Domain: Agriculture

Dataset Description:

Dataset: Agriculture dataset Karnataka (https://data.mendeley.com/datasets/nfj84km5fz/1)

The Karnataka Agriculture dataset contains detailed agricultural records from 2004 to 2019 across the state's main crop-growing regions, encompassing 3,158 rows and 12 columns with certain missing values (cleaned before visualization). Each record includes:
- Temporal details (Year),
- Location-specific attributes (Location, Soil type, Irrigation),
- Quantitative measures (Area cultivated, Rainfall, Temperature, Humidity, Yield, Market price),
- Categorical production information (Crops, Season: Kharif, Rabi, Zaid).

The data aggregately covers over a dozen crop types (such as coconut, ginger, coffee, and arecanut) and multiple districts. It reflects variations in rainfall, climatic conditions, irrigation methods, and soil types, allowing for multidimensional analysis of agricultural productivity and its drivers. The dataset was sourced from Mendeley and rigorously cleaned for integrity, enabling reliable visualizations and insights.

Primary Goal of the Dashboard:

Dashboard Title: Agricultural Insights Dashboard: Yield, Resources, and Crop Trends in Karnataka (2004–2019)

The primary goal is to deliver a comprehensive analytical view of agricultural performance in Karnataka by examining crop yield patterns, resource utilization, soil and seasonal dynamics, and market factors. The dashboard enables farmers, policymakers, and agribusiness stakeholders to make data-driven decisions for optimizing cultivation strategies, improving productivity, and enhancing profitability.

Target Audience:

The dashboard is designed for a wide spectrum of stakeholders:
- **Farmers and agricultural cooperatives:** Seeking to identify best-performing crops, optimal planting strategies, and resource management techniques,
- **Agricultural extension officers and planners:** Needing granular regional and seasonal trends for targeted interventions,
- **Policy makers:** Crafting support schemes and subsidies based on actual productivity and resource usage patterns,
- **Agribusiness investors and researchers:** Assessing market dynamics and risk factors for strategic planning.

Metrics or Data Points Displayed:

The dashboard highlights several critical metrics:
- **Crop distribution** (count and average yield per crop),

- **Yield trends** over time (annual changes and outliers),
- **Yield by crop and location** (regional efficiency, productivity gaps),
- **Rainfall vs. yield** (resource dependency, potential vulnerability),
- **Market price distributions** (by crop, season, and location),
- **Box plots of yield by soil type** (soil fertility and suitability),
- **Heatmaps of average yield per location and season** (seasonal/regional strengths),
- Comprehensive filters for crop, season, location, and year, supporting multidimensional analysis.

Dashboard Support for Decision Making:

This dashboard empowers data-driven decision-making in several ways:
- **Pinpoints high-yield crops and regions,** facilitating targeted crop selection and land-use optimization,
- **Reveals the relationships between rainfall, yield, and cultivation practices,** guiding irrigation planning and climate risk strategies,
- **Highlights price volatility and revenue opportunities,** enabling rational market planning and timing for harvests,
- **Surface regional, seasonal, and soil-based productivity insights,** supporting extension services and strategic resource allocation.

By integrating environmental, agronomic, and economic factors in one interactive space, the dashboard enables stakeholders to identify actionable trends, minimize risks, and maximize benefits.

Chart Interpretations:

Trend: Yield vs Rainfall (Line Chart)
This dual-axis line chart tracks the average annual yield and rainfall across the years 2004–2019. The data reveals an initial sharp decline in both rainfall and yield, after which rainfall stabilizes but yield demonstrates modest variability and intermittent peaks. The overall yield trend does not strictly follow rainfall, indicating that factors beyond precipitation, such as advances in farming techniques or irrigation, influence agricultural productivity.
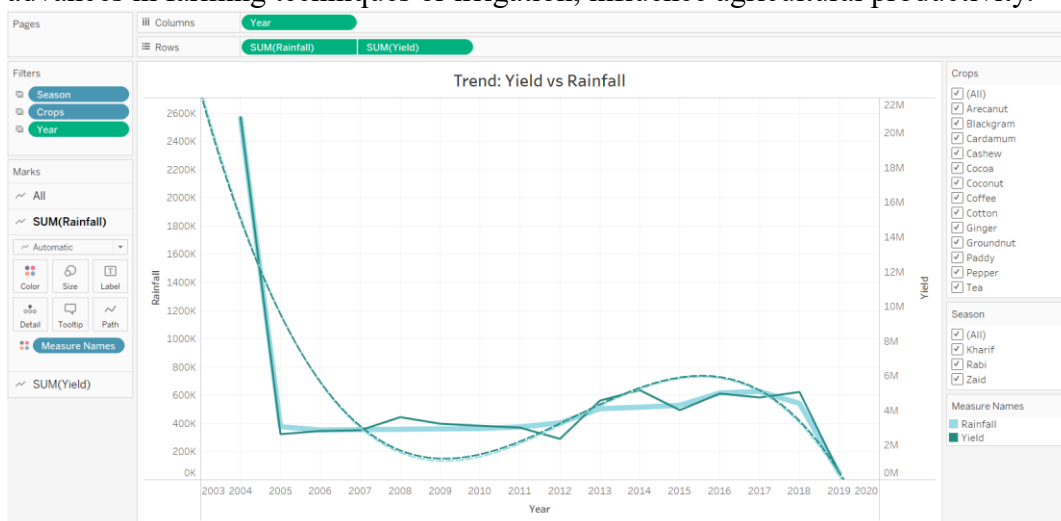

