Final Project Report Template

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Introduction

Project Overview

The project "Global Food Production Trends and Analysis: A Comprehensive Study from 1961 to 2023 using Power BI" is designed to analyze and visualize long-term global food production patterns through an interactive and data-driven approach. In the context of rising global population, food security challenges, and climate variability, understanding historical trends in food production across regions and commodities has become critically important for strategic planning and policy formulation. This project consolidates extensive historical food production datasets from globally recognized and reliable sources such as the Food and Agriculture Organization (FAO) and other international statistical repositories into a unified Power BI environment. The system enables users to explore production trends of major food categories including cereals, fruits, beverages, and meat across different countries, regions, and time periods spanning more than six decades.

Objective

The primary objective of this project is to design and develop an interactive Power BI dashboard that provides a comprehensive understanding of global food production trends from 1961 to 2023. The project aims to collect, clean, integrate, and visualize historical food production data from multiple international sources in order to analyse long-term production patterns and regional performance. The dashboard is intended to enable comparative analysis of key food commodities such as rice, wheat, maize, fruits, beverages, and meat across different regions and time frames. By converting complex datasets into intuitive visual representations, the project seeks to support data-driven insights for researchers, policymakers, agricultural analysts, and academic users. Additionally, the project aspires to highlight global production growth, identify regional dominance and disparities, and examine historical trends that influence food security and agricultural sustainability. Ultimately, the objective is to create a structured analytical framework that enhances awareness of global food production dynamics and supports informed decision-making related to agricultural planning and food system sustainability.

Project Initialization and Planning Phase

Define Problem Statements (Customer Problem Statement Template):

Create a problem statement to understand your customer's point of view. The Customer Problem Statement template helps you focus on what matters to create experiences people will love. A well-articulated customer problem statement allows you and your team to find the ideal solution for your customers' challenges. Throughout the process, you'll also be able to empathize with your customers, which helps you better understand how they perceive your product or service.

Reference: https://miro.com/templates/customer-problem-statement/

Example:

Problem Statement (PS)	I am (Customer)	I'm trying to	But	Because	Which makes me feel
PS-1	a researcher	analyze changes in global food	traditional tools	the dataset is large, complex,	overwhelmed and inefficient during analysis.

		production	fail to reveal clear patterns and insights	and time-dependent	
PS-2	a food security analyst	evaluate whether global food production is keeping pace with population growth	historical trends are not visually comparable across years and regions	there is no unified interactive visualization system	concerned about identifying potential future risks.

Initial Project Planning Template

Product Backlog, Sprint Schedule, and Estimation (4 Marks)

Use the below template to create a product backlog and sprint schedule

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members	Sprint Start Date	Sprint End Date (Planned)
Sprint-1	Project Initialization and Planning	USN-1	As a user, I want to define project objectives, scope, and problem statements so that the project is properly planned and structured.	2	High	Sk Adil	15-Dec-25	16-Dec-25
Sprint-2	Data Collection and Preprocessing	USN-2	As a user, I want to collect and preprocess global food production data from 1961 to 2023 so that the data is clean and ready for analysis.	3	High	Sk Adil	17-Dec-25	18-Dec-25
Sprint-3	Data Visualization	USN-3	As a user, I want to create visual charts and graphs to identify trends and patterns in global food production data.	2	Medium	Sk Adil	19-Dec-25	20-Dec-25

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members	Sprint Start Date	Sprint End Date (Planned)
Sprint-4	Dashboard Development	USN-4	As a user, I want interactive dashboards to visualize global food production trends.	3	High	Sk Adil	21-Dec-25	22-Dec-25
Sprint-5	Report Generation	USN-5	As a user, I want to prepare a detailed project report explaining methodology, analysis, and results.	2	Medium	Sk Adil	23-Dec-25	24-Dec-25
Sprint-6	Insights and Documentation	USN-6	As a user, I want summarized insights and proper documentation so that conclusions from the analysis are clearly communicated.	2	Medium	Sk Adil	25-Dec-25	25-Dec-25

Project Initialization and Planning Phase

Project Proposal (Proposed Solution) template

This project proposal outlines a solution to address a specific problem. With a clear objective, defined scope, and a concise problem statement, the proposed solution details the approach, key features, and resource requirements, including hardware, software, and personnel.

