PROJECT REPORT

Title: **Global Food Production Trends (1961-2023)**

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Team Members: Dudekula Reshma

1. Introduction

The study of global food production trends from 1961 to 2023 provides valuable insights into the agricultural sector's growth and key commodity production patterns. Using Power BI, this project analyses significant trends in food production, focusing on staple crops such as wheat, rice, maize, and key fruits like grapes, apples, and bananas. The data-driven approach helps in understanding production growth, regional contributions, and strategic decision-making for agricultural stakeholders.

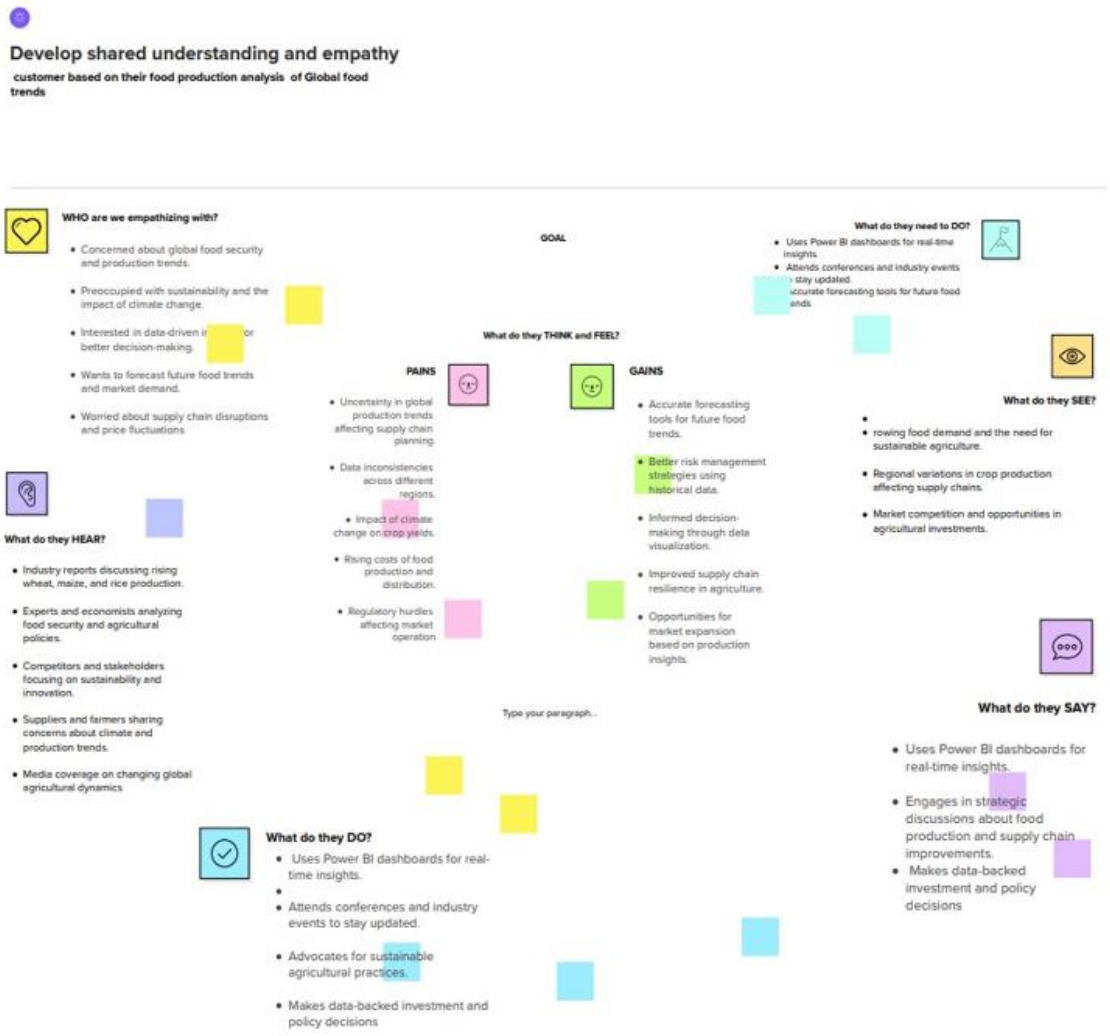
2. IDEATION PHASE

2.1Problem Statement

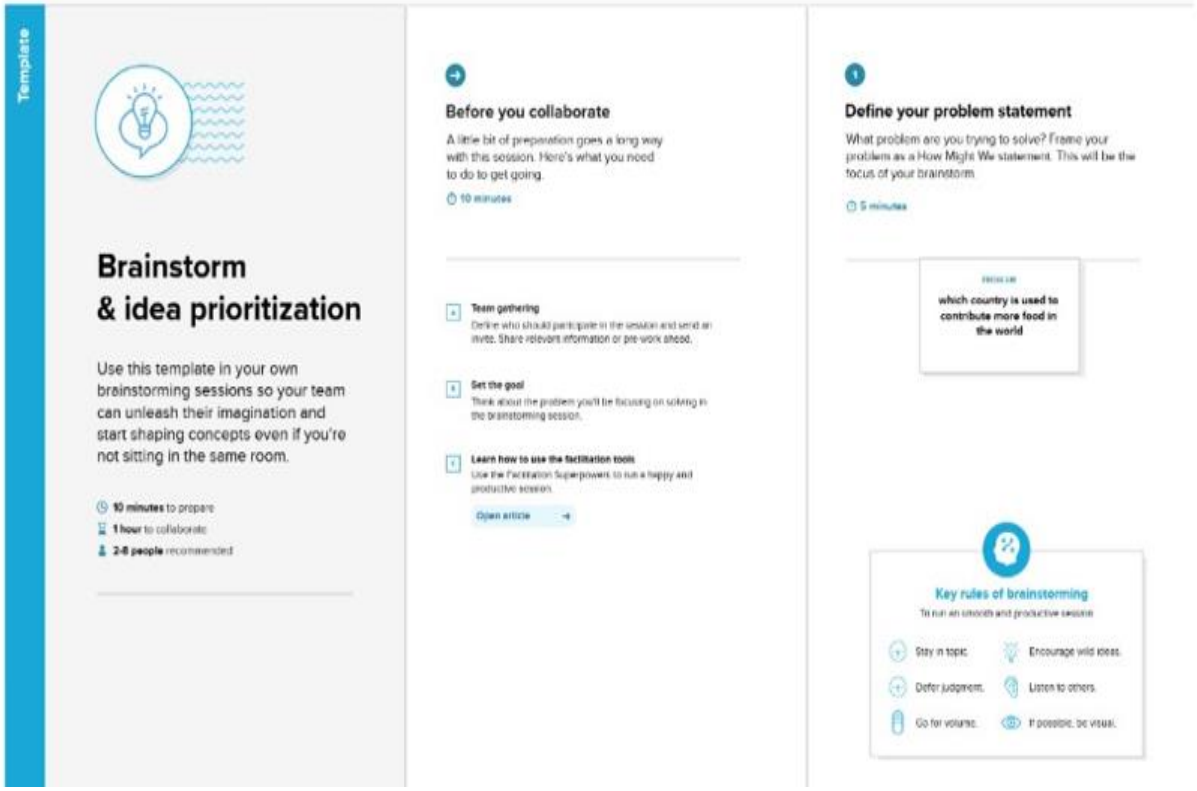
Problem Statement (PS)	I am (Customer)	I'm trying to	But	Because	Which makes me feel
PS-1 Lack of real time data insights	Agriculture analyst	Gain accurate data	Data is insatiable it creates difficulty	I need proper visualization for decision making	Frustration due to difficulties in consolidating and interpreting data.
PS-2 Data Integration and Cleaning Challenges	Variability in data sources and reporting standards across regions	Identify key contributors to the production of major agricultural commodities and fruits	Difficulty in consolidating and analysing large datasets spanning multiple decades	Uneven distribution of resources and cultivation practices across different regions	Concern over the challenges of global food security and resource allocation.
PS-3 Regional and Commodity-Specific Analysis	Understanding And making polices	The data is to segmented and properly aligned	Data segmentations is not easy	Effective planning require for polices	Disappointment in the production disparities among regions, leading to unequal access to food

PS-4 Time-Series Analysis and seasonal analysis	Understanding which is contributing more food from which state and item specific	strategic decision by providing actionable insights into crop growth commodity demands	Fluctuations in crop production due to environment and climate factors.	The lack of standardized methodologies for global data collection and reporting in the agricultural sector	A sense of urgency to address climate and sustainability issues affecting production

