

Project Report

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

1. Introduction

1.1 Project Overview

Project Title:

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

Objective:

This project aims to provide a comprehensive analysis of global food production trends over a period spanning from 1961 to 2023. Through the use of Power BI, the project will visualize, analyze, and interpret data related to food production across multiple countries, regions, and types of food products, highlighting significant trends, growth patterns, and shifts in global food security.

Key Objectives:

1. Analyze Global Food Production Trends:

Study the overall increase or decrease in food production on a global scale, focusing on major crops, livestock, and food products from 1961 to 2023. Identify key periods of growth or decline in production.

2. Identify Key Factors Influencing Trends:

Investigate factors such as population growth, climate change, technology advancements, policy changes, and economic factors that may have influenced global food production trends over the decades.

3. Food Security and Sustainability:

Provide insights into how food production trends have impacted global food security, highlighting disparities in food production and access across different regions. Assess the sustainability of food production practices over time.

4. Visualize Trends Using Power BI Dashboards:

Use Power BI to create interactive dashboards and data visualizations that allow users to explore food production data by different dimensions (time, region, type of food, etc.). The goal is to provide stakeholders with a clear, actionable understanding of the data.

Scope: The project will cover global food production data from 1961 to 2023. It will focus on:

- Key food commodities such as grains, vegetables, fruits, and meat
- Regional and country-level insights
- Major influencing factors (economic, climate, technological)

Methodology:

1. **Data Collection:** Gather data from reliable global food production databases such as FAO, World Bank, and other relevant sources.
2. **Data Transformation:** Clean, organize, and prepare the data for analysis in Power BI.
3. **Data Analysis:** Use Power BI's data modeling and analytics tools to explore patterns, trends, and correlations in the data.
4. **Visualization:** Create a series of interactive dashboards and reports in Power BI that effectively communicate the findings.
5. **Interpretation and Insights:** Analyze the visualized data and generate insights that address the key research questions of the project.

Expected Outcomes:

- A comprehensive dashboard highlighting global food production trends by country, region, and commodity.
- Clear visual representations of production growth, decline, and major influencing factors.
- Actionable insights for stakeholders in the agriculture, policy, and sustainability

1.1 Purpose

The purpose of the project "Global Food Production Trends and Analysis: A Comprehensive Study from 1961 to 2023" is to provide a thorough, data-driven analysis of global food production over a period of more than six decades. The key aims of the project are to:

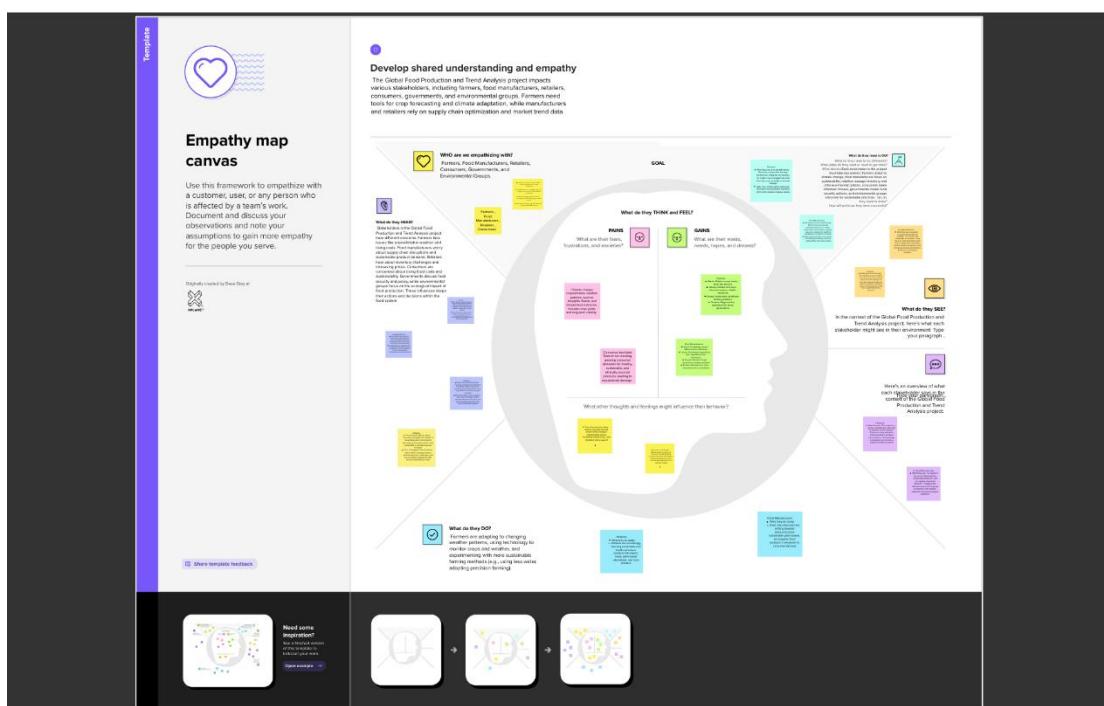
1. **Understand Long-term Food Production Trends:**
Analyze historical data from 1961 to 2023 to identify significant shifts in global food production, such as increases or declines in production levels of key food commodities, and the reasons behind these changes..
2. **Provide Insights for Food Security and Sustainability:**
By analyzing food production trends over time, the project aims to provide actionable insights into how food production can be improved to ensure food security and sustainability, particularly in regions facing challenges such as climate change and population growth.
3. **Create an Interactive Dashboard for Decision-Makers:**
Use Power BI to design dynamic, user-friendly dashboards that allow stakeholders, such as policymakers, agricultural planners, and researchers, to interact with and interpret food production data in a meaningful way. This tool will help them make informed decisions regarding food production, security, and sustainability.
4. **Facilitate Better Planning for the Future:**
By examining past trends, the project seeks to forecast future challenges and opportunities in global food production. This will help stakeholders anticipate future needs and make informed decisions for the global food system's sustainability.