Scatter Plot: Rainfall vs Yield

The scatter plot maps the relationship between average rainfall and average yield per area across the dataset. Most data points cluster at moderate rainfall (1,000–3,000 mm) and lower yields, with a few outliers achieving high productivity under specific rainfall conditions. The scattered distribution, with limited upward trend, suggests that greater rainfall doesn't guarantee higher yields—soil characteristics, irrigation methods, and crop choice also play significant roles.
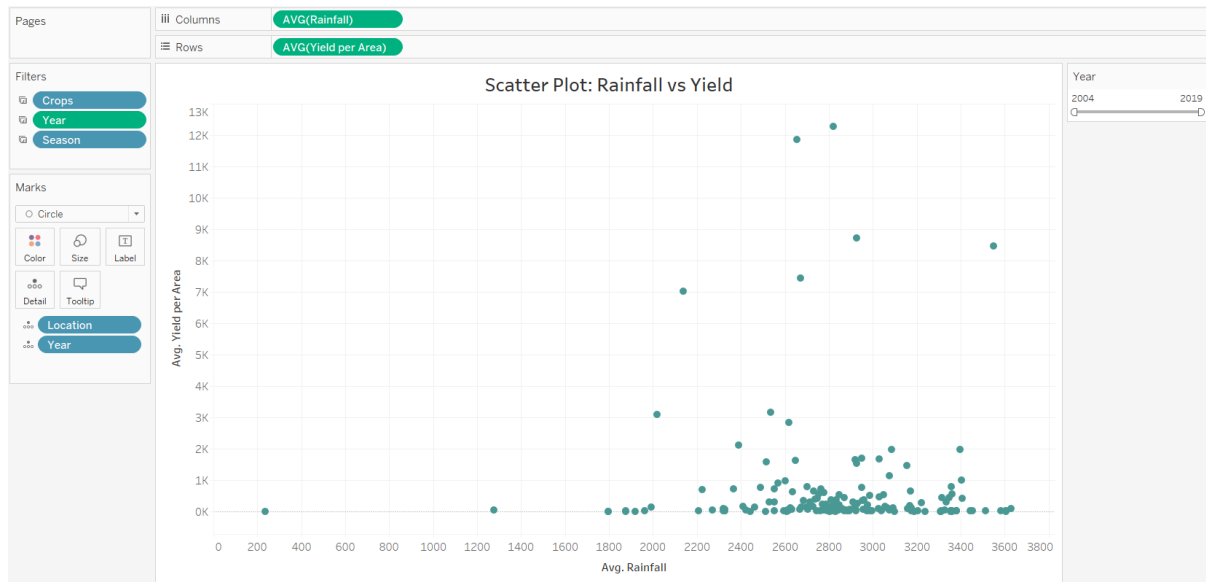
Stacked Bar Chart: Area Share by Crop & Season

