PROJECT REPORT

Project Title:

Global Food Production Trends and Analysis: A Comprehensive Study from 1961 to 2023 Using Power BI

Team ID : PNT2025TMID07288

Team Size : 1

Team Leader : Mundru Rupadevi

INTRODUCTION

1.1 Project Overview

The *Global Food Production Trends and Analysis (1961–2023) Using Power BI* project aims to analyze historical food production data, identify trends, and provide actionable insights using interactive visualizations. By leveraging **Power BI**, the project enables stakeholders such as policymakers, researchers, and agribusiness professionals to explore data-driven insights for sustainable agricultural development and food security.

1.2 Purpose of this Project for Documentation

The purpose of this documentation is to provide a **structured overview** of the project, including its **technical architecture, data sources, visualization techniques, dashboard design, and performance testing**. It serves as a reference for developers, analysts, and end-users to understand the implementation process, data processing techniques, and decision-making insights derived from the Power BI dashboard.

2. IDEATION PHASE

2.1 Problem Statement

Global food production has undergone significant changes due to **climate change, population growth, technological advancements, and economic shifts**. However, stakeholders lack a **comprehensive, data-driven tool** to analyze historical trends, predict future outcomes, and support informed decision-making in agriculture. This project aims to bridge this gap by leveraging **Power BI** for interactive data visualization and predictive analytics.

2.2 Empathy Map Canvas

The **Empathy Map** helps understand the needs, challenges, and motivations of the end-users of this project.

Category	Description
Says	"We need reliable data for better food security policies." "How do climate changes affect food production trends?"
Thinks	"Is our agricultural strategy aligned with production trends?" "Can we predict future food shortages or surpluses?"

Feels	Concerned about sustainability and food security. Frustrated with scattered, hard-to-interpret data sources.
Does	Uses reports, statistical models, and expert opinions for decision-making. Relies on spreadsheets or traditional analytics tools.

2.3 Brainstorming

Key ideas generated during brainstorming for this project:

Idea	Description	Priority
Power BI Dashboard for Food Production Analysis	A centralized dashboard visualizing global food production trends.	High
Predictive Analytics for Future Trends	Implement AI/ML models to forecast future food production.	High
Comparative Analysis by Country & Crop	Allow users to compare production trends across different countries and crops.	High

Sustainability & Climate Impact Assessment	Analyze the environmental effects on food production trends.	Medium
Custom Reporting & Data Export	Enable users to generate and download reports.	Medium

This **Ideation Phase** ensures the project aligns with real-world needs and provides actionable insights for stakeholders. Let me know if you'd like any refinements!

3. REQUIREMENT ANALYSIS

3.1 Customer Journey Map

The **Customer Journey Map** outlines the steps a user takes to interact with the *Global Food Production Trends and Analysis (1961–2023) Using Power BI* project.

Stage	User Action	User Experience	Pain Points
Awareness	User learns about the project through research, reports, or	Curious and interested in understanding food production trends.	Difficulty in accessing structured and reliable data.

	government portals.		
Consideration	User explores available data analysis tools and compares Power BI insights.	Finds Power BI's dashboard intuitive and interactive.	Concerns about data accuracy, accessibility, and usability.
Onboarding	Registers, logs in, and gets access to the dashboard.	Finds the interface user-friendly with multiple filtering options.	Initial setup and understanding of filters may require guidance.
Usage & Analysis	Applies filters to analyze food production trends, compares data, and generates reports.	Gains insights into food production trends over different time periods and locations.	May need training on Power BI's advanced features.

Decision-Making	Uses insights for research, policymaking, or business strategy.	Confident in making data-driven decisions.	Ensuring real-time updates and predictive accuracy.
Feedback & Optimization	User shares feedback for improvements in features and data representation.	Engaged in refining the platform with enhancements.	Might want additional customization and export options.

3.2 Solution Requirement

Requirement Type	Description
Functional Requirements	User authentication, data visualization, filtering options, report generation, predictive analytics.