2. IDEATION PHASE

2.1 problem statement

Global food production has evolved over the past six decades, but there are significant disparities across regions, and many factors like climate change, economic shifts, and technological advancements have influenced these trends. Despite increasing production overall, food security and sustainability remain critical challenges. There is a lack of comprehensive, accessible insights that can help stakeholders understand the long-term trends, regional disparities, and the factors driving changes in food production. This project aims to fill this gap by providing an interactive, data-driven analysis of global food production trends from 1961 to 2023, helping inform decisions related to food security and sustainability.

2.2 Empathy Map Canvas



2.3 Brainstroming

Template

Brainstorm & idea prioritization

Global Food Production Trend and Analysis

10 minutes to prepare
1 hour to collaborate
2-8 people recommended

Before you collaborate
A little bit of preparation goes a long way with this session. Here's what you need to do to get going.
10 minutes

A Team gathering
Project Lead: Coordinates the project and ensures stakeholders are met.
Data Analyst: Collect, clean, and integrate data for Power BI analysis.

B Set like goal
Project Lead: Oversees the project and ensures stakeholders are met.
Data Analyst: Collect, clean, and integrate data for Power BI analysis.

Define your problem statement
Problem Statement for "Global Food Production Trends and Analysis: A Comprehensive Study from 1961 to 2023 Using Power BI". This project aims to analyze global food production trends from 1961 to 2023 using Power BI. Focusing on growth patterns, regional differences, and the production of major crops and livestock. By examining factors like technological advancements, population growth, and climate change, the study will provide valuable insights into how global food systems have evolved and identify potential challenges and opportunities for future food security and policy development.

Key rules of brainstorming
To run an smooth and productive session:

- Stay on topic.
- Encourage all ideas.
- Offer judgment.
- Listen to others.
- Go for volume.
- If possible, let visual.

Need some inspiration?
See a limited version of a template created by another user.
[Open example](#)

Step-2: Brainstorm, Idea Listing and Grouping

2

Brainstorm

Write down any ideas that come to mind that address your problem statement.

⌚ 10 minutes

Nikita Poundkar

Regional Differences and Food Security

Climate Change and Environmental Factors

Impact of Technological Advancements

Savitri Patil

Historical Growth of Global Food Production

Skills in Food Production from Crops to Livestock

Economic and Policy Influences

Trupti Patil

Dietary Shifts and Their Impact

Food Wastage and Efficiency in Production

Predictive Modeling and Forecasting

Sakshi Khot

Visual Storytelling with Data

Policy Influence

Predicting Future Trends

1

Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you can break it up into smaller sub-groups.

