AGRICULTURE PRODUCTION PREDICTION USING LINEAR REGRESSION

Project: Rice Production Trend Analysis (Mini Regression Project)

Tools Used: Python, Pandas, Matplotlib, scikit-learn

Dataset: World Food Production (CSV format)

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1. Introduction

This project explores rice production trends over the years using linear regression. The aim is to understand how rice production has evolved globally and predict future values using a simple but powerful machine learning model.

2. Tools & Technologies

- Python
- Pandas
- Matplotlib
- Scikit-learn
- Jupyter Notebook

2. Dataset Description

The dataset used for this project includes food production statistics from various countries and years. The key columns are:

- year: Represents the year of production
- country: Name of the country
- rice production: Quantity of rice produced
- wheat production: Quantity of wheat produced
- vegetable production: Quantity of vegetables produced

The dataset may also contain other numerical columns representing production data from specific years.

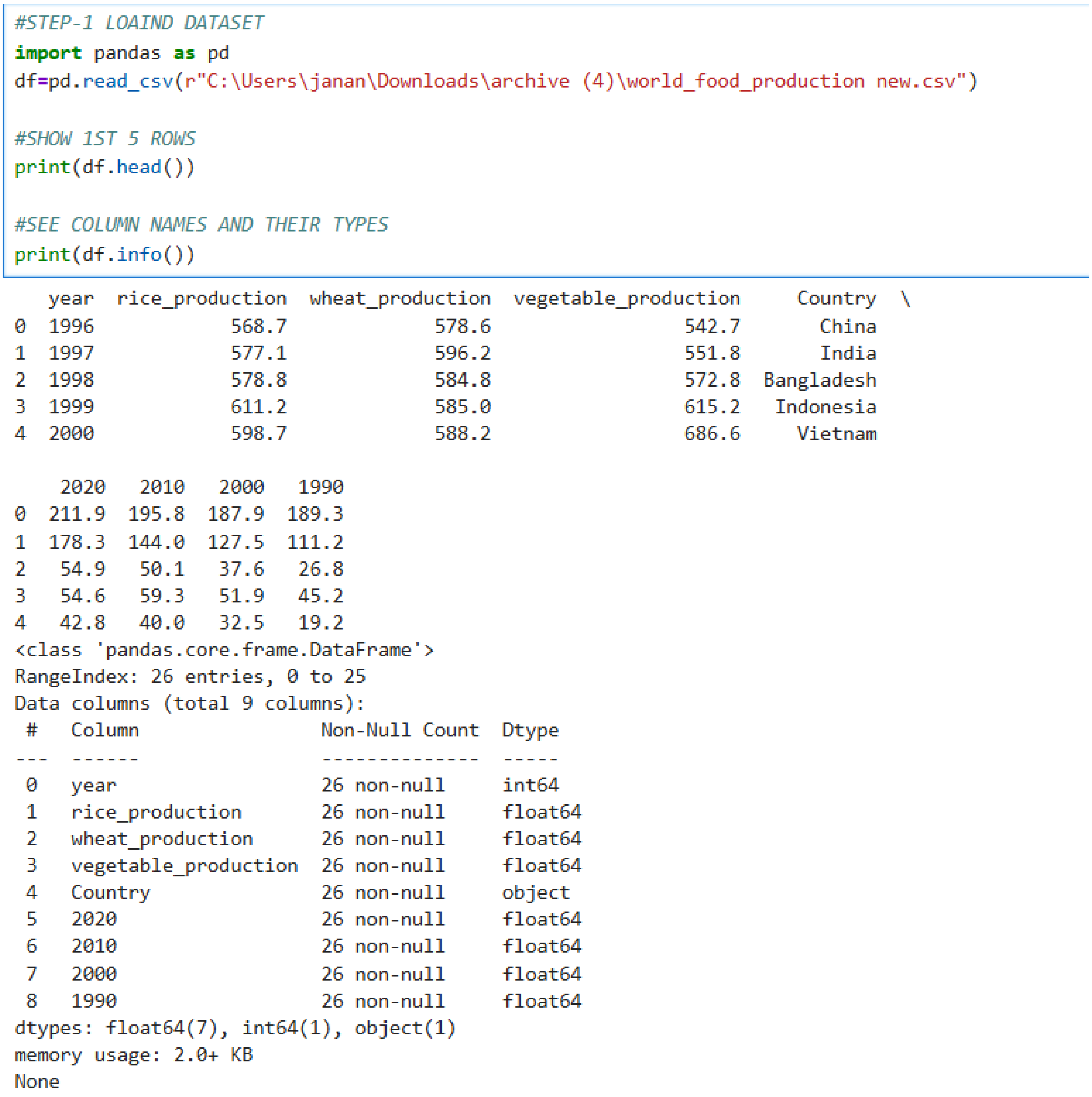
3. Methodology

1. **Data Loading & Cleaning:**
    - Imported the CSV file using Pandas
    - Handled missing values by removing incomplete rows
2. **Feature Selection:**
    - Selected year as the independent variable (X)
    - Selected rice production as the dependent variable (y)
3. **Model Building:**
    - Applied Linear Regression using scikit-learn
    - Trained the model on the data
4. **Visualization:**
    - Created a scatter plot of actual rice production values
    - Plotted the regression line to visualize the trend

4. Insights

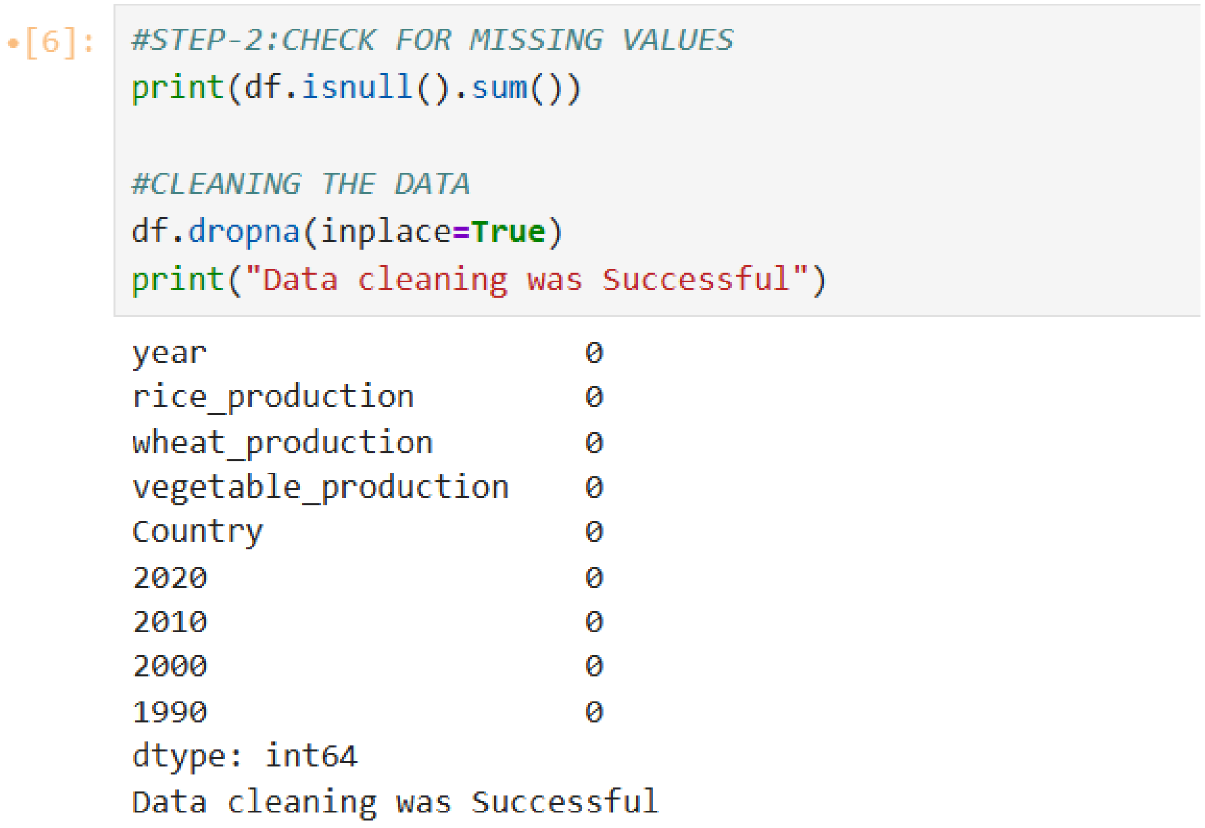
- Rice production has shown a steady increase over the years.
- The regression line indicates a positive upward trend.
- The model can estimate future production levels, such as predicting production for the year 2024-2030.
- Similar analysis can be applied to wheat and vegetable production trends