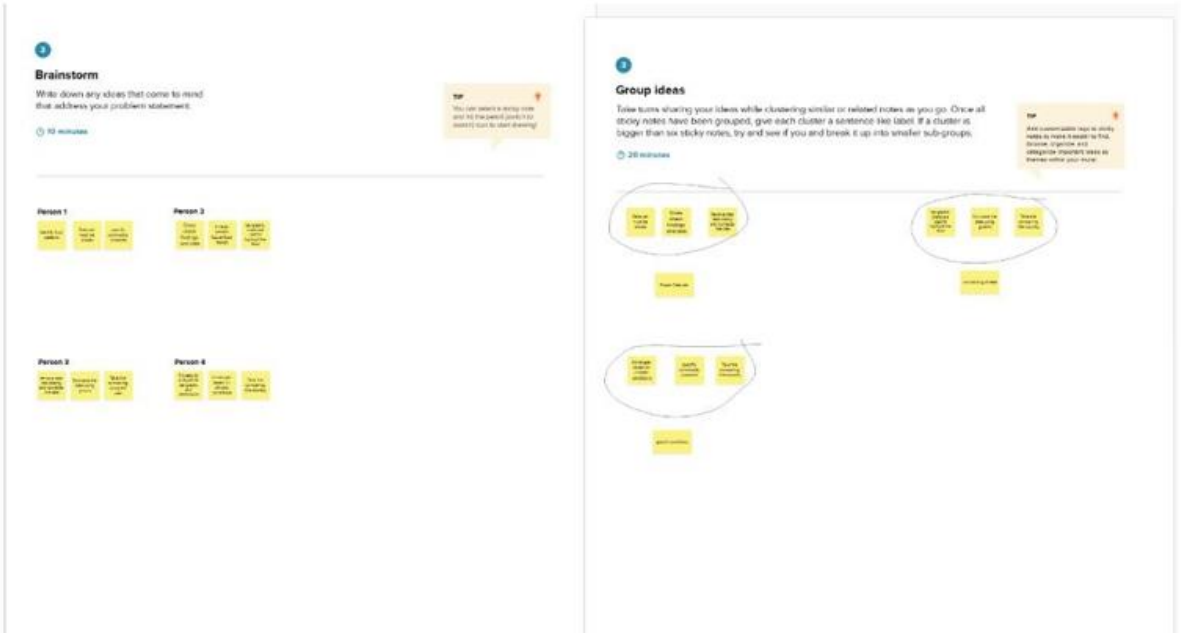
2.2 Empathy Map Canvas



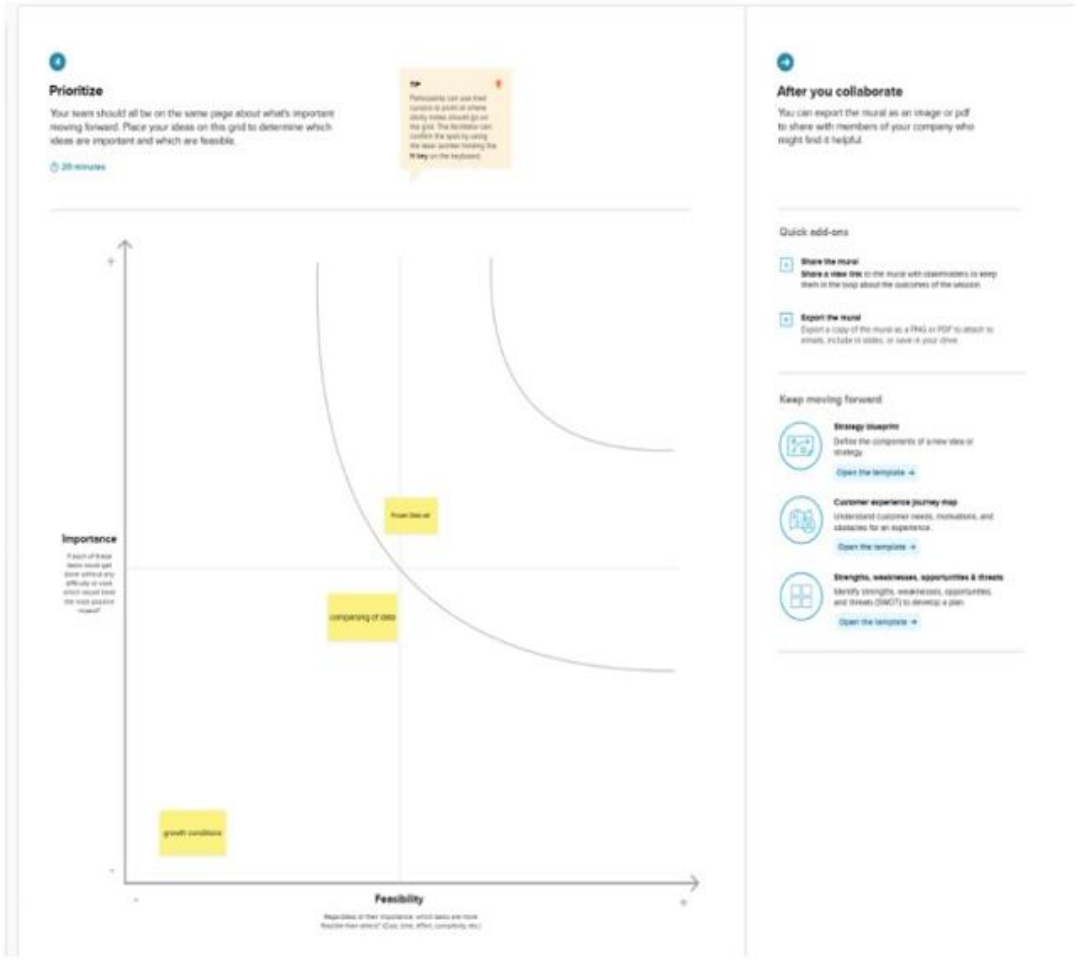
2.3 Brainstorming



Step-2: Brainstorm, Idea Listing and Grouping



Step-3: Idea Prioritization



3. REQUIREMENT ANALYSIS

3.1Customer Journey map

3.2 Solution Requirement

Functional Requirements:

Following are the functional requirements of the proposed solution.