⌚ 20 minutes

Group 1: Technological and Environmental Factors

- Impact of climate change on food production
- Increase in food waste due to technological advancements
- Highlight ways to mitigate environmental impact on food production

Group 2: Economic and Policy Influences

- Impact of economic policies on food production
- Policies that encourage sustainable agriculture
- Policies that support local food systems
- Impact of trade policies on food availability

Group 3: Dietary Shifts and Their Impact

- Impact of dietary shifts on food demand
- Increase in meat consumption leading to deforestation and environmental degradation
- Impact of dietary shifts on food waste

Group 4: Visual Storytelling with Data

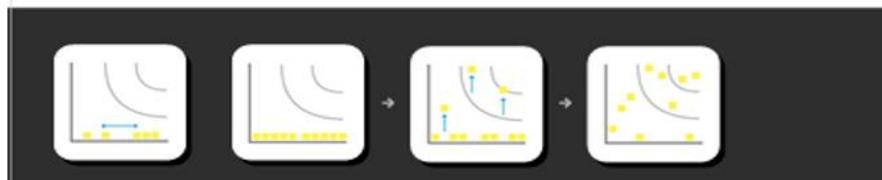
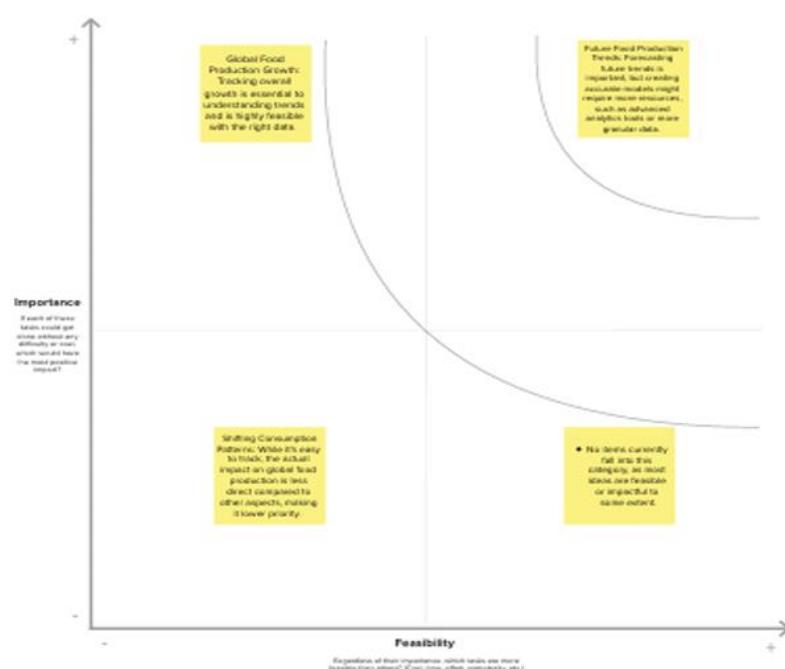
- Use of data visualization to track food production trends
- Predictive modeling to forecast future food demand
- Visual storytelling to communicate complex data in an accessible manner