5.Visualisations:



```
#STEP-1 LOAIND DATASET
import pandas as pd
df=pd.read_csv(r"C:\Users\janan\Downloads\archive (4)\world_food_production new.csv")

#SHOW 1ST 5 ROWS
print(df.head())

#SEE COLUMN NAMES AND THEIR TYPES
print(df.info())
```

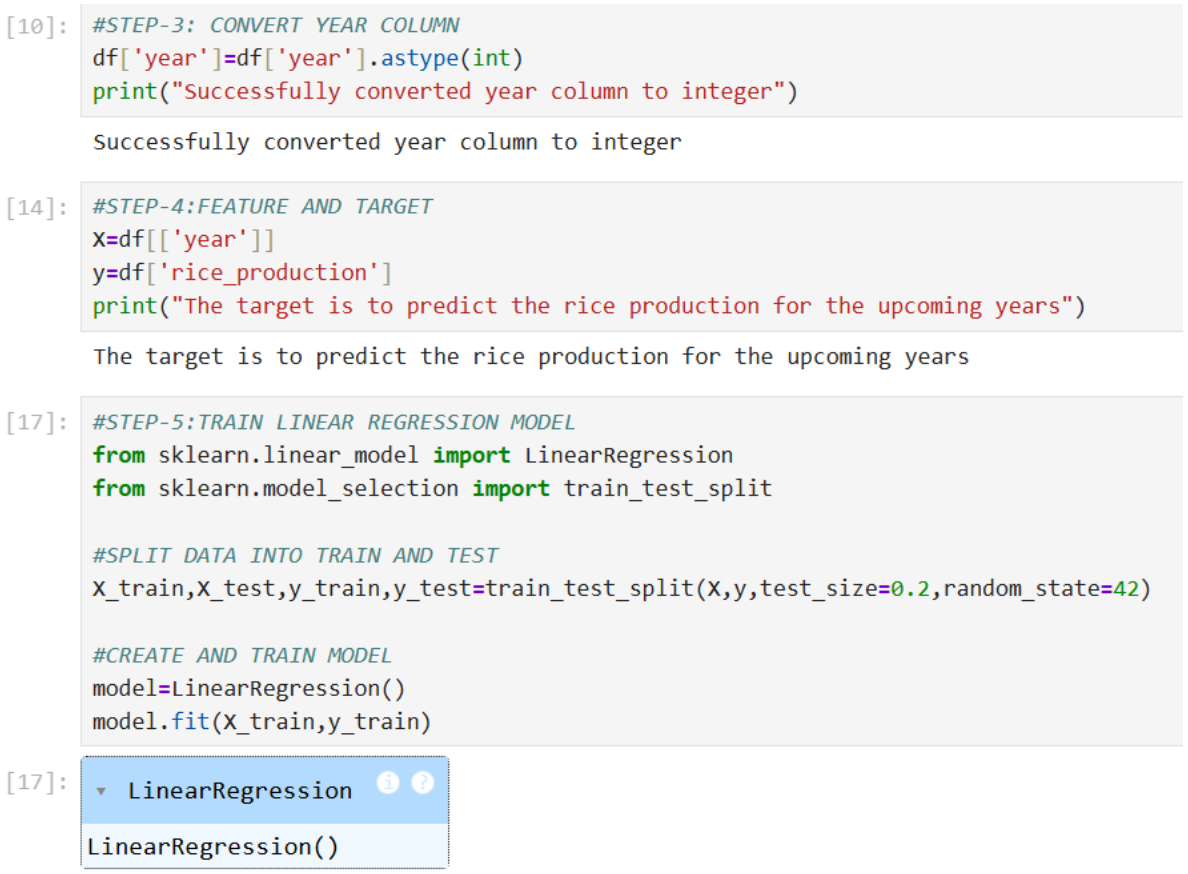
```
   year  rice_production  wheat_production  vegetable_production     Country  \
0  1996            568.7             578.6                 542.7       China   
1  1997            577.1             596.2                 551.8       India   
2  1998            578.8             584.8                 572.8  Bangladesh   
3  1999            611.2             585.0                 615.2   Indonesia   
4  2000            598.7             588.2                 686.6     Vietnam   

    2020   2010   2000   1990  
0  211.9  195.8  187.9  189.3  
1  178.3  144.0  127.5  111.2  
2   54.9   50.1   37.6   26.8  
3   54.6   59.3   51.9   45.2  
4   42.8   40.0   32.5   19.2  
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 26 entries, 0 to 25
Data columns (total 9 columns):
 #   Column                Non-Null Count  Dtype  
---  ------                --------------  -----  
 0   year                  26 non-null     int64  
 1   rice_production       26 non-null     float64
 2   wheat_production      26 non-null     float64
 3   vegetable_production  26 non-null     float64
 4   Country               26 non-null     object 
 5   2020                  26 non-null     float64
 6   2010                  26 non-null     float64
 7   2000                  26 non-null     float64
 8   1990                  26 non-null     float64
dtypes: float64(7), int64(1), object(1)
memory usage: 2.0+ KB
None
```