Project Overview	
Objective	To analyze global food production trends from 1961 to 2023 using Power BI and identify long-term patterns, regional variations, and insights to support data-driven decision-making.
Scope	The project covers historical global food production data across countries and commodities from 1961 to 2023, including data preprocessing, visualization, dashboard creation, and insight generation using Power BI.
Problem Statement	
Description	Understanding long-term global food production trends is challenging due to large, complex historical datasets that lack clear visualization and comparative analysis.
Impact	The project helps policymakers, researchers, and analysts gain clear insights into global food production trends, supporting better planning, sustainability analysis, and informed decision-making.
Proposed Solution	
Approach	The approach involves data collection, preprocessing, exploratory analysis, visualization, and dashboard development using Power BI to extract meaningful insights from historical food production data.
Key Features	Interactive Power BI dashboards • Year-wise and region-wise trend analysis

	• Commodity-wise comparisons • Filter and slicer-based exploration • Clear insight summaries

Resource Requirements

Resource Type	Description	Specification/Allocation
Hardware		
Computing Resources	CPU	Laptop/Desktop with Intel i5 / Ryzen 5 or higher
Memory	RAM specifications	Minimum 8 GB
Storage	Disk space for data, Power BI files, Reports and documentation	256 GB SSD or Higher
Software		
Frameworks	Visualization and analytics framework	Power BI and Microsoft Excel
Libraries	Visualization and analytical functions	Built in power BI visuals and DAX functions
Development Environment	Tools and operating environment	Power BI Desktop and windows OS
Data		
Data	Source, size and format	Global food production dataset csv/excel from kaggle

Data Collection and Preprocessing Phase

Data Collection Plan & Raw Data Sources Identification Template

Elevate your data strategy with the Data Collection plan and the Raw Data Sources report, ensuring meticulous data curation and integrity for informed decision-making in every analysis and decision-making endeavor.

Data Collection Plan Template

Section	Description
Project Overview	This project analyzes global food production trends from 1961 to 2023 using Power BI. The objective is to study long-term patterns, regional variations, and commodity-wise production changes to derive meaningful insights for decision-making.
Data Collection Plan	The data will be collected from reliable public datasets related to global food production. The collected data will be verified, cleaned, and prepared before importing into Power BI for analysis and visualization.
Raw Data Sources Identified	FAO (Food and Agriculture Organization) global food production datasets • Kaggle public datasets on food and agriculture • Open government and international statistical data repositories

	The data is available in CSV/Excel format and contains year-wise, country-wise, and commodity-wise production values.

Raw Data Sources Template

Source Name	Description	Location/URL	Format	Size	Access Permissions
Dataset	World Food Production.	https://www.kaggle.com/datasets/rafsunahmad/world-food-production	CSV	2.04 MB / 0.002 GB	Public

Data Collection and Preprocessing Phase

Data Quality Report Template

The Data Quality Report Template will summarize data quality issues from the selected source, including severity levels and resolution plans. It will aid in systematically identifying and rectifying data discrepancies.

Data Source	Data Quality Issue	Severity	Resolution Plan
Kaggle	Production values were recorded as general or decimal values instead of whole number	Low	Production values were converted from general / decimal format to whole number to ensure consistency and readability during analysis.
Kaggle	Missing values in production data for some countries and year	Moderate	Missing values were handled by removing incomplete records or applying appropriate aggregation
Kaggle	Inconsistent country names across different years	High	Country names were standardized using consistent naming conventions to ensure accurate grouping and comparison.

Kaggle	Duplicate records in the dataset	Moderate	Duplicate entries were identified and removed during data preprocessing to avoid skewed results.
Kaggle	Outliers and extreme values in production figures	Low	Outliers were analyzed and retained or removed based on contextual relevance to maintain data integrity.

Data Collection and Preprocessing Phase

Data Exploration and Preprocessing Template

Identifies data sources, assesses quality issues like missing values and duplicates, and implements resolution plans to ensure accurate and reliable analysis.