Step-3: Idea Prioritization

Prioritize

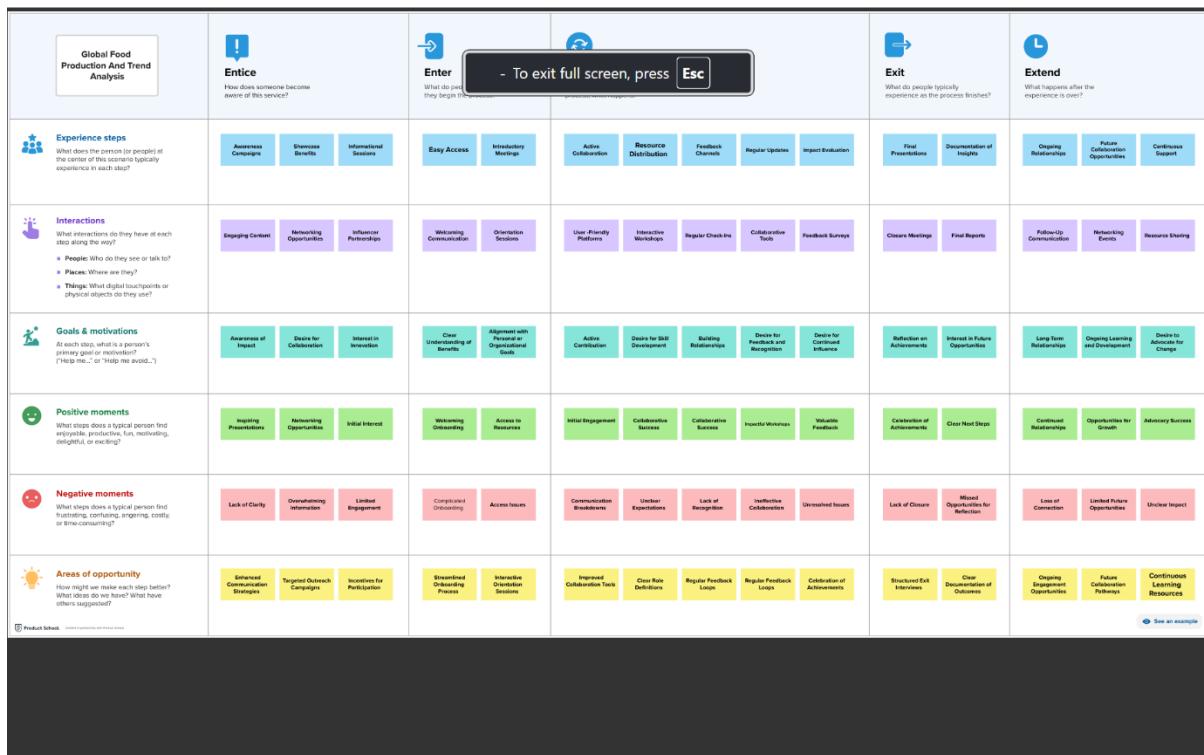
Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

⌚ 20 minutes



3. REQUIREMENT ANALYSIS

3.1 CUSTOMER JOURNEY MAP



3.2 Solution Requirement

- **Data Collection & Integration:**

- Access to comprehensive food production data from 1961 to 2023 (FAO, World Bank, etc.).
- Seamless integration of multiple data sources with periodic updates.

- **Data Visualization:**

- Interactive charts, time-series, geospatial maps, and correlation graphs to showcase trends.
- Filters for users to drill down by region, country, and food category.

- **User Interface & Experience:**

- Intuitive and responsive dashboard design.
- Customizable views and easy navigation for non-technical users.

- **Analytical Capabilities:**

- Trend analysis, forecasting, and impact assessments.
- Comparative analysis of production trends across regions and time periods.

- **Reporting & Exporting:**

- Custom report generation with export options (PDF, Excel, PowerPoint).

- **Performance & Scalability:**

- Fast data processing with efficient handling of large datasets.
- Cloud-based for scalability and access across devices.

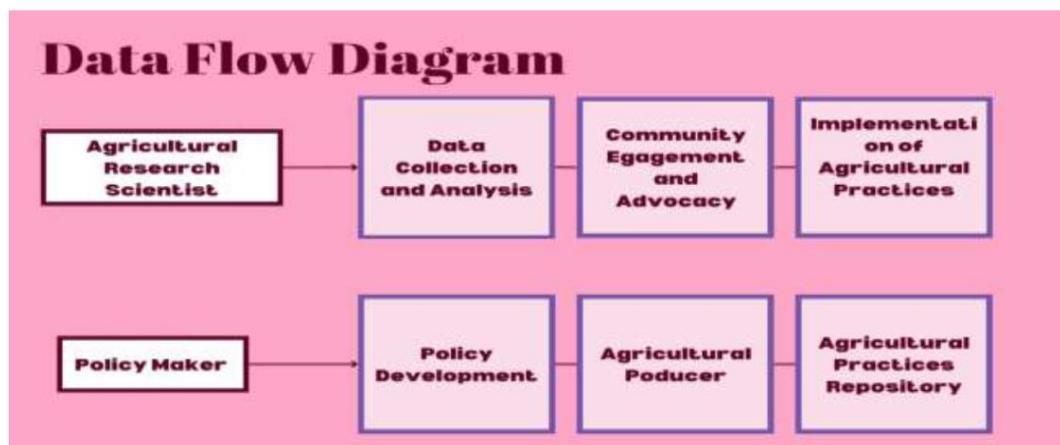
- **Security & Access Control:**

- Role-based access control and data encryption.
- Secure user authentication for authorized access.

