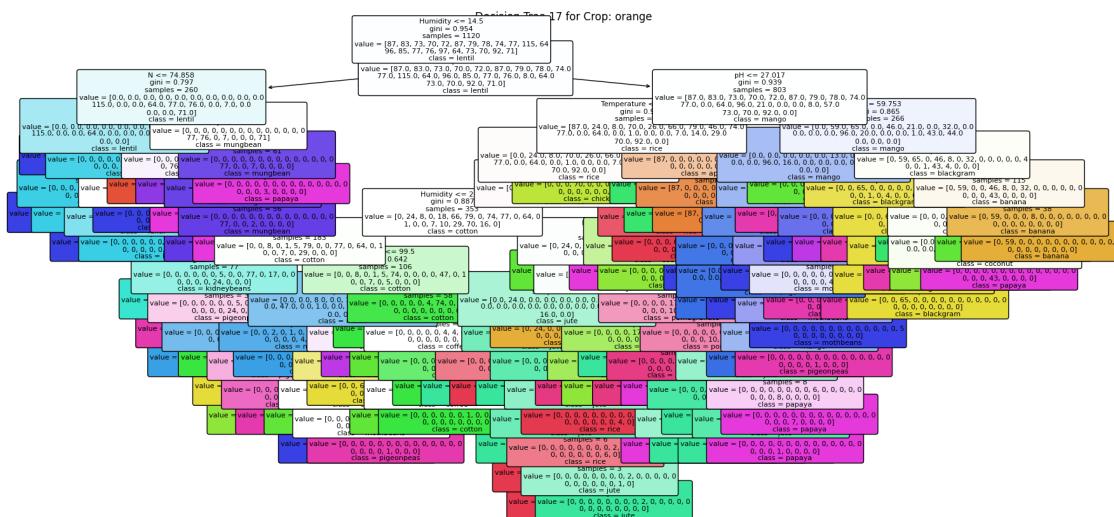
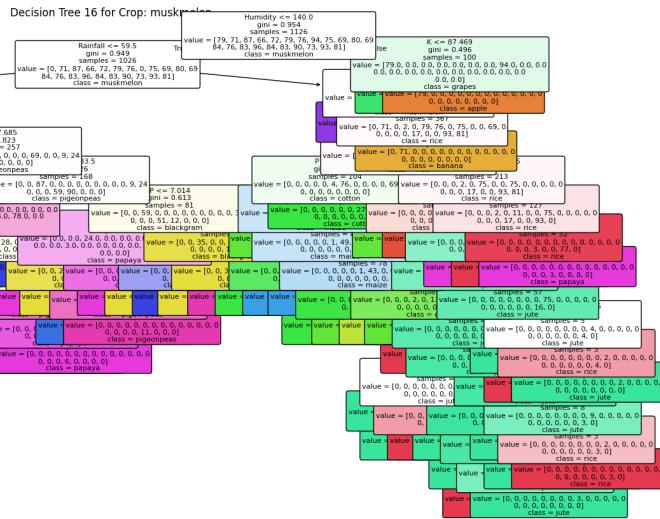


