Crop Production Analysis In India

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Introduction

Crop production in India plays a vital role in the country's economy, contributing significantly to its GDP and employment. The diverse climatic conditions and fertile soil support the cultivation of a variety of crops, including rice, wheat, pulses, and sugarcane. Agriculture in India is a blend of traditional farming practices and modern technology, aiming to ensure food security and sustainable growth.

Problem Statement

The Agriculture business domain, as a vital part of the overall supply chain, is expected to highly evolve in the upcoming years via the developments, that are taking place on the side of the Future Internet. This paper presents a novel Business-to-business collaboration platform from the agri-food sector perspective, which aims to facilitate the collaboration of numerous stakeholders belonging to associated business domains, effectively and flexibly.

This dataset provides a huge amount of information on crop production in India ranging from several years. Based on the Information the ultimate goal would be to predict crop production and find important insights highlighting key indicators and metrics that influence crop production.

Make views and dashboards first and also make a story out of it.

The Process

- Data Collection
- Data Cleaning
- Data Analysis
- Insights
- Summary

Data Collection

- Data Collected in an Excel file in the name of Crop Production Data
- There are 2,46,091 rows and 7 columns
- The Excel file has a dataset of Crop Production from Year 1997 to 2015

Data Description

- State Name: It describes the name of the states in India where people do farming
- District Name: It indicates the districts in each state where people do farming
- Crop_Year : It indicates the year in which we harvest a particular crop
- Season: It describes the diverse climatic conditions that allow for multiple cropping Season
- Crop: It indicates the name of the crop
- Area: Total land area in which a particular crop is grown
- Production: It describes the total production of a particular crop in a particular year

Data Cleaning

- Data has been cleaned using Python
- There are 3730 null values in the production column. Since it is only 1 % of the dataset, I handled the missing values by dropping the rows
- Corrected typos and inconsistencies in categorical data using .str.strip() and .replace() methods
- Replaced "Winter" season with "Rabi" and "Summer" season with "Zaid", for more clarity in analyzing as in Indian agriculture, seasons are referred to as Kharif, Rabi, and Zaid
- There are 4 duplicate rows, so I handled it by dropping them permanently

DATA ANALYSIS

Important KPIs

Understanding of Crop Production

- Total Number of Crops
- Total Production
- Total Production by Crop Category
- Total Area by Crop Category
- Crop Production Over the Years

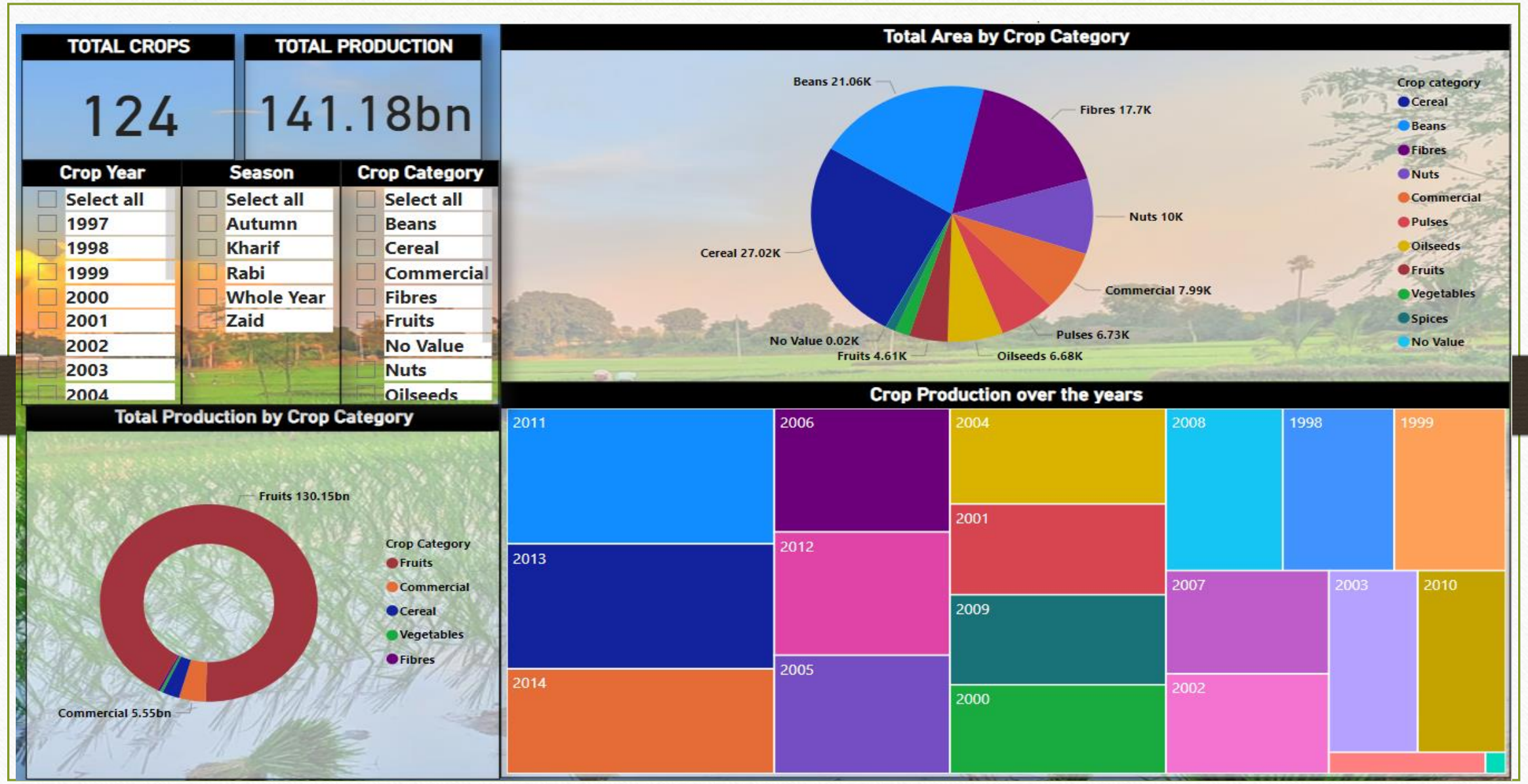
Regional Performance

- Total States
- Total Districts
- Top 5 Districts in Crop Production
- Top 5 States in Crop Production
- Average Production of Crop by Zones
- Average Cultivated Area by States and Crop Category
- Total Production by Zones
- Region-wise Profit