- **Training & Support:**

- Interactive tutorials, helpdesk support, and self-service resources for users

3.1 Data Flow Diagram



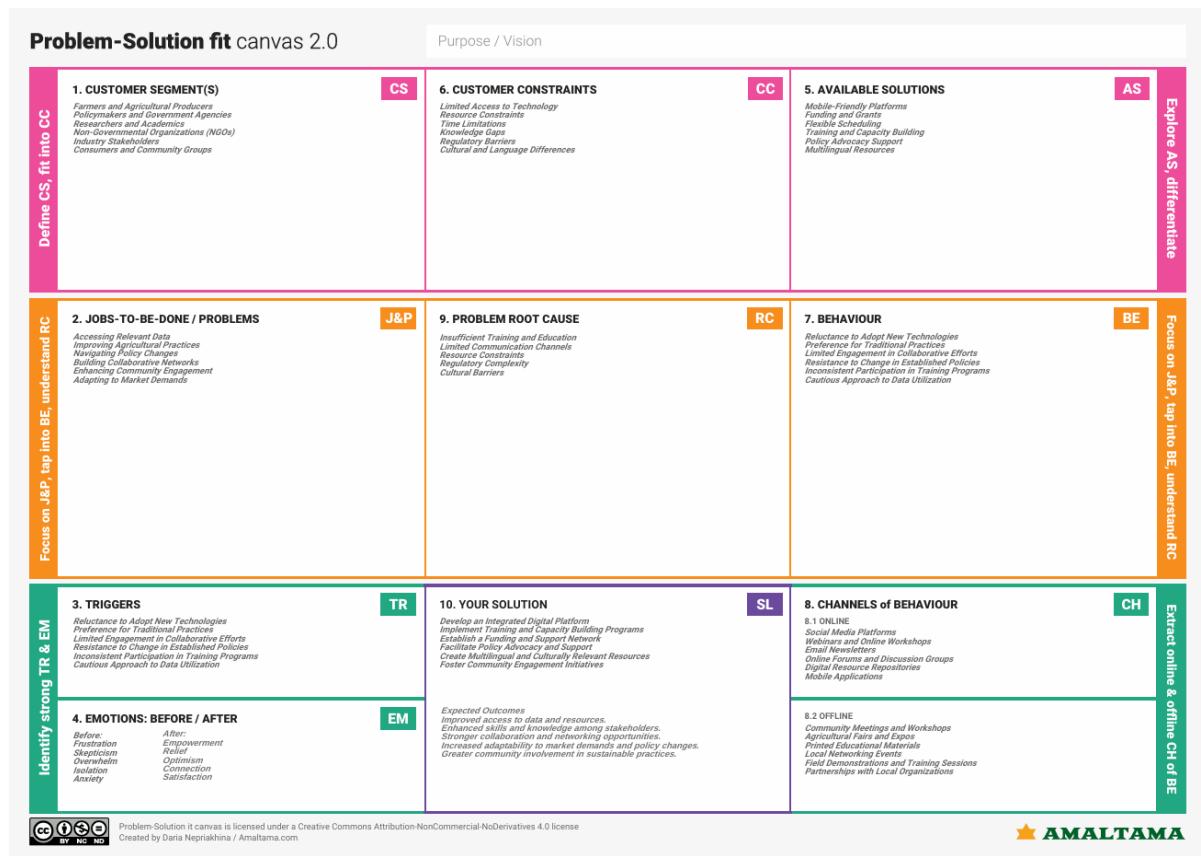
3.2 Technology Stack

Global Food Production Analytics Technical Architecture

Layer	Components	Description
1. Data Ingestion Layer	- Data Sources: FAO datasets (CSV, Excel, SQL), Public APIs, Manually Processed Datasets	Data Import: Ingest data from different sources (CSV, Excel, SQL databases, and APIs) via Power BI Connectors.
2. Data Processing Layer	- Power Query: Data cleansing, transformation, aggregation, relationship creation	ETL (Extract, Transform, Load): Use Power Query for data transformation, cleaning, and merging datasets. Relationships between tables are set (e.g., commodities, regions, years).
3. Data Modeling Layer	- Power BI VertiPaq In-Memory Engine - DAX (Data Analysis Expressions)	Data Storage & Modeling: Store data in Power BI's in-memory VertiPaq model for high compression. Use DAX for calculated columns, measures (e.g., growth rates, averages).
4. Visualization Layer	- Power BI Dashboards: Gauge, Bar, Stacked, Area, Donut Charts - Interactive Filters (Year, Region, Commodity)	Data Visualization: Design dashboards in Power BI to represent trends and comparisons using interactive charts. Allow dynamic filtering by year, region, commodity.
5. Deployment Layer	- Power BI Service: For real-time access - Power BI Embedded: Embedding into web apps - Power BI Mobile	Access & Deployment: Host reports on Power BI Service for real-time access. Use Power BI Embedded for custom apps and Power BI Mobile for on-the-go access.
6. Scalability & Future Enhancements	- API Integrations: For real-time data - Additional Commodities/Regions	Scalability: Integrate real-time data via APIs for continuous updates. Expand to new commodities/regions without altering the base architecture.