Decision Tree 11 for Crop: lentil

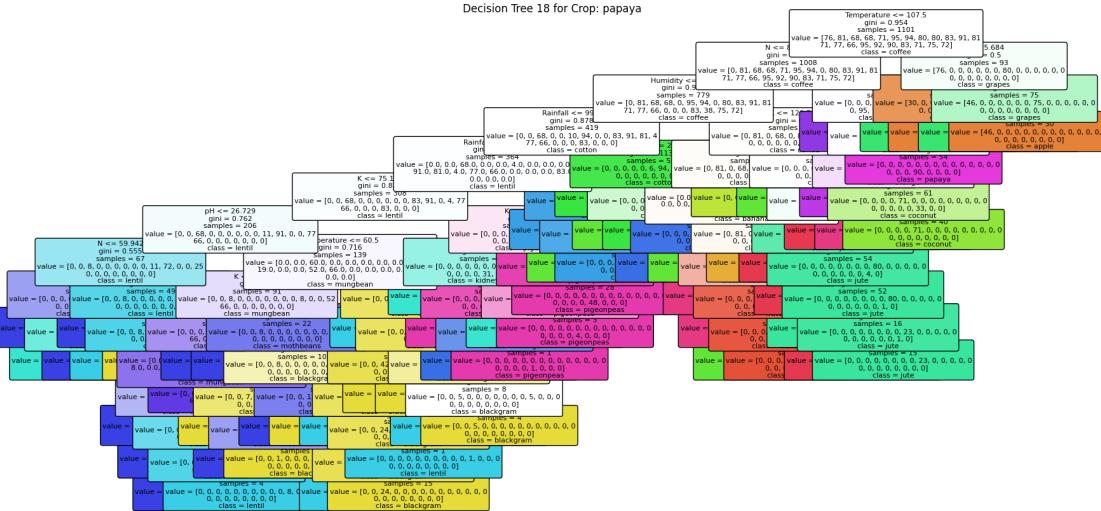




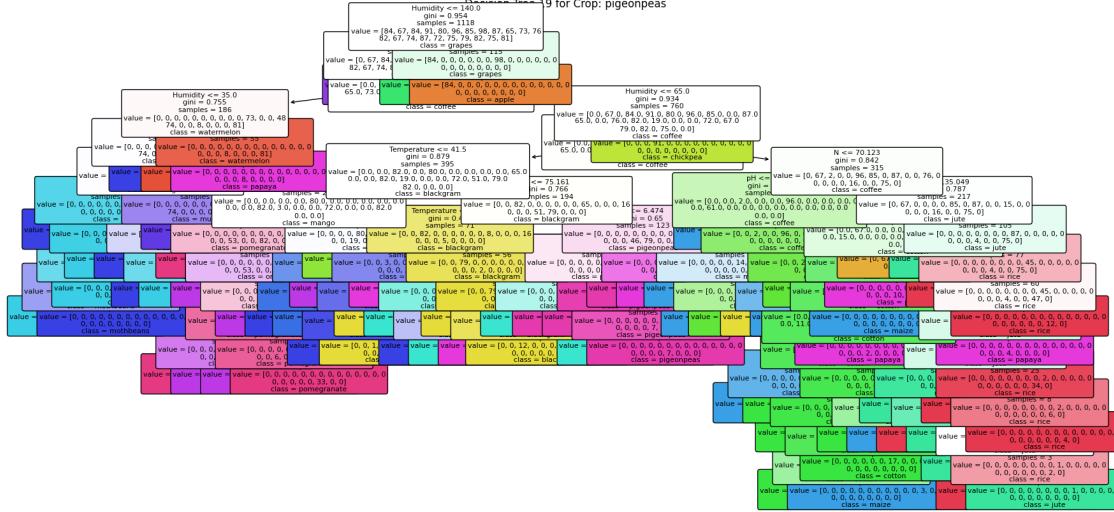


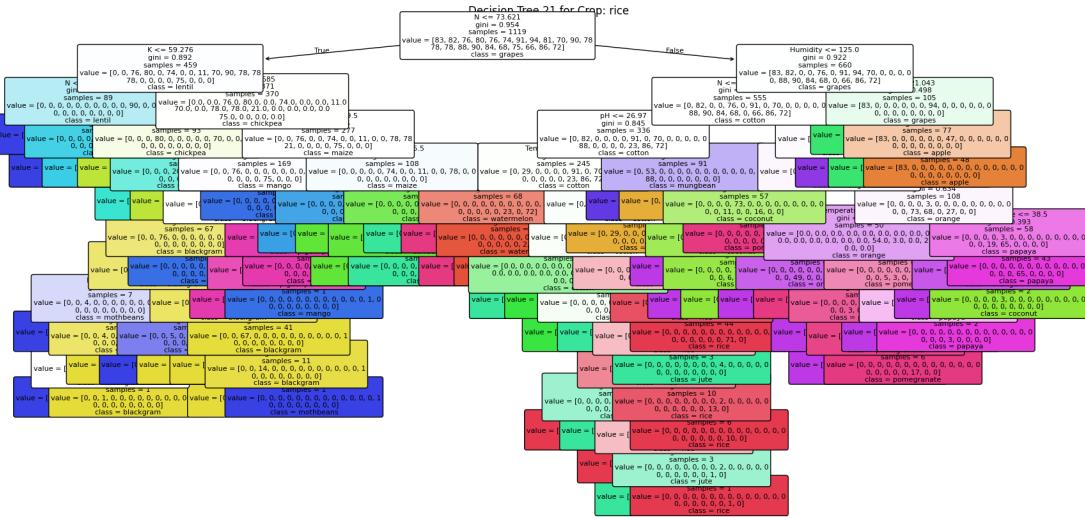