Section	Description
Data Overview	The dataset contains global food production data from 1961 to 2023, including country-wise, year-wise, and commodity-wise production values used for trend and comparative analysis.
Data Cleaning	Missing values, duplicate records, and inconsistent entries were identified and handled using Power Query in Power BI to ensure data accuracy and consistency.
Data Transformation	Power Query was used to filter irrelevant data, sort records, rename columns, and create calculated columns required for analysis.
Data Type Conversion	Production values were originally in general or decimal format and were converted into whole numbers. Data types were corrected to ensure numerical consistency and accurate aggregation in Power BI.
Column Splitting and Merging	Columns were split or merged where necessary to separate or combine attributes such as year, Entity for better analysis.
Data Modeling	Relationships between tables were defined, and measures were created using DAX to support efficient querying and interactive dashboard visualization.

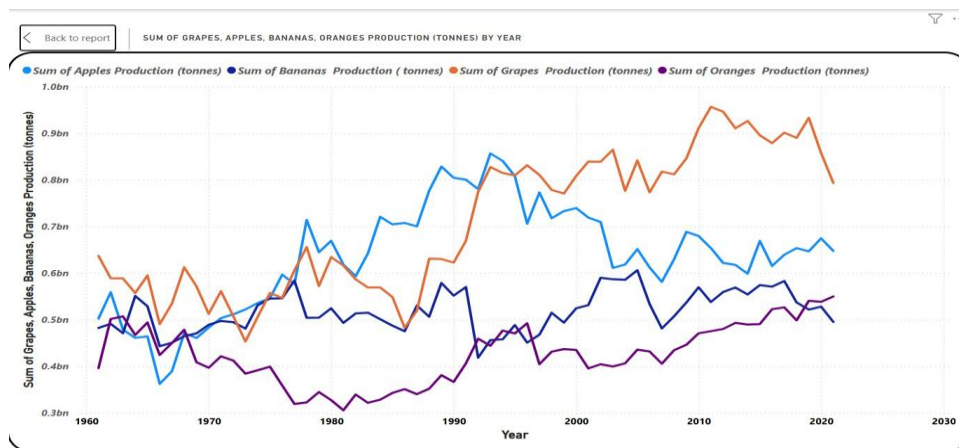|	
Save Processed Data	The cleaned and transformed dataset was saved and loaded into Power BI for visualization, dashboard creation, and future analysis.

Business Question and Visualization Report

Visualization development refers to the process of creating graphical representations of data to facilitate understanding, analysis, and decision-making. The goal is to transform complex datasets into visual formats that are easy to interpret, enabling users to gain insights and make informed decisions. Visualization development involves selecting appropriate visual elements, designing layouts, and using interactive features to enhance the user experience. This process is commonly associated with data visualization tools and platforms, and it plays a crucial role in business intelligence, analytics, and reporting
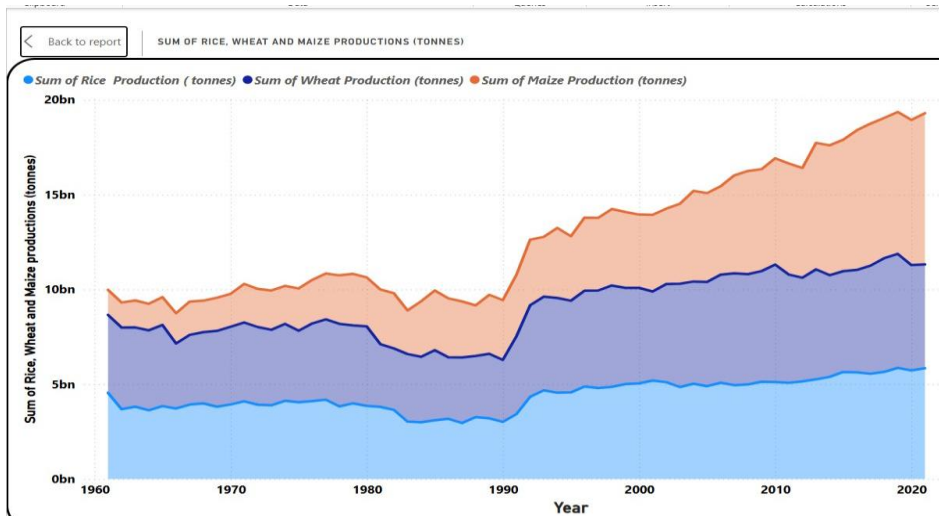
Business Questions and Visualisation

The process involves defining specific business questions to guide the creation of meaningful and actionable visualizations in Power BI. Well-framed questions help in identifying key metrics, selecting relevant data, and building visualisation that provide insights.