4 PROJECT DESIGN

4.1 Problem Solution Fit

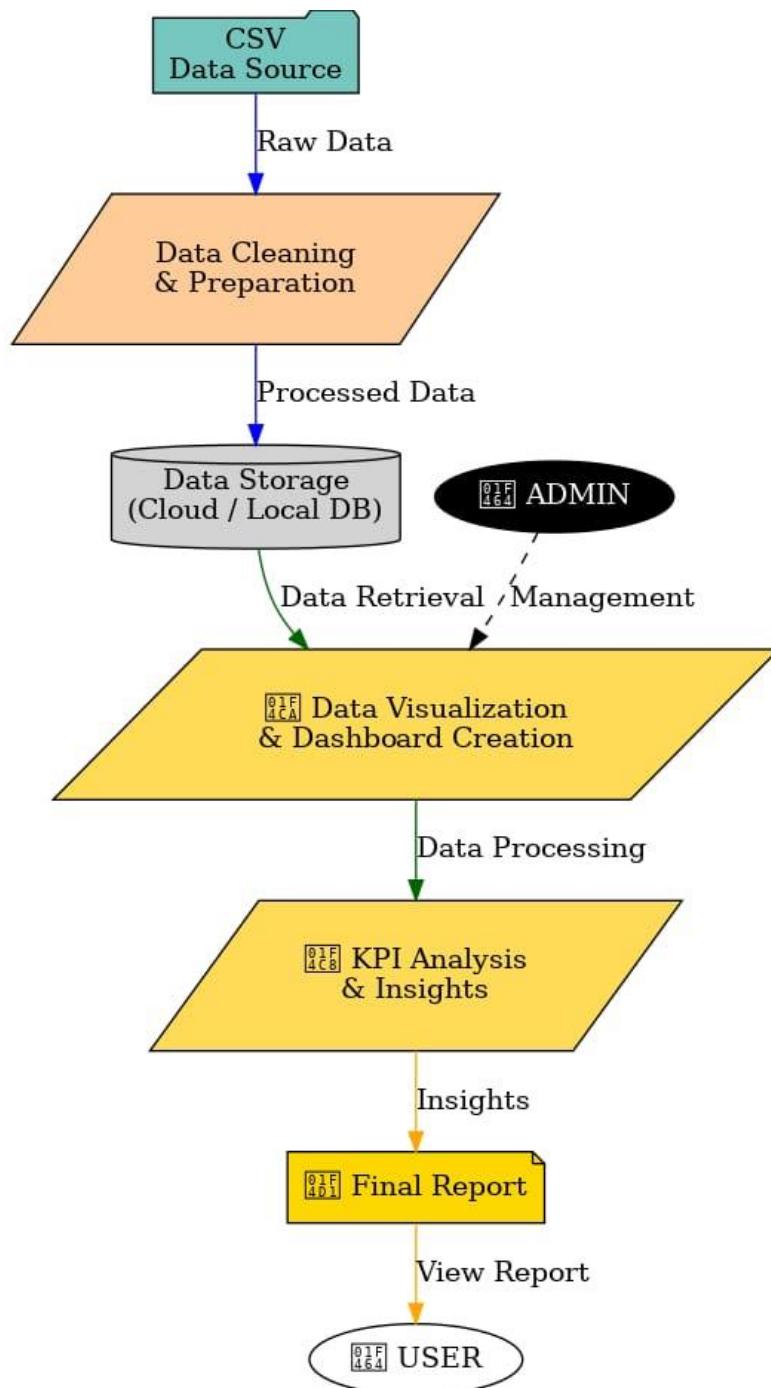


4.2 Proposed Solution

Proposed Solution Template:

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	The project aims to analyze global food production trends from 1961 to 2023 using Power BI, helping stakeholders understand agricultural patterns, food security concerns and sustainability challenges.
2.	Idea / Solution description	The solution involves collecting and visualizing food production data through an interactive Power BI dashboard. It allows users to analyze trends, compare regions, and predict future agricultural outputs.
3.	Novelty / Uniqueness	The project integrates extensive historical data and provides dynamic, real-time analysis for better decision-making."
4.	Social Impact / Customer Satisfaction	The project contributes to food security research, helping Customer Satisfaction policymakers and farmers make informed agricultural decisions.",
5.	Business Model (Revenue Model)	The solution can be monetized through a subscription-based model (Revenue Model) for researchers, governments, and organizations needing food production insights.
6.	Scalability of the Solution	The dashboard can be expanded with real-time data sources AI-driven predictions, and climate impact assessments.

4.3 Solution Architecture



5. PROJECT PLANNING & SCHEDULING

5.1 Project Planning