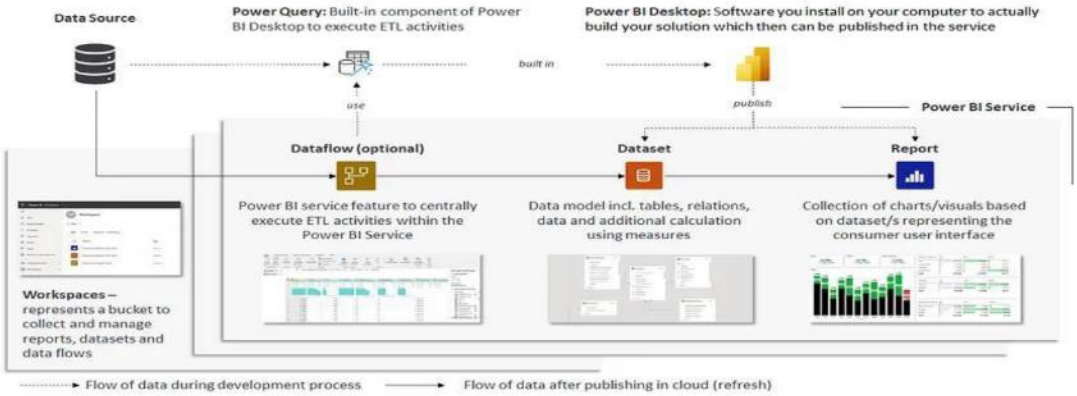
FR No.	Functional Requirement	Sub Requirement
FR-1	Data Input & Management	Users can upload food production datasets in CSV or Excel format. The system validates the format and structure of uploaded data.
FR-2	Data Preprocessing & Cleaning	The system should clean, normalize, and structure data for consistency and accuracy.
FR-3	Feature Selection & Model Training	The system identifies the most relevant features affecting food production.
FR-4	Prediction & Recommendations	The system predicts future food production trends based on historical data. It provides recommendations for improving yield (e.g., soil health, climate impact).
FR-5	Visualization & Insights	Users can view interactive dashboards with trends and reports.
FR-6	Model Updates	Admins can retrain models with new data for improved accuracy.

Non-functional Requirements:

Following are the non-functional requirements of the proposed solution.

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Dashboards should be user-friendly and accessible.
NFR-2	**Security**	Users must authenticate via email & password before accessing data.
NFR-3	**Reliability**	The system should work accurately and without failures.
NFR-4	**Performance**	The system should process large data records Predictions should be generated quickly for standard queries.
NFR-5	**Availability**	The system should be accessible in all of the time.
NFR-6	**Scalability**	System should handle large datasets efficiently with the data growth

3.3 Data Flow Diagram



User Stories

Use the below template to list all the user stories for the product.

User Type	Functional Requirement	User Story Number	Acceptance criteria	Priority	Release
Data Analyst	Analyse global food consumption trends over time	USN-1	Data should include per capita consumption of key food groups	High	Sprint-1
Data Engineer	Collect and preprocess food production and trade data	USN-2	Data should be cleaned, normalized, and structured for analysis	High	Sprint-1
BI Developer	Develop interactive dashboards for food trends visualization	USN-3	Dashboards should show trends by region, food type, and time period.	High	Sprint-2
Policy Maker	Assess the impact of food trends on nutrition and health	USN-4	Reports should highlight dietary shifts and health correlations	High	Sprint-1
Farmer	Access insights on crop demand and price trends	USN-5	Reports should provide forecast data on crop prices and demand	High	Sprint-1
Admin	Manage data access, permissions, and updates	USN-6	Admin should have control over user access, data refresh, and security	Medium	Sprint-2

3.4Technology Stack

Technical Architecture:

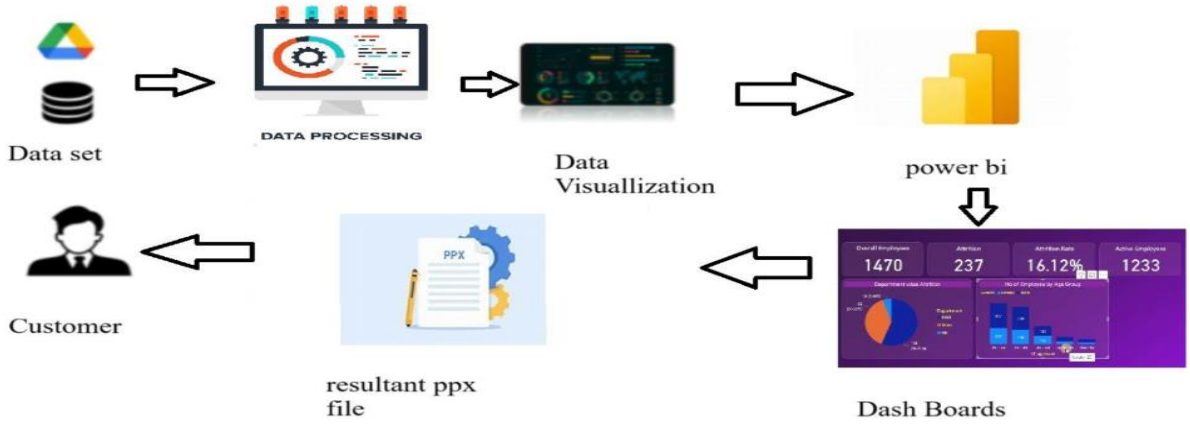


Table 1: components and Technologies

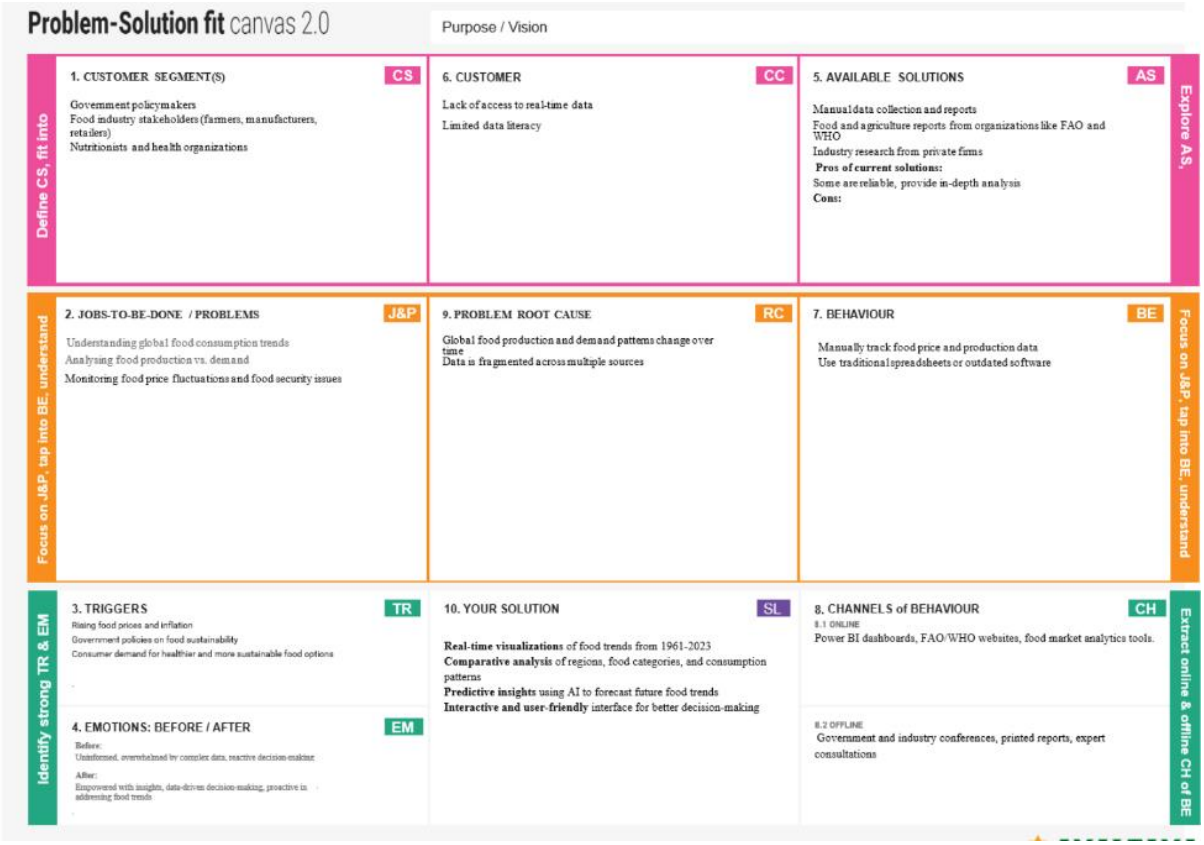
S. No	Component	Description	Technology
1.	Data Source	Historical food production dataset (1961-2023)	CSV, Excel, SQL Database
2.	Data Processing	Cleansing, transforming, and preparing data	Power Query (Power BI), Python (Pandas)
3.	Data Visualization	Graphical representation of data trends and insights	ableau, Power BI, Python
4.	Power BI D	BI tool used to create interactive reports & dashboards	Power BI
5.	Dashboards	Visual representation of key metrics and reports	Power BI Visuals (Line charts, Bar charts, Heatmaps)
6.	Resultant File	Exported presentation or report file	PowerPoint, PDF