•[6]:

```python
#STEP-2:CHECK FOR MISSING VALUES
print(df.isnull().sum())

#CLEANING THE DATA
df.dropna(inplace=True)
print("Data cleaning was Successful")
```

```
year                    0
rice_production         0
wheat_production        0
vegetable_production    0
Country                 0
2020                    0
2010                    0
2000                    0
1990                    0
dtype: int64
Data cleaning was Successful
```



[10]:

```python
#STEP-3: CONVERT YEAR COLUMN
df['year']=df['year'].astype(int)
print("Successfully converted year column to integer")
```

```
Successfully converted year column to integer
```

[14]:

```python
#STEP-4:FEATURE AND TARGET
X=df[['year']]
y=df['rice_production']
print("The target is to predict the rice production for the upcoming years")
```

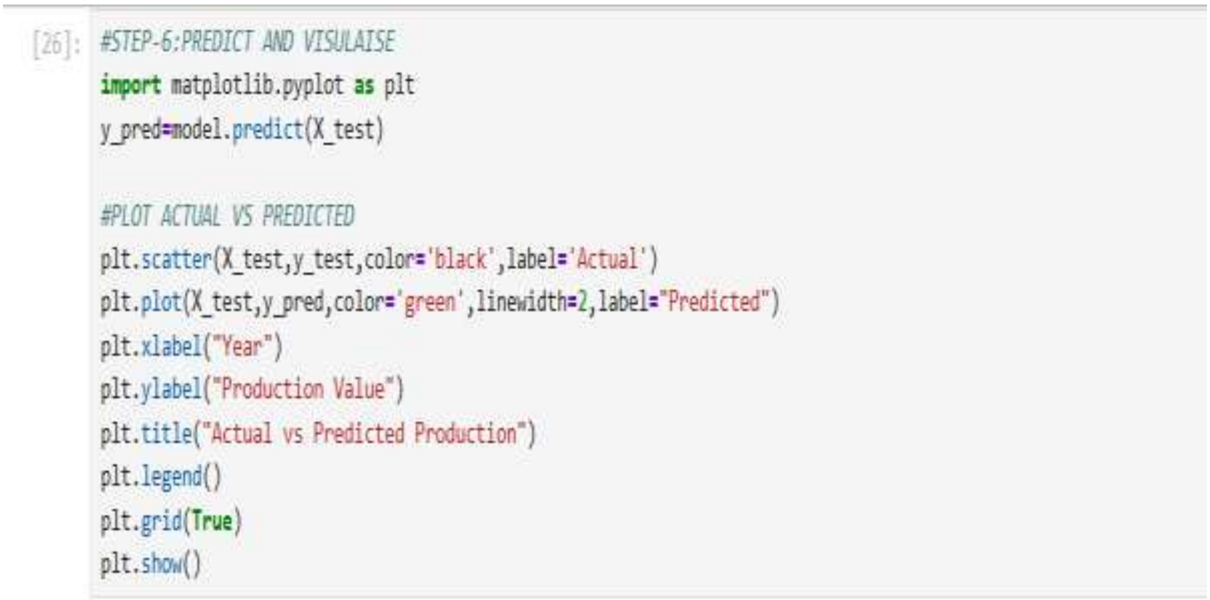
```
The target is to predict the rice production for the upcoming years
```

[17]:

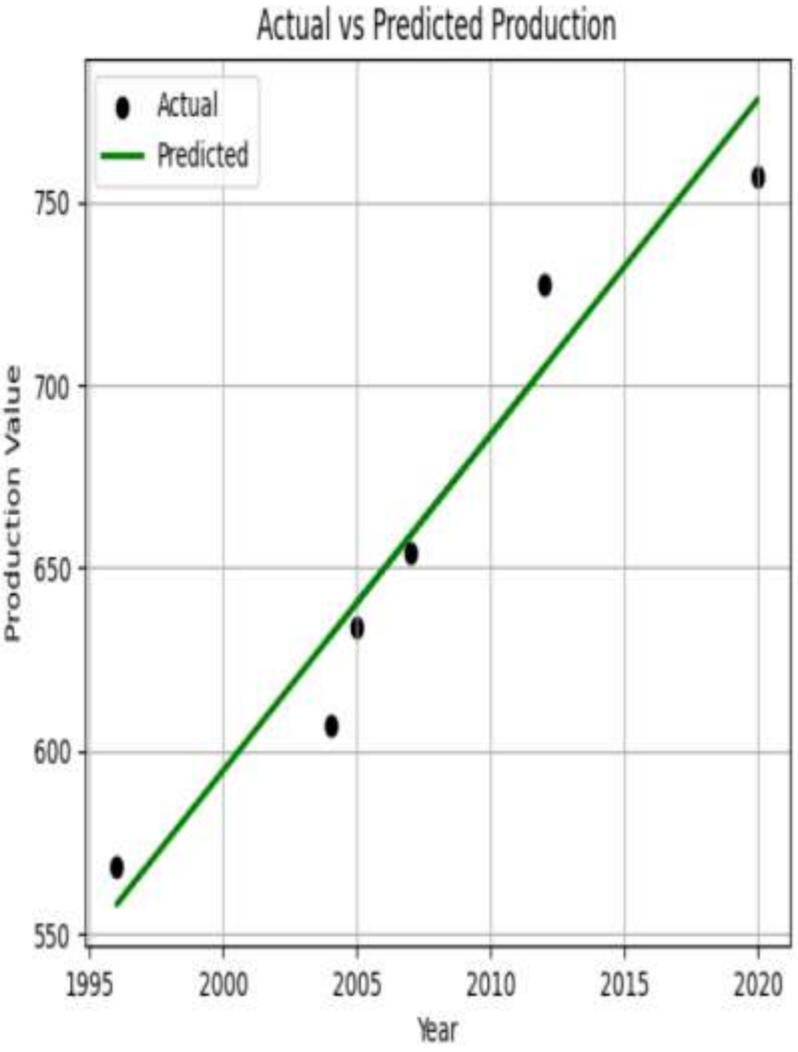
```python
#STEP-5:TRAIN LINEAR REGRESSION MODEL
from sklearn.linear_model import LinearRegression
from sklearn.model_selection import train_test_split

#SPLIT DATA INTO TRAIN AND TEST
X_train,X_test,y_train,y_test=train_test_split(X,y,test_size=0.2,random_state=42)

#CREATE AND TRAIN MODEL
model=LinearRegression()
model.fit(X_train,y_train)
```