1. **How has global food production changed from 1961 to 2023?**

   o *Visualization*: Line chart showing year-wise global food production trends.

2. **How does rice, wheat, and maize production compare over the years?**
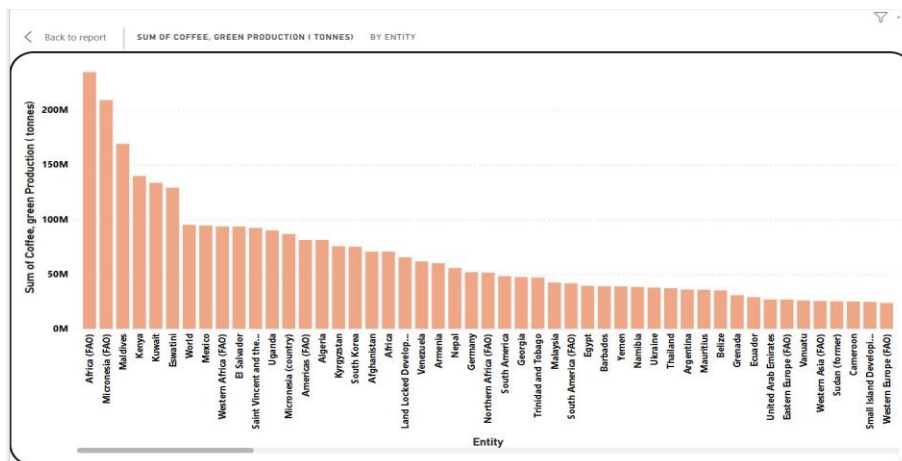
   o *Visualization*: Multi-line or stacked area chart

● Sum of Rice Production (tonnes) ● Sum of Wheat Production (tonnes) ● Sum of Maize Production (tonnes)

3. **Which food commodities have the highest total production globally?**

   o *Visualization*: KPI cards / summary tiles of Rice and Wheat

269bn

Sum of Rice Production (tonnes)

282bn

Sum of Wheat Production (tonnes)

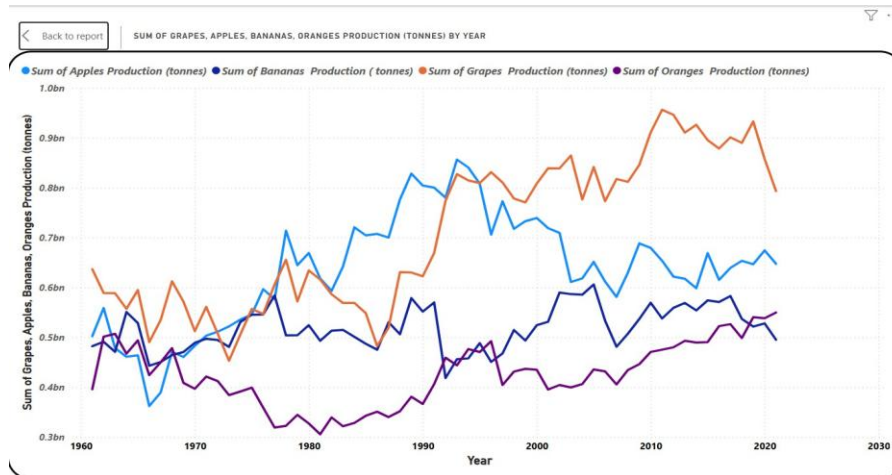*4.* **Which countries or regions are the top producers of coffee?**

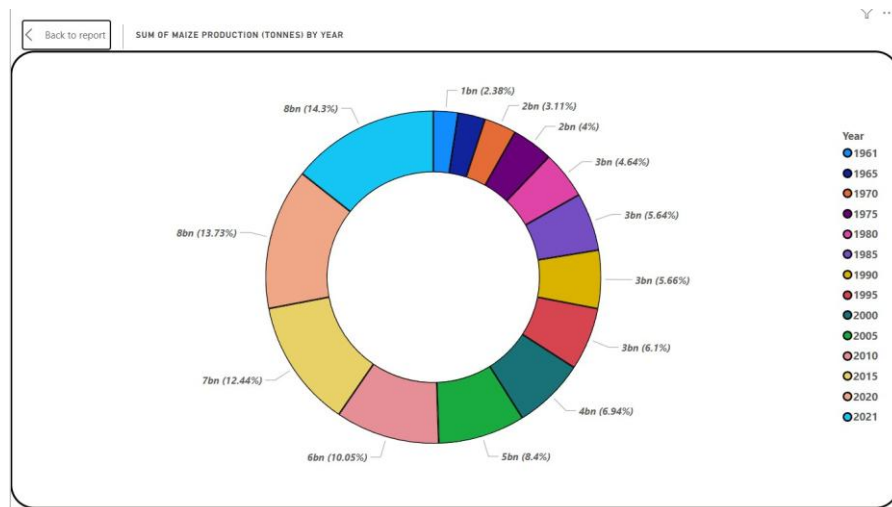   • *Visualization*: Bar chart showing coffee production by entity.

