Climate Change Impact on Agriculture - Data Analysis Report

Objective

This project explores how climate change - specifically factors like rising temperatures, extreme weather events, and declining soil health -
affects agricultural outcomes such as crop yield and economic impact. The analysis focuses on trends across multiple regions and crop types using a synthetic dataset.
An interactive dashboard was also created to support data-driven decisions in sustainable agriculture.

Dataset Description

- Source: Synthetic, created for educational and research purposes
- Range: Simulated yearly data across multiple global regions
- Columns: year, region, crop type, temperature, extreme weather, irrigation access, pesticide use, fertilizer use, soil health, economic impact

Data Preprocessing

- Cleaned and renamed columns
- Removed duplicate temperature columns
- Verified data types and handled missing values
- Filtered for regional analysis (e.g., Punjab - Wheat)

Exploratory Data Analysis (EDA)

- Visualized temperature and economic trends by region
- Analyzed soil health and input use (pesticides, fertilizers)
- Insights:
    - Temperature is rising in most regions
    - Soil health is declining in high pesticide-use areas
    - Economic impact is volatile in climate-sensitive regions

Interactive Dashboard

Climate Change Impact on Agriculture - Data Analysis Report

An interactive dashboard built with Plotly Dash allows users to:

- Select region and crop type

- View plots: Temperature vs Year, Economic Impact vs Year, Soil Health vs Year

Recommendations

1. Invest in adaptive crop strategies

2. Improve irrigation infrastructure

3. Optimize pesticide and fertilizer usage

4. Use predictive modeling for early warning systems

Limitations

- Synthetic dataset only (no real-world validation)

- Limited to select features (no satellite or live data)

- No ML or forecasting models included

Future Work

- Add ML for predicting yield and impact

- Use real datasets from FAO, NOAA, etc.

- Add geo-spatial maps

- Host the dashboard using Streamlit or Render

Conclusion

This project provides insights into how climate change affects agricultural sustainability across regions.

The dashboard enhances data exploration and supports the need for adaptive strategies to ensure food security in a changing climate.