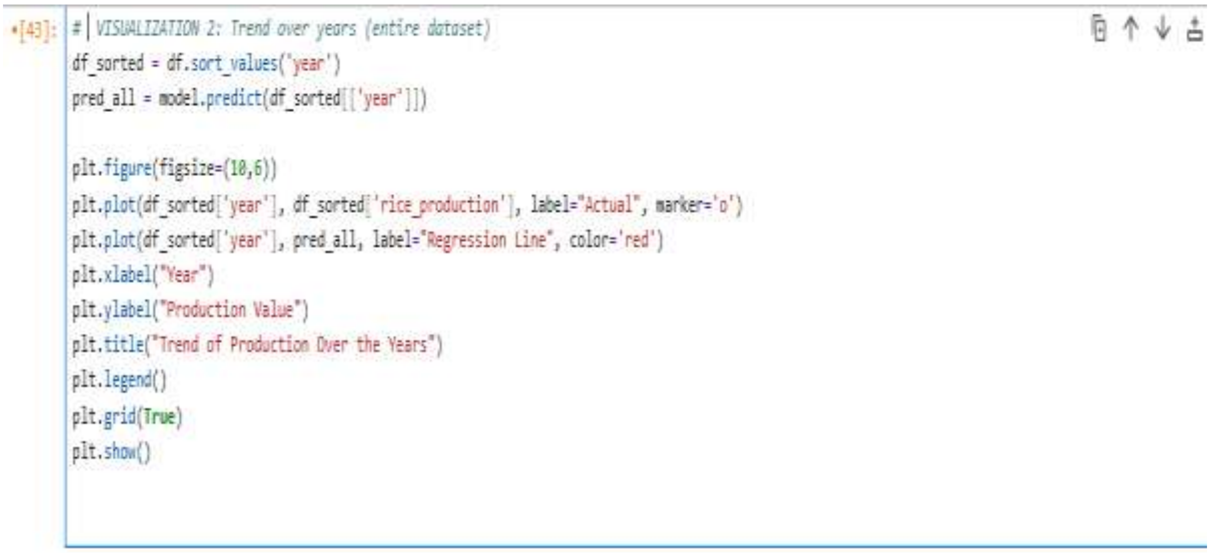
[17]:

```
▾ LinearRegression
LinearRegression()
```