Table-2: Application Characteristics:

S. No	Characteristics	Description	Technology
1	Data Processing	Handling the large sets and transforming raw data	Power BI, Python
2	Security Implementations	Implements role-based access and authentication.	Power BI Security, Row-Level Security
3	Visualization & Reporting	Graphical and tabular representation of data	Power BI,
4	Availability	Accessible through cloud-based Power BI reports	Power BI Service
5	Performance	Optimized report generation and fast loading	Power BI Data Model, DAX Optimization

4. PROJECT DESIGN

4.1 Problem Solution Fit

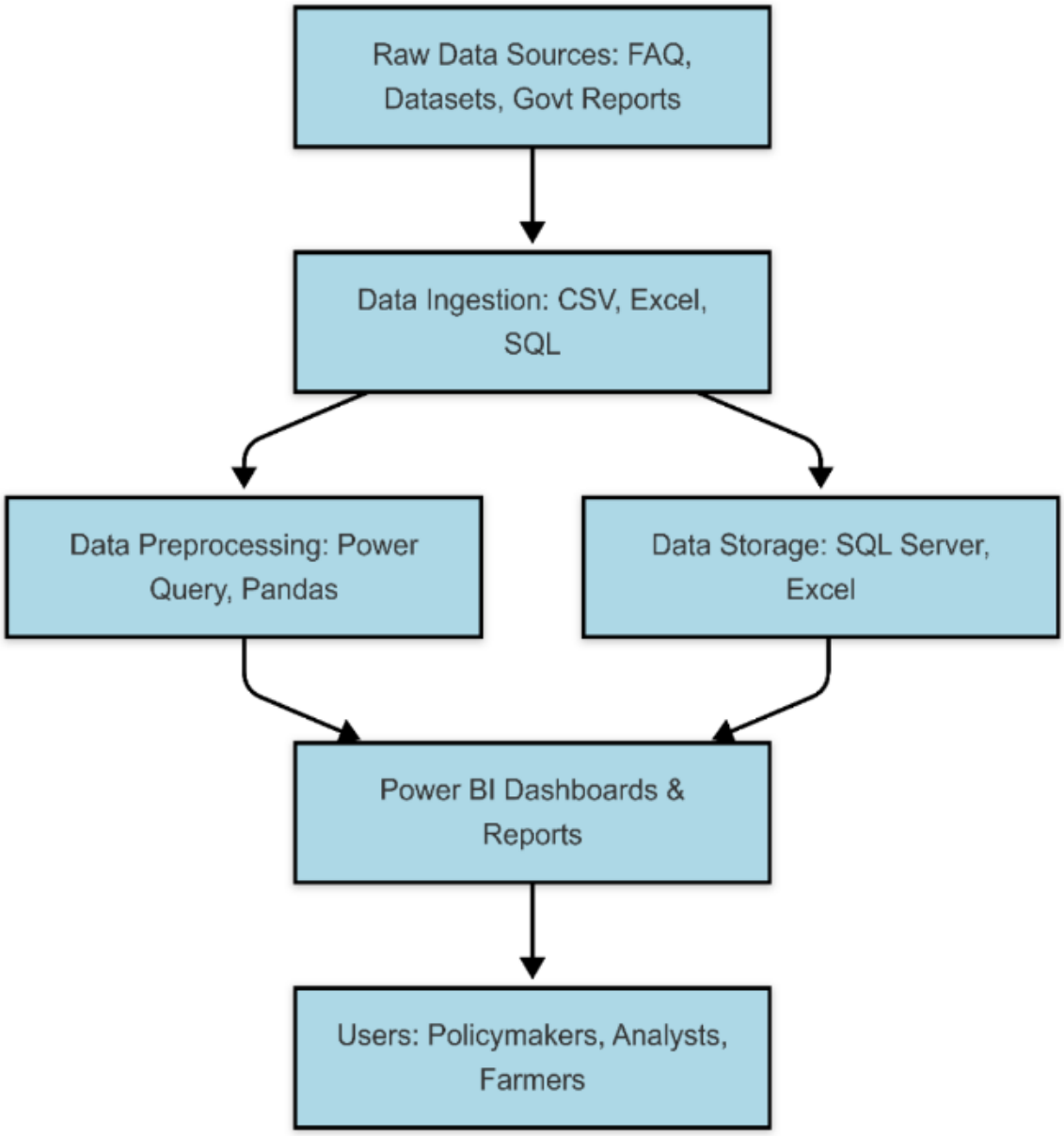


4.2 Proposed Solution

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Global food production has seen significant growth, yet challenges remain in distribution, sustainability, and accessibility. While total production of staple crops like wheat (282 billion tonnes) and rice (269 billion tonnes) has increased, food insecurity persists. Additionally, climate change and regional disparities in production affect food availability and affordability
2.	Idea / Solution description	Leveraging historical data from 1961 to 2023, this project aims to develop data-driven insights for optimizing food production, reducing waste, and improving distribution channels. Using Power BI visualizations, the solution will identify key production trends, predict future demands, and propose policies for sustainable agriculture.
3.	Novelty / Uniqueness	• Utilization of over 60 years of historical data to create predictive analytics for future food production. • Regional insights into key contributors like Africa (green coffee leader) and Asia/Europe (fruit production hubs).
4.	Social Impact / Customer Satisfaction	• Enhanced food security by identifying gaps in production and distribution. • Support for farmers and policymakers in making informed decisions. • Contribution to reducing food waste and promoting efficient resource utilization.