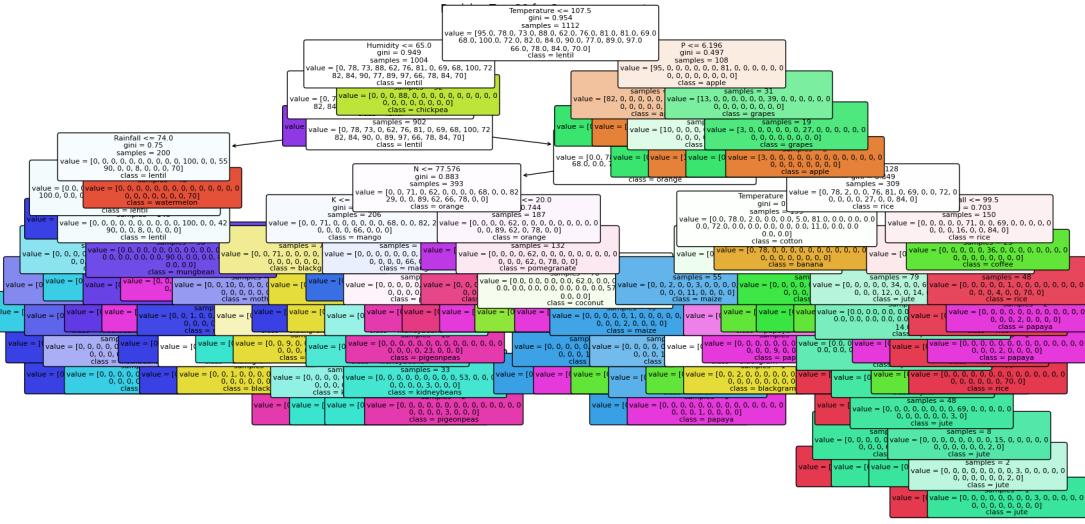


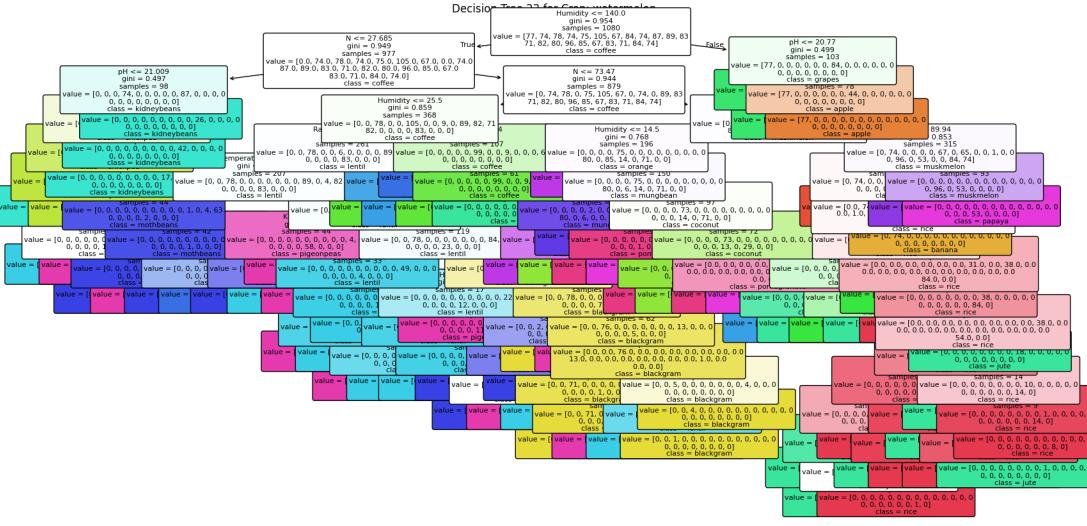
Decision Tree 18 for Crop: papaya



9 for Crop: pigeonpea







Crop Recommendation Model Saved.

[]: