

Climate Change Impact on Agriculture Visualization

Exploring Agricultural Productivity in Response to Climate Variables

Introduction

This project visualizes the impact of climate change on agriculture by analyzing temperature, precipitation, and crop yield data across different regions.

As climate patterns shift, understanding these impacts on agriculture is vital for food security and sustainability.

SDG 12: Responsible Consumption and Production

Objectives:

Identify regions and crops most affected by climate change.

Analyze relationships between climate factors and agricultural productivity.

Dataset Overview

Source: Kaggle (Climate Change and Agriculture)

Description: The dataset includes features like region, crop type, soil health index, temperature, precipitation, CO₂ emissions, and resource use (fertilizers, pesticides).

Pre-processing:

- Handled missing values and normalized data.
- Filtered and transformed for analysis in Power BI.

Objectives and Key Performance Index

Goals:

Analyze climate effects on crop yields and regional agricultural health.

Track economic impact metrics and extreme weather events by region.

KPIs:

- Soil Health Index
- Economic Impact (USD)
- Resource Usage (Fertilizer, Pesticides, Irrigation)

A decorative graphic on the left side of the slide. It consists of a series of vertical lines of varying heights, with a dark blue sphere positioned in front of them, partially obscuring the lines.

Visualization in Power BI

Power BI visualizations enable insights into regional agricultural performance and climate influence.

Chart Types Used:

- Bar and Line Charts: Compare countries and crop types in soil health and economic impact.
- Heatmap: Highlights temperature and CO₂ emission variations, pinpointing high-impact regions.
- Scatter Plots: Display correlations between resource use and crop types, aiding optimization.

Key Visualizations

The visualizations presented explore the intricate relationship between climate factors—such as temperature, precipitation, and CO₂ emissions—and agricultural productivity across regions.

By mapping economic impact, resource usage, and soil health, these visuals highlight both the vulnerabilities and strengths within global agriculture.

Collectively, they underscore how climate variations influence crop performance and resource allocation, offering a data-driven foundation for strategies aimed at sustainable agricultural resilience.

1. Soil Health Distribution by Country:

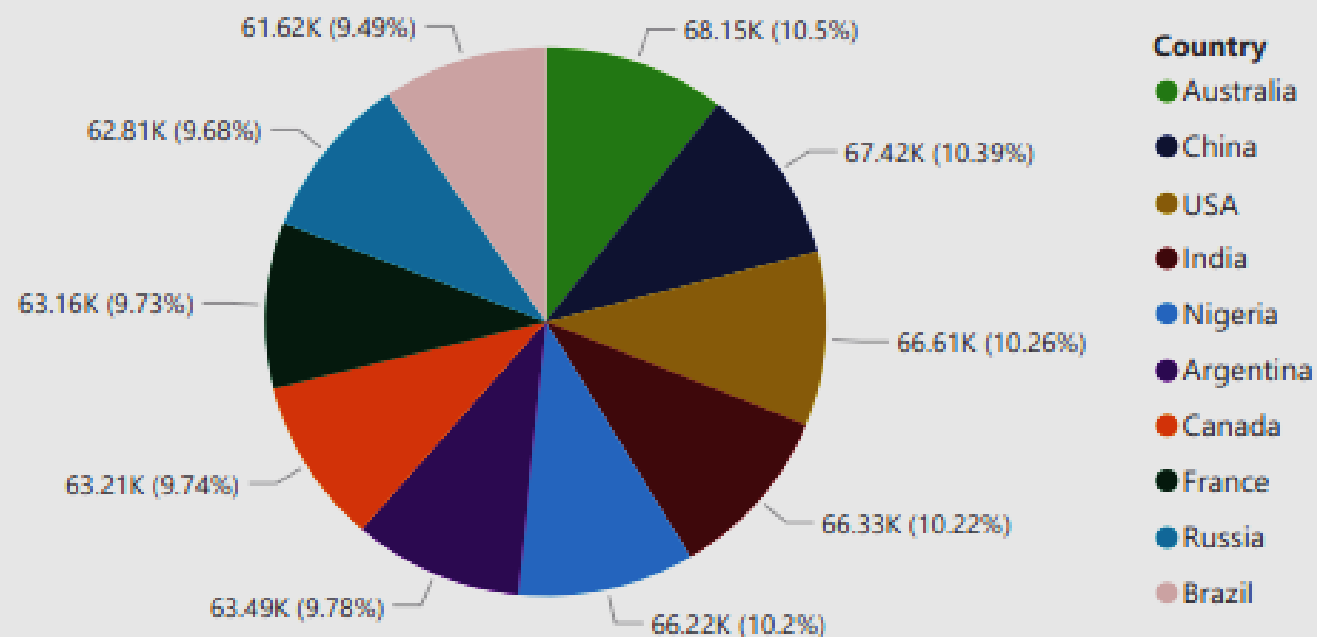
Insight: Countries with the highest soil health indexes include Australia, China, and the USA. This indicates that these regions likely have agricultural practices or soil management techniques that promote healthy soils, contributing to sustainable crop growth.