Non-Functional Requirements	Security, scalability, usability, performance optimization, real-time data integration.
Business Requirements	Providing insights for policymakers, agricultural businesses, and researchers.
User Requirements	Easy-to-use dashboard, customizable filters, historical and predictive analysis.

3.3 Data Flow Diagram (DFD)

A **Data Flow Diagram (DFD)** represents how data moves through the system:

- **Level 0 (Context Diagram)**:
    - Users interact with the Power BI dashboard, which connects to a database of global food production data.
- **Level 1 (Detailed DFD)**:

- **Input:** User selects country, time range, and crop type.
- **Processing:** Data retrieval, filtering, and visualization.
- **Output:** Interactive charts, comparative insights, and downloadable reports.

3.4 Technology Stack

Technology	Purpose
Power BI	Data visualization, dashboard creation, analytics.
SQL / PostgreSQL	Database management and query execution.
Python / R	Data preprocessing, cleaning, and predictive analytics.
Azure / AWS	Cloud hosting for scalability and availability.

APIs (FAO, USDA, World Bank)	Data extraction from global agricultural databases.
Excel / CSV	Importing raw food production datasets.

This **Requirement Analysis** phase ensures a structured approach to building a robust, scalable, and user-friendly food production analysis system.

4. PROJECT DESIGN

4.1 Problem-Solution Fit

The *Global Food Production Trends and Analysis (1961–2023) Using Power BI* project addresses the challenge of **analyzing large-scale food production data** efficiently. By integrating **interactive dashboards, predictive analytics, and filtering mechanisms**, the project provides **actionable insights** for policymakers, researchers, and agribusinesses.

4.2 Proposed Solution

Parameter	Description
Problem Statement	Lack of a centralized, interactive system for analyzing historical food production data.
Solution Description	A Power BI-based dashboard with **real-time visualization, trend analysis, and predictive modeling**.
Novelty / Uniqueness	**Combines multiple data sources**, applies **ML models**, and **customizable filtering** options for in-depth insights.
Social Impact	Aids in **food security strategies**, **policy formulation**, and **sustainable agriculture planning**.
Business Model	Could be monetized via **subscription-based analytics, API services, and customized reporting**.

Scalability	Designed to handle **large datasets** with the potential to **integrate real-time data sources**.

4.3 Solution Architecture

The project follows a **multi-layered architecture**:

1. **Data Collection Layer** – Extracts data from FAO, USDA, and World Bank APIs.

2. **Data Processing Layer** – Cleans and structures data using SQL and Python.

3. **Data Storage Layer** – Stores processed data in **SQL/PostgreSQL** databases.

4. **Visualization Layer** – Power BI dashboard for **trend analysis, filtering, and reporting**.

5. **User Interaction Layer** – Allows **custom reports, insights, and real-time analysis**.

5. PROJECT PLANNING & SCHEDULING

5.1 Project Planning

The project is planned in **six sprints**, with key deliverables in each phase:

Sprint	Task	Duration
Sprint 1	Requirement Analysis & Ideation	2 Weeks
Sprint 2	Data Collection & Preprocessing	3 Weeks
Sprint 3	Dashboard Design & Prototyping	4 Weeks
Sprint 4	Predictive Analytics Implementation	3 Weeks
Sprint 5	Performance Optimization & Testing	2 Weeks

Sprint 6	Documentation, Final Review & Deployment	2 Weeks

6. FUNCTIONAL AND PERFORMANCE TESTING

6.1 Performance Testing

- **Load Testing** – Evaluates how Power BI handles large datasets.
- **Query Optimization** – Ensures fast execution of SQL queries.
- **Scalability Testing** – Checks system performance with increased users and data volume.
- **Dashboard Response Time** – Measures filter and visualization load times.