5. How has fruit production evolved over time?

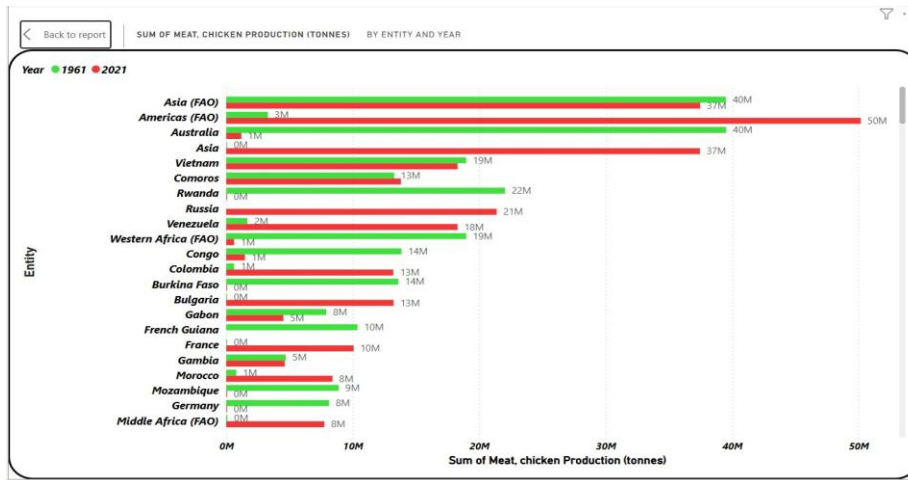- *Visualization*: Line chart comparing fruit production trends

6. What is the distribution of maize production across different years?

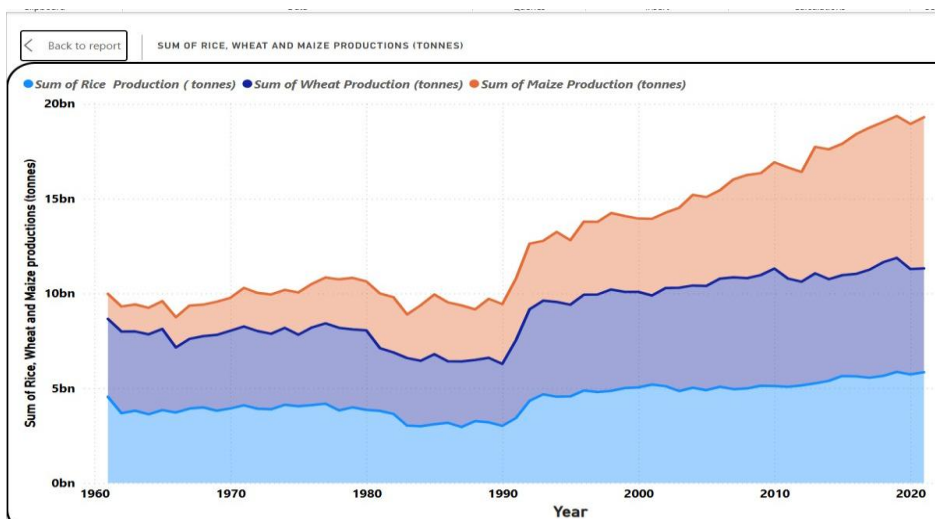- *Visualization*: Donut chart of maize production by year

7. Which regions lead in meat (chicken) production over different years?

- *Visualization*: Horizontal bar chart comparing meat production by region and year
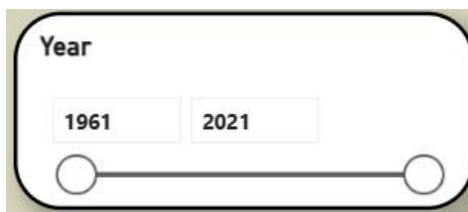
8. **Which food categories show the most consistent growth from 1961 to 2023?**