5.	Business Model (Revenue Model)	• **Subscription-based data analytics platform:** Farmers, governments, and businesses subscribe to access detailed insights. • **Consulting services:** Providing insights to policymakers and organizations for agricultural strategy development.

		• **Collaboration with Agri-tech firms:** Selling data-driven solutions to optimize agricultural supply chains.
6.	Scalability of the Solution	• **Regional Adaptability:** The model can be tailored for specific countries based on their agricultural production trends • **Expansion to other commodities:** Beyond staple crops, this approach can be applied to livestock and fisheries.

4.3 Solution Architecture



5.1 PROJECT PLANNING & SCHEDULING

5.1 Project Planning

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

Use the below template to create product backlog and sprint schedule

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Data Collection & Preprocessing	USN-1	Collect food production datasets from 1961-2023	2	High	Aguan
Sprint-1	Data Collection & Preprocessing	USN-2	Clean and handle missing data values	3	High	Aguan
Sprint-1	Data Collection & Preprocessing	USN-3	Standardize categorical values for analysis	2	Medium	Reshma
Sprint-2	Data Modelling & Visualization	USN-4	Develop predictive models for food production trends	5	High	Avinash
Sprint-2	Data Modelling & Visualization	USN-5	Create Power BI dashboards for data visualization	4	High	Avinash
Sprint-2	Data Modelling & Visualization	USN-6	Test and validate predictive models	3	Medium	Avinash
Sprint-3	Insights & Deployment	USN-7	Develop insights and recommendations for policymakers	5	High	Kalyan
Sprint-3	Insights & Deployment	USN-8	Deploy interactive dashboards for stakeholders	5	High	Kalyan
Sprint-3	Insights & Deployment	USN-9	Conduct review and refine insights based on feedback	3	Medium	Kalyan

Project Tracker, Velocity & Burndown Chart: (4 Marks)

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	7	3 Days	18 March 2025	20 March 2025	7	29 Oct 2022
Sprint-2	12	3 Days	20 March 2025	23 March 2025	12	
Sprint-3	13	3 Days	23 March 2025	26 March 2025	13	

Velocity Calculation

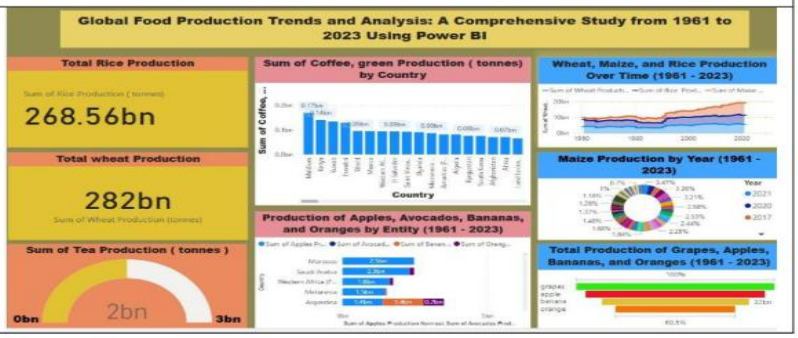
Total Story Points = 7 + 12 + 13 = **32**