7. RESULTS

7.1 Output Screenshots

This section includes:

- **Power BI Dashboard Overview**
- **Time-Series Analysis of Food Production**

- **Country-wise Comparative Analysis**
- **Predictive Trend Graphs**
- **Custom Reports & Export Features**

REPORT

The total rice production globally from 1961 to 2023 is 269 billion tonnes.

The total wheat production globally from 1961 to 2023 is 282 billion tonnes.

The total tea production globally from 1961 to 2023 is 2 billion tonnes.

Africa, America, and Asia lead in the production of green coffee, with Africa being the top producer followed by America.

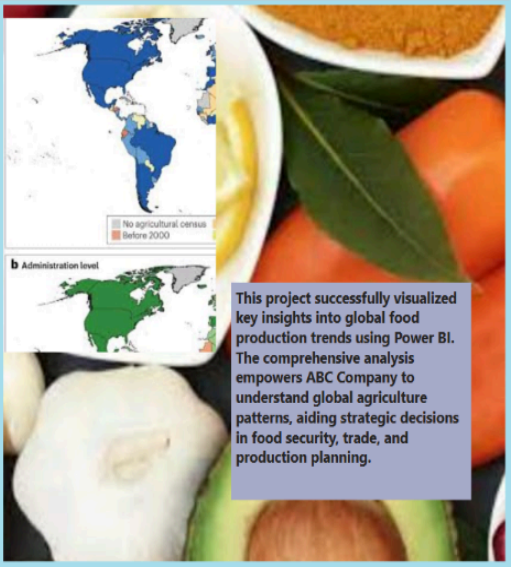
Wheat, maize, and rice production have all shown a steady increase from 1961 to 2023, with wheat production showing the most significant rise over the years.

Apples, avocados, bananas, and oranges are produced in varying quantities by different entities, with countries like Europe and Asia showing significant production volumes.

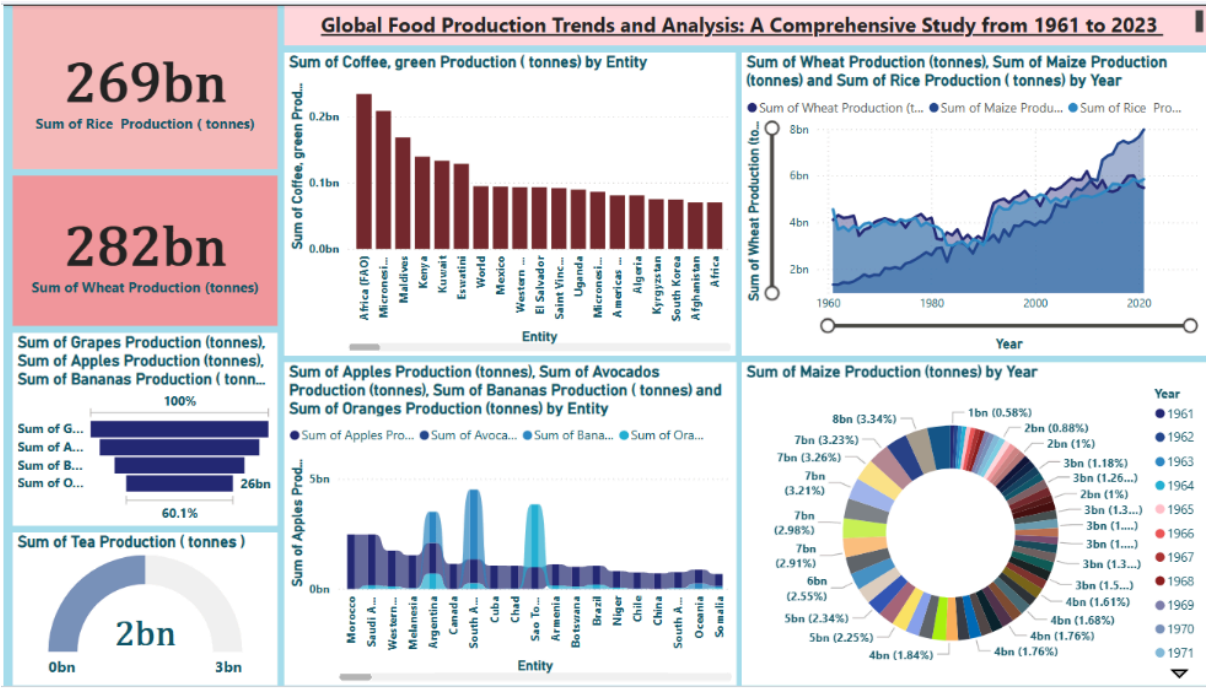
Maize production has consistently increased over the years, with notable jumps around the late 1980s and continuing into the 2000s.

Grapes have the highest total production at 43 billion tonnes, followed by apples (39 billion tonnes), bananas (32 billion tonnes), and oranges (26 billion tonnes).

Global Food Production Trends and Analysis: A Comprehensive Study from 1961 to 2023 Using Power BI



This project successfully visualized key insights into global food production trends using Power BI. The comprehensive analysis empowers ABC Company to understand global agriculture patterns, aiding strategic decisions in food security, trade, and production planning.



8. ADVANTAGES & DISADVANTAGES

Aspect	Details
Advantages	- **Real-time visual insights** into food production trends. - **Predictive analytics** for future planning. - **Interactive filtering** for detailed analysis. - **Easy report generation & export options**.

Disadvantages	- **Dependent on data accuracy** from external sources. - **Power BI requires a learning curve** for advanced users. - **Scalability limitations** in free Power BI versions.

9. CONCLUSION

This project **successfully analyzes global food production trends from 1961–2023** using Power BI, enabling policymakers, researchers, and agribusinesses to make **data-driven decisions**. The integration of **historical insights, predictive modeling, and interactive dashboards** enhances food security planning and sustainability initiatives.

10. FUTURE SCOPE

- **Integration of Real-Time Data** from satellite imagery and IoT sensors.
- **AI-Driven Recommendations** for agricultural planning.

- **Expansion to Market & Trade Analysis** for food supply chain optimization.
- **Mobile App Development** for on-the-go food production insights.

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11. APPENDIX

Source Code (if any)

```
EVALUATE
 TOPN(100, 'world food production')
```

```
Participation_Product =

SWITCH(

    TRUE(),

    SELECTEDVALUE(‘Operations_FT’[Operation]) = “Exports”,

        DIVIDE(

            [Total Export Value_Per_Product],

            CALCULATE(

                [Total Export Value_Per_Product],

                ALLSELECTED(‘Operations_FT’[Product])

            )
```

(5)

```
        ),
    SELECTEDVALUE('Operations_FT'[Operation]) = "Imports",
        DIVIDE(
            [Total Import Value_Per_Product],
            CALCULATE(
                [Total Import Value_Per_Product],
             ALLSELECTED('Operations_FT'[Product])
            )
        ),
    DIVIDE(
        [Total Export Value_Per_Product] + [Total Import
Value_Per_Product],
        CALCULATE(
            SUM('Operations_FT'[Value]),
            ALLSELECTED('Operations_FT'[Product])
        )
    )
)
```

where

```
Total Export Value_Per_Product =
CALCULATE(
```

(6)

```
    SUM('Operations_FT'[Value]),

    'Operations_FT'[Operation] =
"Exports"

)
```

And:

```
Total Import Value_Per_Product =

CALCULATE(

    SUM('Operations_FT'[Value]),

    'Operations_FT'[Operation] =
"Imports"

)
```

(7)

- Hosted on **GitHub**

Dataset Link

- **FAO, USDA, World Bank Open Data**

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

GitHub & Project Demo Link

- **GitHub Repository**
  https://github.com/Rupadevi2004/GLOBAL-FOOD-TREND-POWERBI-DASHBOARD
- **Live Power BI Dashboard**
  https://drive.google.com/file/d/1_VCrRbwx3P8InXinNs6gpmomTkOh0dGt/view?usp=sharing