   - *Visualization*: Line chart highlighting long-term trends across multiple commodities

9. **Which Year and Entity is the data present in the datasets**

   - *Visualization:* Year and Entity slicers represents analysis of global food production from 1961 to 2023.
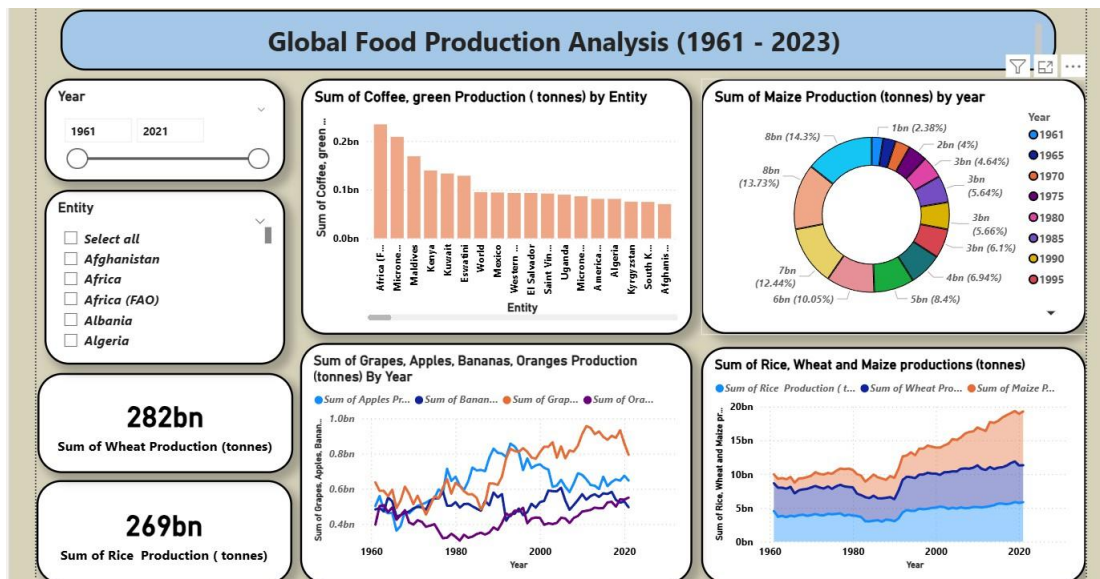
Dashboard Design

Creating an effective dashboard involves thoughtful design to ensure that the presented information is clear, relevant, and easily understandable for the intended audience. Here are some key principles and best practices for dashboard design

Activity 1: Interactive and visually appealing dashboards

Creating interactive and visually appealing dashboards involves a combination of thoughtful design, effective use of visual elements, and the incorporation of interactive features. Here are some tips to help you design dashboards that are both visually appealing and engaging for users so take care of below points