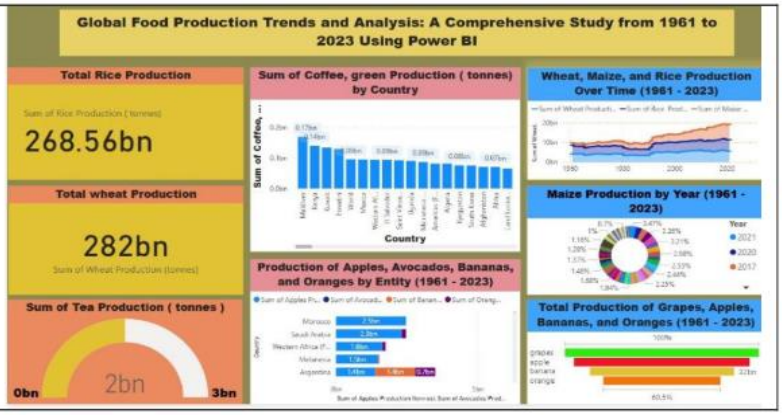
Number of Sprints = **3**

Velocity = **32 / 3 = 10.67**

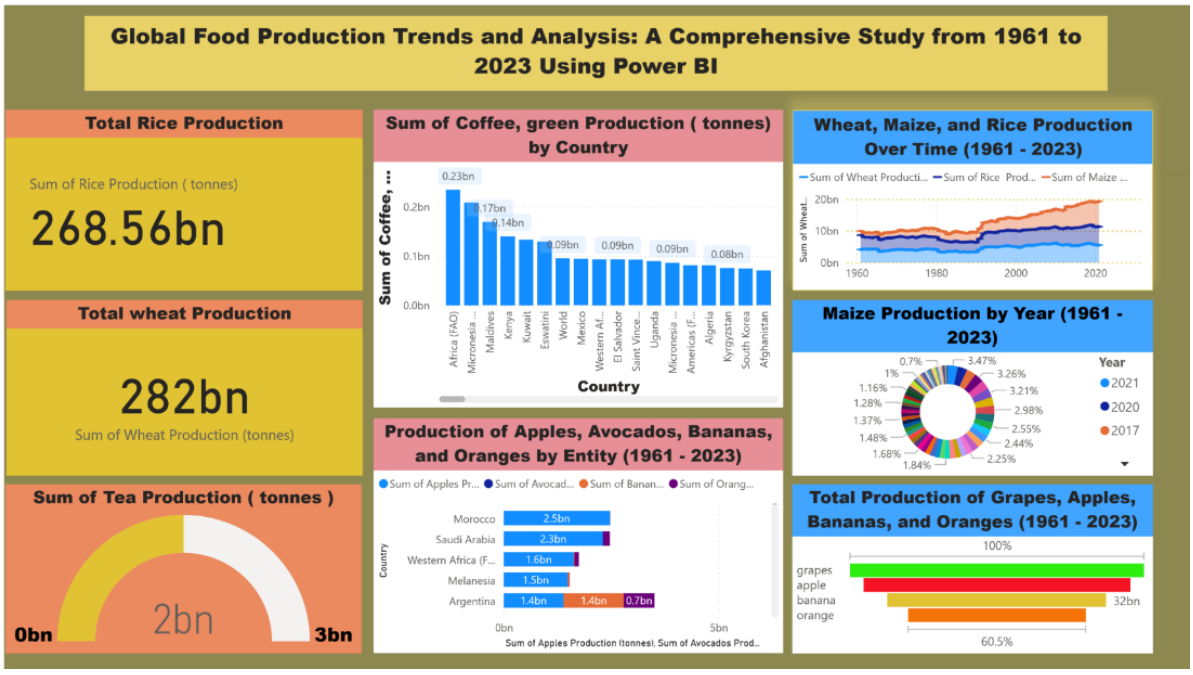
6 FUNCTIONAL AND PERFORMANCE TESTING

6.1 Performance Testing

S.No.	Parameter	Screenshot / Values
1.	Data Rendered	11913 Rows and 25 Columns
2.	Data Preprocessing	Removing null values. Standardizing column names.
3.	Utilization of Data Filters	Year, Country and crop type filters are used
4.	DAX Queries Used	
5.	Dashboard design	

6	Report Design	

7. RESULTS



8. ADVANTAGES & DISADVANTAGE

ADVANTAGES

- Power BI enables dynamic charts and dashboards, making trend analysis more insightful.
- It is easily to connect with multiple data sources for a comprehensive analysis.
- Power BI allows real-time data refresh, ensuring up-to-date analysis.
- It functionality makes it accessible for non-technical users.

DISADVANTAGE

- Power BI face performance issues with extremely large datasets.

- Preprocessing data is time-consuming.

9. CONCLUSION

This analysis of global food production from 1961 to 2023 provides essential insights into agricultural growth patterns and key commodity trends. It shows us resource for policymakers, agribusinesses, and researchers in strategic decision-making for food security and global trade. The study highlights the increasing demand for staple foods like wheat, maize, and rice, emphasizing the need for sustainable farming practices. Additionally, the rise in fruit and beverage crop production reflects shifts in global consumption patterns. Power BI analysis has given a clear understanding of food production trends, which can be used for the future agricultural investments and innovations to ensure food sustainability.

10. APPENDIX

Dataset& Project Demo Link:
https://drive.google.com/drive/folders/1rx5gbQ9_2AUJq43HVWnO_UTUmvGHyLPR

GitHub link: https://githubhttps://github.com/avinash0546/global-food-trend-powerbi-dashboard.git.