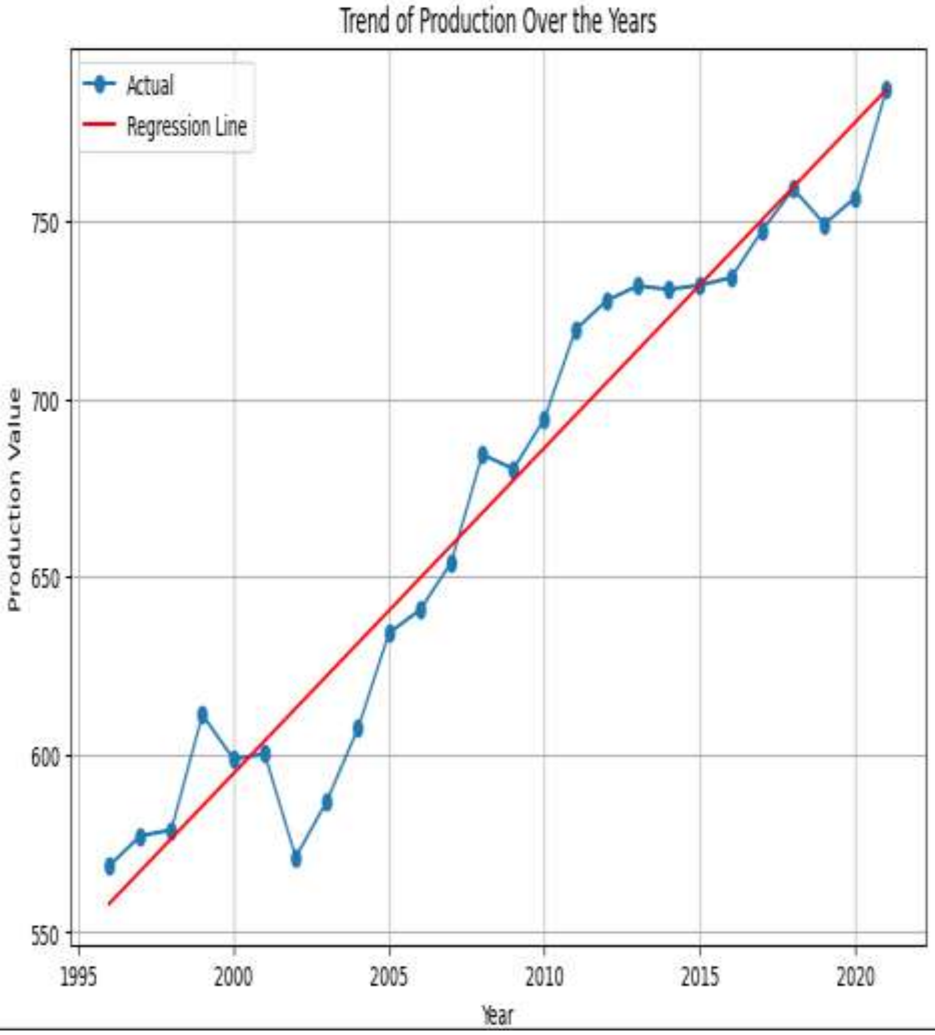


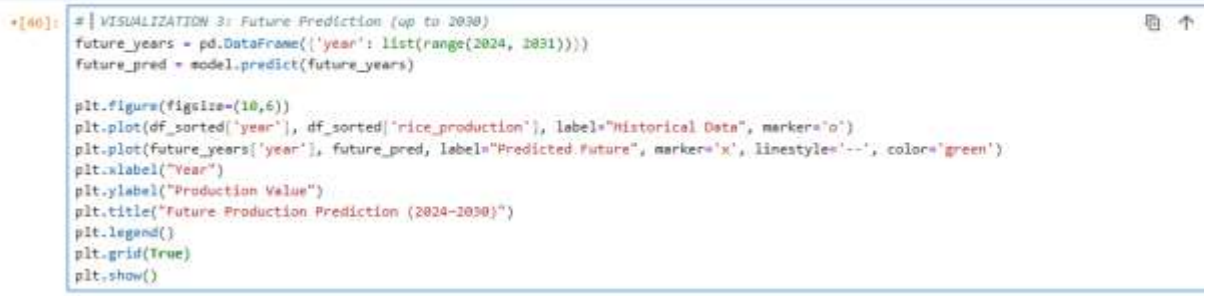
```
#STEP-6:PREDICT AND VISULAISE
import matplotlib.pyplot as plt
y_pred=model.predict(X_test)

#PLOT ACTUAL VS PREDICTED
plt.scatter(X_test,y_test,color='black',label='Actual')
plt.plot(X_test,y_pred,color='green',linewidth=2,label="Predicted")
plt.xlabel("Year")
plt.ylabel("Production Value")
plt.title("Actual vs Predicted Production")
plt.legend()
plt.grid(True)
plt.show()
```