Soil Health Distribution

Sum of Soil_Health_Index

649.01K

Sum of Soil_Health_Index by Country



2. Economic Impact by Crop Type

Insight: Nigeria, India, and China face significant economic impacts due to climate change, with extreme weather events also contributing to this burden. These countries may need to implement more climate-resilient agricultural practices to mitigate losses.

"Economic Impact & Weather Events by Country"

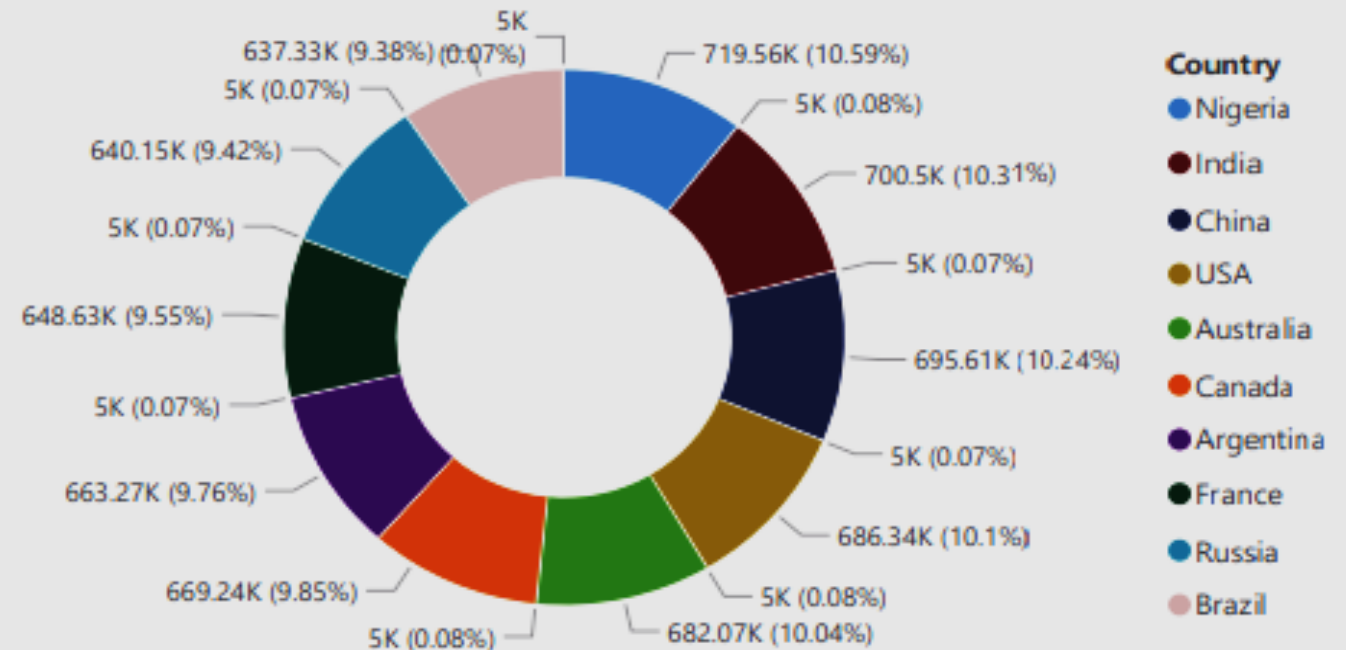
Sum of Economic_Impact_Million_USD

6.74M

Sum of Extreme_Weather_Events

50K

Sum of Economic_Impact_Million_USD and Sum of Extreme_Weather_Events by Country

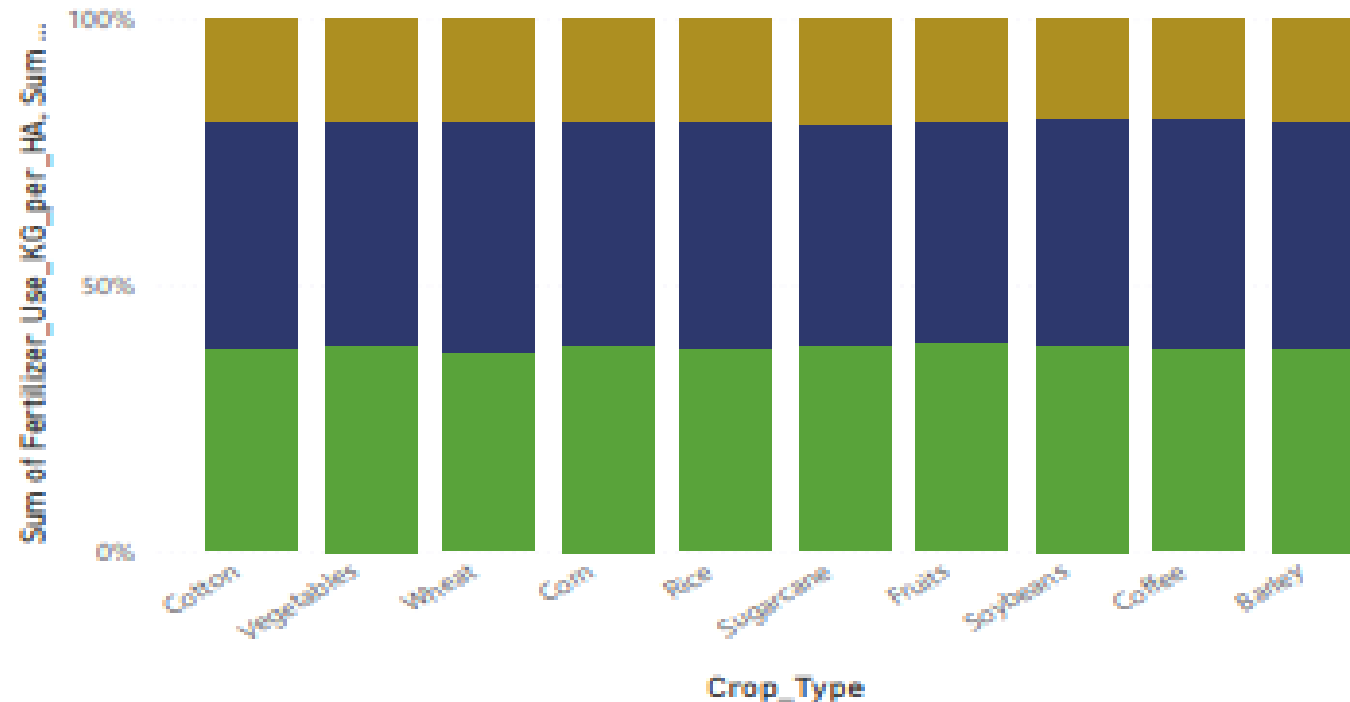


Resource Use by Crop Type (KG/HA & %).

First Crop_Type	Sum of...	Sum of...
Barley	499.7...	552....

Sum of Fertilizer_Use_KG_per_HA, Sum of Irrigation_Access_% and Sum of Pesticide_Use_KG_per_HA by Crop_Type

● Sum of Fertilizer_Use_KG_per_HA ● Sum of Irrigation_Access_% ● Sum of Pesticide_Use_KG_per...



3. Resource Use by Crop Type (Fertilizer, Irrigation, and Pesticides)

Insight: Cotton and vegetable crops show higher usage of fertilizers, irrigation, and pesticides. This could indicate these crops' sensitivity to soil nutrients and water, requiring careful resource management to balance productivity and environmental sustainability.