- Clear and Intuitive Layout
- Use Appropriate Visualizations
- Colour and Theming
- Interactive Filters and Slicers
- Drill-Down Capabilities
- Responsive Design
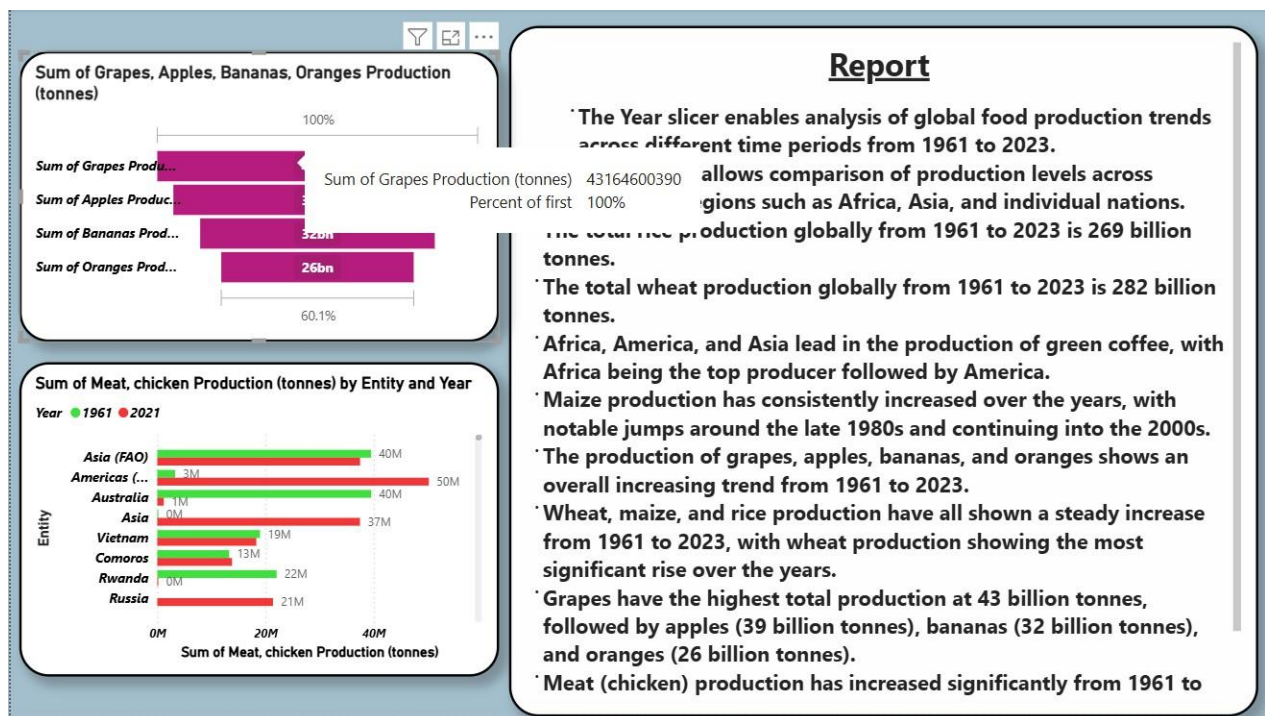- Custom Visuals and Icons
- Use of Infographics

Here are Eight potential outcomes from the dashboard image provided:

1. **Overall Global Food Production Trend:** The dashboard shows a clear and steady increase in global food production from **1961 to 2023,** indicating **long-term growth** in agricultural output worldwide.

2. **Top Food Commodities by Production: Rice (269 billion tonnes) and wheat (282 billion tonnes)** are the highest produced food commodities globally, highlighting their importance as staple crops.

3. **Cereal Production Growth Over Time: Rice, wheat, and maize** production have all shown **consistent growth over the years,** with noticeable acceleration after the 1980s, reflecting advancements in agriculture and technology.

4. **Tea Production Trend:** Global tea production has **increased steadily** from 1961 to 2023, showing stable demand and continuous growth despite being lower than cereal crops.

5. **Fruit Production Comparison:** Among fruits, grapes have the **highest total production (43 billion tonnes)**, followed by apples, bananas, and oranges, indicating strong global demand for fruit crops.

6. **Regional Leadership in Coffee Production: Africa, America, and Asia lead in green coffee production,** with Africa emerging as one of the top producers globally.

7. **Meat (Chicken) Production by Region:** Meat (chicken) production has **increased significantly** across regions, with Asia and America showing the highest production levels over the years.

8. **Year-wise Contribution Analysis:** The donut and area charts highlight how different years contribute to total production, showing **increased output** in recent decades compared to earlier years.

Report

A report is a comprehensive document that provides a detailed and structured account of data analysis, findings, and insights. It is typically used for in-depth analysis, documentation, and communication of results. Reports are suitable for a diverse audience, including decision-makers, analysts, and stakeholders who need a comprehensive understanding of the data.

Designing a report in Power BI involves connecting to data sources, creating visualizations like charts and graphs, customizing their appearance and interactivity, organizing them logically on the canvas, formatting elements for consistency and clarity, and optionally creating dashboards for a summarized view. Throughout the process, it's essential to consider the audience's needs and ensure the report effectively communicates insights from the data. Finally, iterate based on feedback to continually improve the report's design and usefulness.

Observations drawn from reports in Power BI can provide valuable insights into business performance and trends.

- **Trends Over Time:**

  The dashboard shows a **clear and consistent increase** in global food production from **1961 to 2023**, indicating long-term growth in agricultural output across regions.