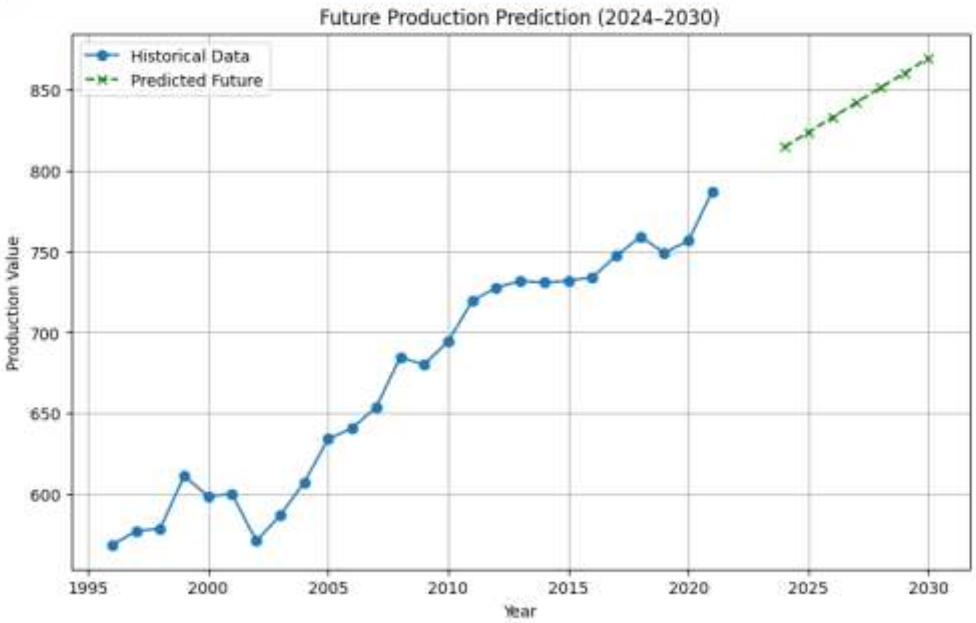


```
•[43]: # VISUALIZATION 2: Trend over years (entire dataset)
       df_sorted = df.sort_values('year')
       pred_all = model.predict(df_sorted[['year']])

       plt.figure(figsize=(10,6))
       plt.plot(df_sorted['year'], df_sorted['rice_production'], label="Actual", marker='o')
       plt.plot(df_sorted['year'], pred_all, label="Regression Line", color='red')
       plt.xlabel("Year")
       plt.ylabel("Production Value")
       plt.title("Trend of Production Over the Years")
       plt.legend()
       plt.grid(True)
       plt.show()
```





```
•[46]: # VISUALIZATION 3: Future Prediction (up to 2030)
future_years = pd.DataFrame({'year': list(range(2024, 2031))})
future_pred = model.predict(future_years)

plt.figure(figsize=(10,6))
plt.plot(df_sorted['year'], df_sorted['rice_production'], label="Historical Data", marker='o')
plt.plot(future_years['year'], future_pred, label="Predicted Future", marker='x', linestyle='--', color='green')
plt.xlabel("Year")
plt.ylabel("Production Value")
plt.title("Future Production Prediction (2024-2030)")
plt.legend()
plt.grid(True)
plt.show()
```



6.Conclusion

This mini-project successfully demonstrates how linear regression can be used to analyze historical data and predict future values. Such analysis is vital in agriculture planning, resource management, and policy-making. As a data analyst, understanding and applying regression techniques like this is a crucial skill.