Regional Fertilizer & Irrigation Access (KG/HA & %).

Sum of...	Sum of...	First Region
499.7...	552....	Britis...

Region	Sum of Fertilizer_Use_KG_per_HA	Sum of Irrigation_Access_%
British Columbia	11,992.30	13,661.01
Central	22,307.84	25,289.96
East	13,429.24	14,352.84
Grand Est	13,048.99	13,974.22
Ile-de-France	11,925.37	13,267.13
Maharashtra	11,093.00	12,643.59
Midwest	13,085.70	13,587.51
New South Wales	13,248.65	15,450.63
North	25,886.11	28,684.05
North Central	10,874.29	13,216.14
North West	12,532.33	13,753.90
Northeast	37,524.25	41,115.79
Northwest	12,141.87	13,802.54
Northwestern	12,062.40	11,071.22
Total	4,99,737.08	5,52,483.32

4. Regional Fertilizer Use and Irrigation Access

Insight: Regions such as Northeast and Central exhibit high fertilizer and irrigation usage, which may reflect attempts to boost productivity in response to climate stressors.

Overreliance on these resources, however, could impact long-term soil health and groundwater levels.

5. Irrigation Access by Region

Insight: The Northeast and North Central regions have notable access to irrigation, which could buffer these areas against periods of drought. This access is critical for ensuring consistent crop yields in light of variable climate conditions.