- **Performance Comparison of Major Crops:**

  Among major food commodities, **wheat (282 billion tonnes)and rice (269 billion tonnes)** have the highest total production, highlighting their role as staple crops worldwide.

- **Regional Production Analysis:**

  The visualizations indicate that **Asia, Africa, and the Americas are leading** regions in the production of cereals, coffee, and meat, reflecting regional agricultural strengths.

- **Fruit Production Insights:**

  Fruit production analysis shows that **grapes** have the **highest total production**, followed by apples, bananas, and oranges, demonstrating strong global demand for fruit crops.

- **Tea Production Growth:**

  Tea production has shown **steady growth** over the years, suggesting increasing consumption and sustained agricultural development in tea-producing regions.

- **Meat (Chicken) Production Trends:**

  Meat (chicken) production has **increased significantly** from 1961 to 2023, with **Asia and the Americas** contributing the largest share.

- **Year-wise Contribution:**

  Recent decades contribute a larger share of total food production compared to earlier years, reflecting improvements in farming techniques and productivity.

- **Overall Insight:**

  The dashboard effectively highlights global food production patterns, regional dominance, and commodity-wise trends, supporting data-driven decisions in food security and agricultural planning.

Conclusion

The project "Global Food Production Trends and Analysis: A Comprehensive Study from 1961 to 2023 using Power BI" successfully demonstrates how data visualization and analytical tools can be effectively used to understand long-term global agricultural trends. By leveraging historical food production data spanning more than six decades, this study provides a comprehensive view of how global food systems have evolved in response to population growth, technological advancements, and changing regional dynamics. Through the use of Power BI, complex and large-scale datasets were transformed into intuitive and interactive dashboards, enabling users to explore food production trends across different commodities, regions, and time periods. The analysis revealed a consistent and significant increase in global food production from 1961 to 2023, highlighting improvements in agricultural practices, mechanization, irrigation, and crop yield optimization. Staple crops such as rice, wheat, and maize were found to dominate global production, emphasizing their critical role in ensuring food security worldwide. The project also highlighted notable regional disparities in food production. Regions such as Asia, Africa, and the Americas emerged as major contributors to global agricultural output, each excelling in different food categories. Asia showed strong dominance in cereal and rice production, Africa played a significant role in coffee and certain crop productions, while the Americas demonstrated high productivity in cereals, fruits, and meat. These regional insights underline the importance of geographic and climatic factors, as well as economic and technological development, in shaping global food production patterns. Another key outcome of this study is the identification of long-term growth trends in fruit, beverage, and meat production. Crops such as grapes, apples, bananas, and oranges showed steady increases over the years, reflecting rising global demand and diversification in dietary preferences. Similarly, meat (chicken) production experienced substantial growth, particularly in recent decades, indicating shifts in consumption patterns and increased livestock farming efficiency.

Future Scope

1. Predictive Analysis and Forecasting

The project can be extended by integrating predictive analytics and time-series forecasting techniques to estimate future food production trends. Using Power BI's forecasting features or advanced machine learning models, stakeholders could anticipate future production levels and plan strategies to address food demand and supply gaps.

2. Climate Impact Integration

Future enhancements may include the integration of climate-related data such as rainfall, temperature variations, drought frequency, and extreme weather events. This would help analyse the impact of climate change on food production and support more resilient agricultural planning.

3. Food Security and Population Analysis

The dashboard can be expanded by incorporating population growth and consumption data to assess food availability per capita. This would enable deeper insights into food security challenges and help identify regions at risk of food shortages.

4. Real-Time and Automated Data Updates

Automating data refresh through live data connections or APIs from global agricultural organizations could enable near real-time analysis. This enhancement would keep the dashboard continuously updated and more relevant for policy monitoring and decision-making.

5. Advanced Regional and Crop-Level Analysis

The scope can be widened to include more granular analysis at country, state, or crop-variety levels. Adding cost of production, export–import data, and yield efficiency metrics would provide a more comprehensive understanding of agricultural performance and global trade dynamics.

Appendix

Dataset: https://www.kaggle.com/datasets/rafsunahmad/world-food-production

GitHub Link: https://github.com/AdilGhub/Global_Food_Production_trends_Analysis.git

Project Demonstration Link:
https://drive.google.com/file/d/1MHEfekNnZevFCOJ8cRUzhZGA1VSK8PEq/view?usp=sharing