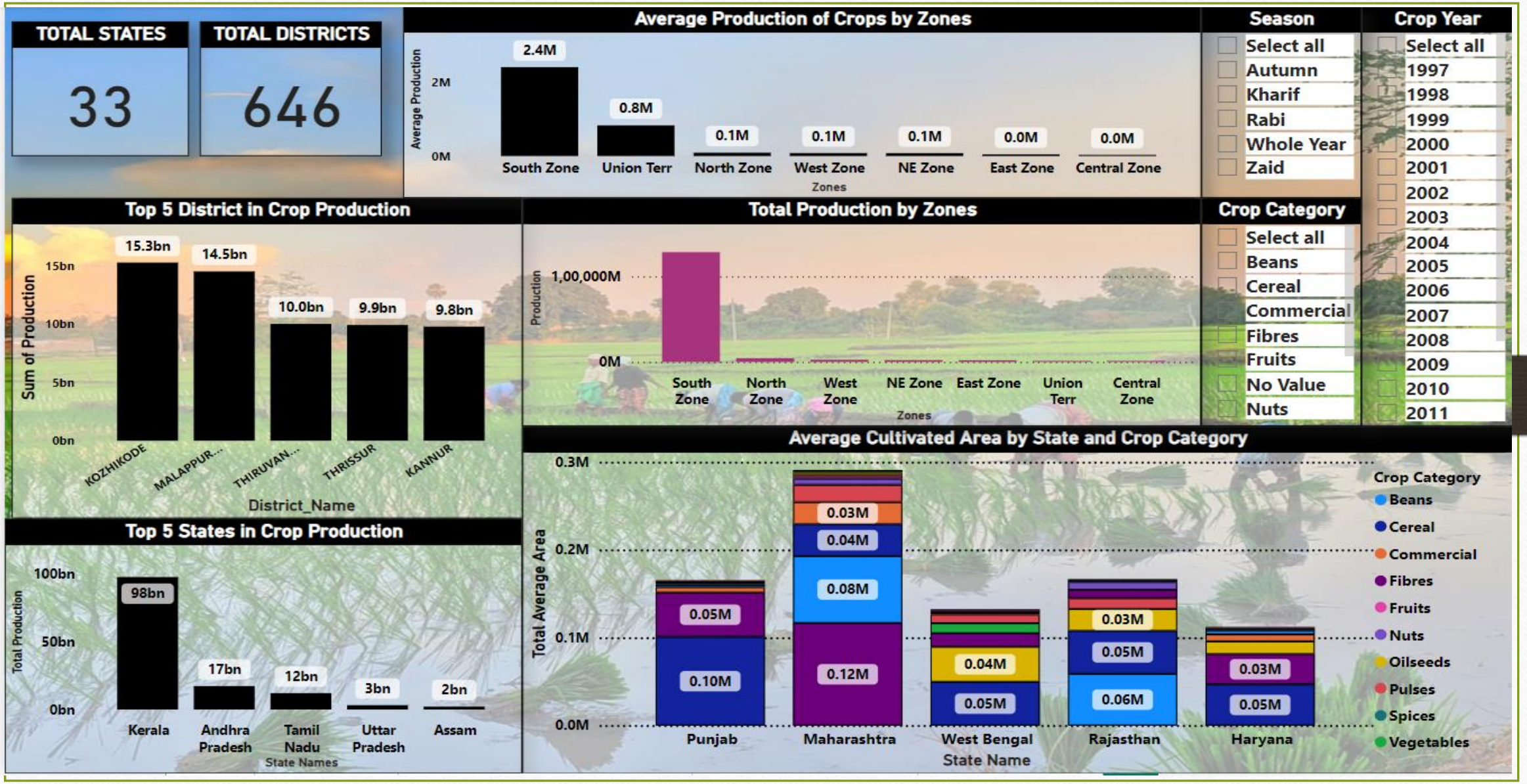
Seasonal Impacts

- Top 5 Crops Produced in Winter, Summer, and Monsoon
- Total Production by Season
- Season, Area, and Production Relation