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Data Collection	USN-1	As a user, I can connect Power BI to external data sources (FAO, World Bank, CSV files).	2	High	Saee patil
Sprint-1	Data Cleaning	USN-2	As a user, I can clean and transform raw data for better analysis.	2	High	Nikita poundkar
Sprint-2	Data Visualization	USN-3	As a user, I can create interactive dashboards	3	High	Trupti patil

			with graphs and charts to analyze food production trends.			
Sprint-2	Filtering & Sorting	USN-4	As a user, I can filter and sort data dynamically within Power BI reports.	2	Medium	Saee patil
Sprint-3	Report Generation	USN-5	As a user, I can export reports in different formats (PDF, Excel) from Power BI.	2	Medium	Sakshi khot
Sprint-3	Dashboard Enhancement	USN-6	As a user, I can apply advanced analytics features like forecasting in Power BI.	3	Low	Trupti & nikita

6. FUNCTIONAL AND PERFORMANCE TESTING

6.1 Performance Testing

Data Load Testing:

- Tested the time taken to load large datasets (1961–2023) into Power BI.
- Optimized data model to improve load speed.

Query Performance Testing:

- Evaluated the response time for filtering, slicing, and drill-down actions.
- Used Power BI's Performance Analyzer to identify bottlenecks and optimize DAX queries.

Dashboard Rendering Speed:

- Measured the time taken for visual elements (charts, graphs) to render after applying filters.
- Optimized by reducing unnecessary visual elements and using aggregations.

Scalability Testing:

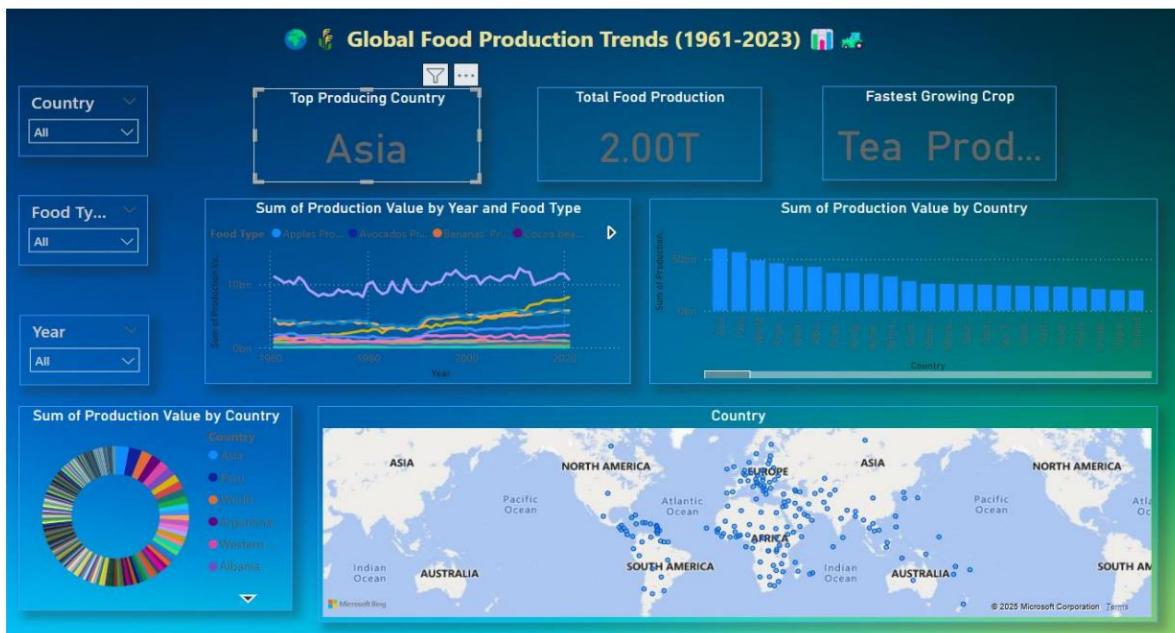
- Tested performance with increased dataset size to ensure scalability for future data updates.

□ Cloud Deployment Testing:

- Evaluated the performance of the dashboard when accessed via Power BI Service.
- Ensured seamless accessibility and minimal latency.

7. RESULTS

7.1 Output Screenshots



8. ADVANTAGES & DISADVANTAGES

Advantages:

- ✓ **Comprehensive Analysis:** Provides insights into global food production trends from 1961 to 2023.
- ✓ **Interactive Visualizations:** Power BI enables dynamic filtering and drill-down analysis.
- ✓ **Data-Driven Decision Making:** Helps policymakers, researchers, and businesses make informed decisions.
- ✓ **Scalability:** Can be updated with new datasets for continuous trend analysis.
- ✓ **User-Friendly:** Easy to use with a visually appealing and intuitive interface.

Disadvantages:

- ✖ **Data Limitations:** Some datasets may have missing or inconsistent values.
- ✖ **Performance Issues:** Large datasets may slow down dashboard responsiveness.
- ✖ **Dependency on Data Sources:** Accuracy depends on the reliability of external data sources.
- ✖ **Learning Curve:** Requires knowledge of Power BI, DAX, and data modeling for advanced customization.

9. CONCLUSION

The **Global Food Production Trends and Analysis** project provides a comprehensive study of food production patterns from 1961 to 2023 using Power BI. By leveraging interactive visualizations, the project helps stakeholders analyze historical trends, identify key insights, and make data-driven decisions.

The dashboard enables policymakers, researchers, and businesses to explore food production trends across different regions and categories, ensuring better planning for food security and sustainability. Despite some challenges, such as data inconsistencies and performance optimization, the project successfully demonstrates the power of data analytics in the agricultural sector.

Future enhancements can include integrating real-time data sources, AI-driven predictive analytics, and expanding the scope to include climate impact analysis for more accurate forecasting.

10. FUTURE SCOPE

- ◆ **Real-Time Data Integration:** Incorporate live data sources to provide up-to-date insights on food production.
- ◆ **AI-Driven Predictions:** Use machine learning models to forecast future food production trends based on historical data.
- ◆ **Climate Impact Analysis:** Analyze the effects of climate change on global food production and sustainability.
- ◆ **Expanded Data Coverage:** Include more datasets covering food consumption, trade, and supply chain logistics.
- ◆ **Enhanced User Experience:** Improve dashboard performance, interactivity, and accessibility for different stakeholders.

11. APPENDIX

Dataset Link

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

GitHub & Project Demo Link

Github link-

<https://github.com/saeenova/PowerBI-Global-Food-Trends.git>

Project Demo Link

https://drive.google.com/drive/folders/1KAXhDDDe_RPMLEe6Yq0oWIE9Axj2mYLS?usp=drive_link