Sum of Irrigation Access % by Region

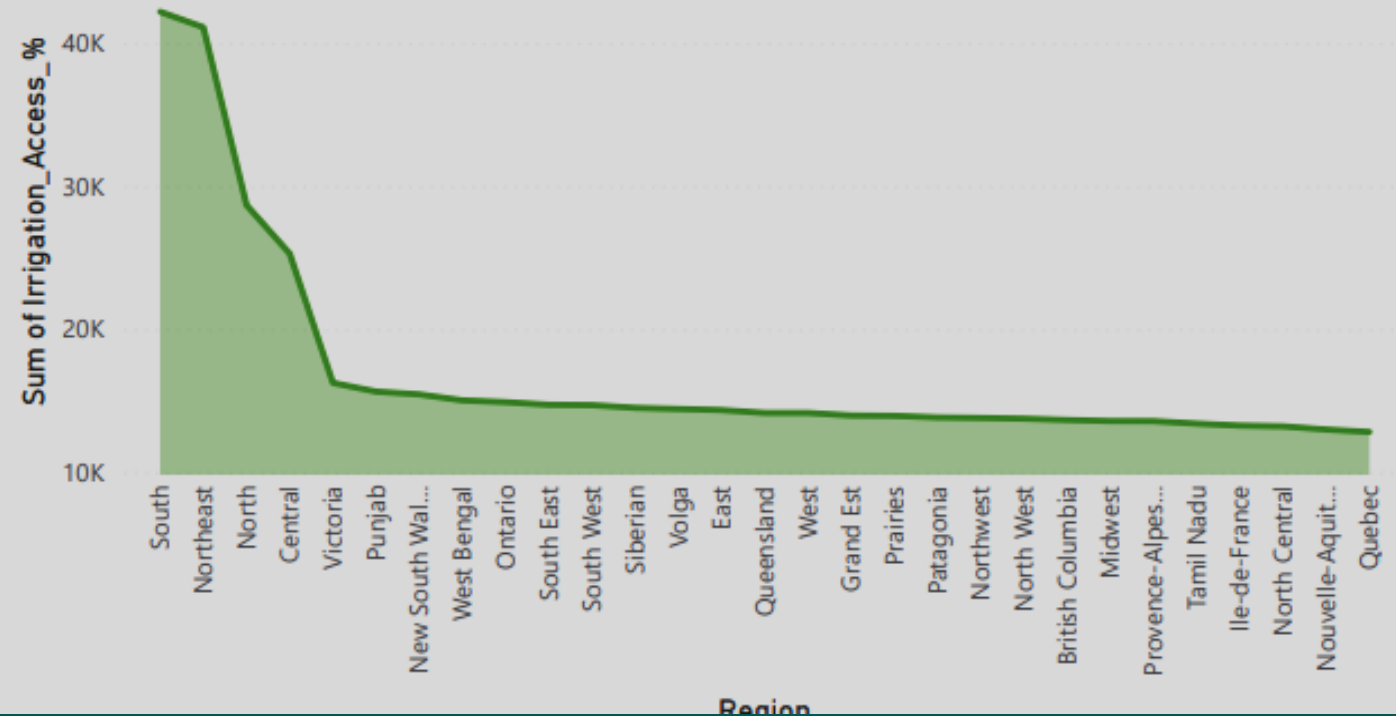
First Region

British...

Sum of Irrigation_Access_%

552.48K

Sum of Irrigation_Access_% by Region



6. Extreme Weather Events by Region

Insight: Certain regions are more prone to extreme weather events, affecting agriculture. Addressing resilience through crop diversification and protective infrastructure could minimize the impact on food security in these vulnerable areas.

Extreme Weather Events by Region

Sum of Extreme_Weather_Events

50K

First Region

British...

Sum of Extreme_Weather_Events by Region

Region ● British Colu... ● Central ● East ● Grand Est ● Ile-de-Fra... ● Maharashtra ● Midwest ▶



Analysis and Insights

- Countries with higher soil health, such as Australia and China, show greater agricultural resilience, while areas with lower soil health need intervention.
- Wheat and rice are key staple crops, significantly impacting regional economies.
- High resource dependency (fertilizer, irrigation) in crops like cotton and vegetables highlights opportunities for optimizing sustainable practices.
- Elevated temperatures and CO₂ emissions, particularly in the USA and China, correlate with climate vulnerability, underscoring the need for targeted adaptation efforts.

Future Work and Improvements

- 1. Data Integration:** Incorporate socio-economic and climate projection datasets for comprehensive analysis.
- 2. Predictive Modeling:** Use machine learning to forecast crop yields based on climate and resource variables.
- 3. Sustainable Practices:** Promote precision farming and organic methods to reduce chemical reliance.
- 4. Stakeholder Engagement:** Collaborate with farmers and policymakers to share insights and best practices.

Thank You

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