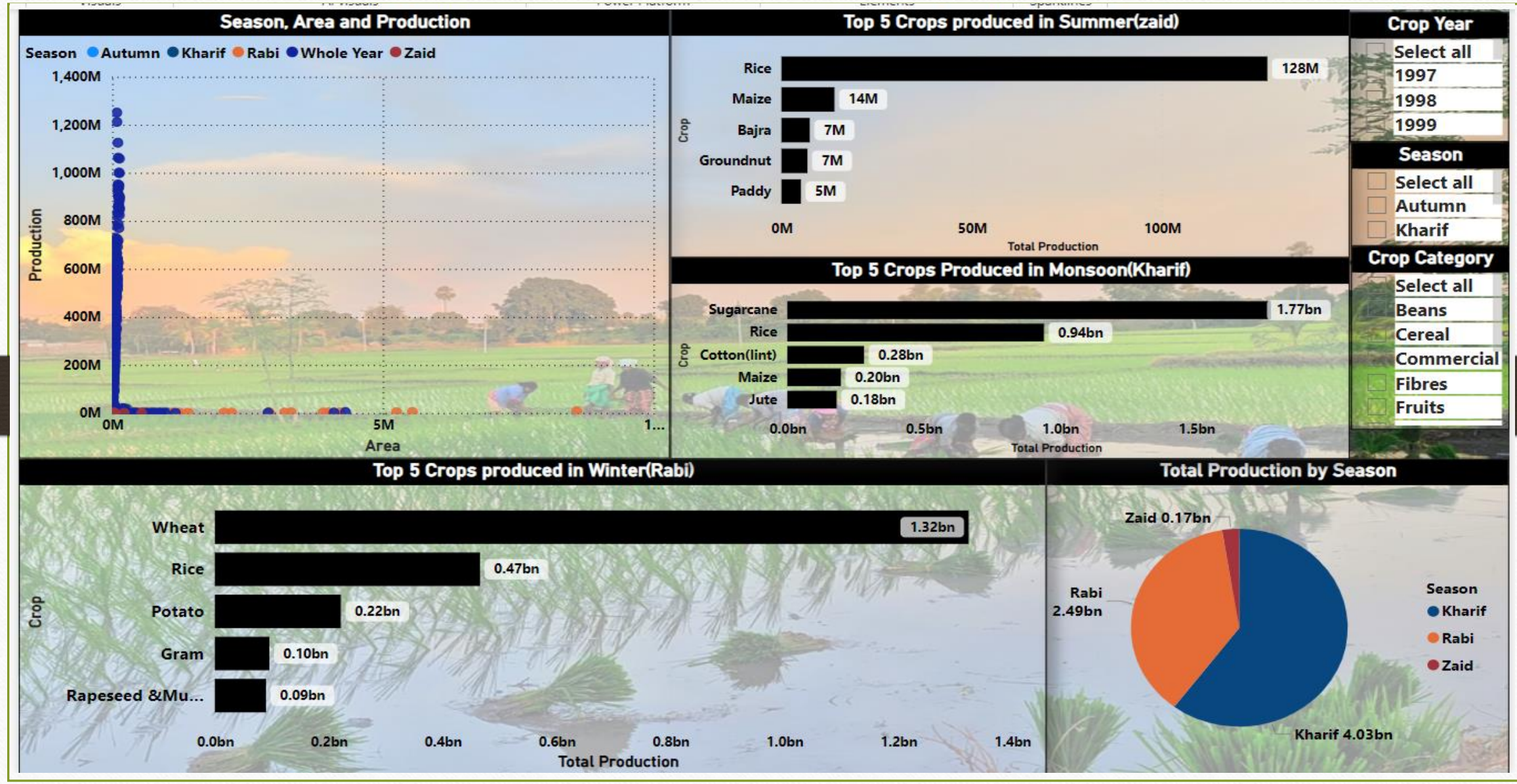
Understanding Crop Production



Regional Performance



Seasonal Impacts



Insights

- There are a total of 124 types of different crops grown in India in the last 19 years as per the dataset
- Total production is 141.18 billion
- There are total 33 states in total of which 4 are union territories
- There are a total of 646 districts in the dataset
- The dataset is from 1997 to 2015
- A total of three seasons which are the main crop seasons: Kharif, Rabi, and Zaid, Autumn is more of a transitional period overlapping with the end of Kharif and the beginning of Rabi. And Whole Year signifies in any of the seasons.

Insights

- Crop Production varies significantly by state and district due to regional climate, soil, and management practices
- The Season (e.g. Kharif, Rabi) has a significant impact on crop production
- The correlation coefficient of Production and Area is 0.041, indicating a very weak positive correlation between these two factors. This suggests that in this specific dataset, the cultivated area does not strongly influence the production levels. Other factors might have a more significant impact like soil quality, farming technique, or weather conditions.
- Rice, Maize, Bajra, Groundnut, and Paddy are the Top 5 crops produced in the Summer Season(Zaid)
- "Wheat", "Rice", "Potato", "Gram", "Rapeseed & Mustard" are the Top 5 crops produced in the Winter season(Rabi)
- Sugarcane, Rice, Cotton, Maize, and Jute are the Top 5 of the Monsoon Season(Kharif)

Insights

- In the Kharif Season, India has higher production of crops i.e. 4.03 billion
- Over the past 19 years, crop production in India has decreased significantly
- There is a drastic decline in the count of crops that have been grown in India from 2014 to 2015 as per the analysis i.e. 75 crops in 2014 to 17 crops in 2015
- The decline in the number of crops grown in 2015 compared to 2014 was mainly due to adverse weather conditions, including unseasonal rainfall, hailstorms, and a deficient monsoon, which led to reduced water availability and forced farmers to either switch to fewer crops or leave land fallow.
- The highest decline in production over the past 19 years is majorly in 2015.
- From 1998 to 2014, Fruits had higher production, in 1997, commercial crops, and in 2015, cereals had higher production
- Top 5 average cultivated areas by state and crop category are Punjab, Maharashtra, West Bengal, Rajasthan, Haryana

Insights

- South zone has the highest crop production as compared to other zones of the country
- The South Zone's high crop production is primarily due to its favorable climate, well-developed irrigation infrastructure, fertile soils, and the adoption of modern agricultural practices, supported by government schemes and innovations like drip irrigation.
- "Kozhikode", "Malappuram", "Thiruvananthapuram", "Thrissur", "Kannur" are the top 5 districts in Crop production.
- Kerala, Andhra Pradesh, Tamil Nadu, Uttar Pradesh, and Assam are the top 5 states in crop production

Recommendations

- **Climate-Resilient Agriculture:** Invest in climate-resilient practices and develop drought-resistant and flood-tolerant crops to mitigate weather-related risks.
- **Irrigation Infrastructure**: Enhance irrigation systems and promote efficient techniques like drip and sprinkler irrigation to optimize water use.
- **Crop Diversification**: Encourage farmers to diversify crops to reduce risk and increase income stability.
- **Crop Insurance**: Strengthen and expand crop insurance schemes to protect farmers from losses due to extreme weather events.
- **Focus on Southern States**: Target agricultural development initiatives in the South Zone to further boost productivity.
- **Regional Planning**: Implement region-specific agricultural plans to optimize production based on local conditions.

Predictions

- **Modern Farming Techniques**: Expect broader adoption of precision agriculture and sustainable practices, improving crop yields.
- **Crop Diversity Decline**: Without mitigation, crop diversity may continue to decline due to adverse weather conditions.
- **Shift to Resilient Crops**: Anticipate a shift toward cultivating more resilient crops to adapt to changing climate conditions.
- **South Zone Growth**: The South Zone may continue to lead in crop production, widening the gap with other regions.
- **Year-Round Farming**: Greater emphasis on year-round farming practices could emerge to ensure consistent production despite seasonal variability.

Thank You