This chart visualizes the total cultivated area and average yield for each crop type, further split by season (Kharif, Rabi, Zaid). It is evident that crops like Ginger and Coconut occupy the largest cultivation areas and deliver the highest yields. The strong seasonal component (Rabi predominance for many crops) highlights the importance of planting cycles for output maximization.
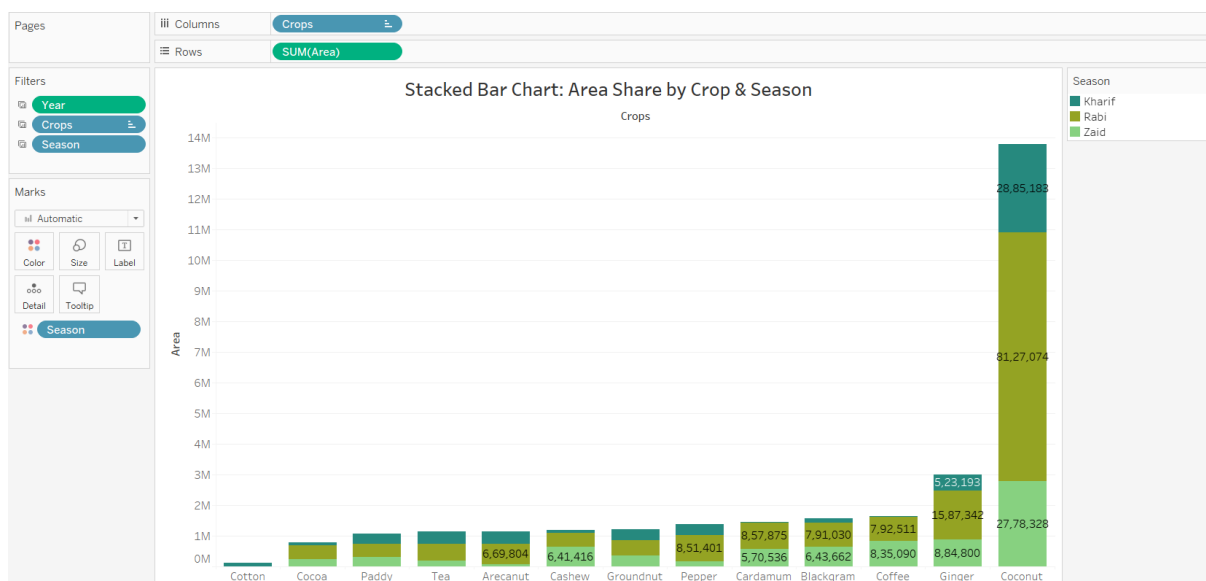

Box Plot: Yield Distribution by Soil Type

The box plot details yield variability across soil types, exposing which soils consistently support higher average yields. For instance, Clay and Black soils show higher median yields and favorable spread, whereas some types have lower or highly variable results. The plot enables quick identification of soils best suited for productive agriculture in the region.


Heat Map: Avg Yield Per Location Per Season

The heat map depicts average yields segmented by location and season. Districts such as Mysuru, Kodagu, and Davangere consistently display darker shades—representing higher yields—particularly during Rabi and Zaid seasons. This visual pinpoints regional strengths and seasonal opportunities, offering a comprehensive perspective on spatial and temporal yield performance.
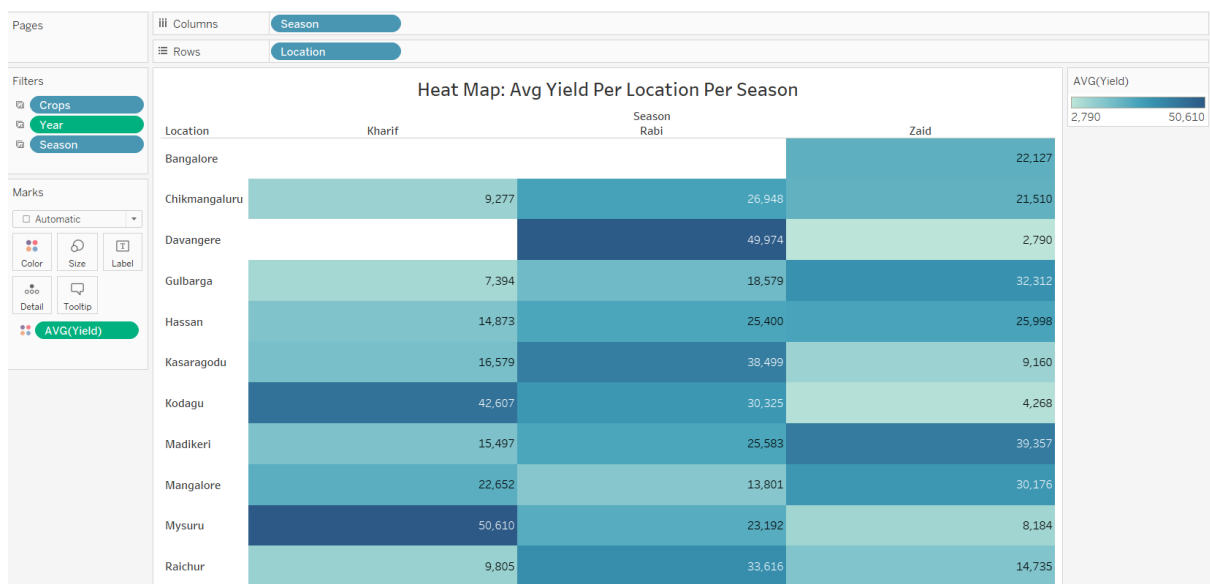
Bar Chart: Average Yield by Crop

This chart ranks crops by average yield. Coconut, Ginger, and Blackgram stand out as top performers, while crops like Cotton and Cashew exhibit much lower averages. Such direct comparisons facilitate strategic crop decision-making for maximizing returns under local agro-climatic conditions.
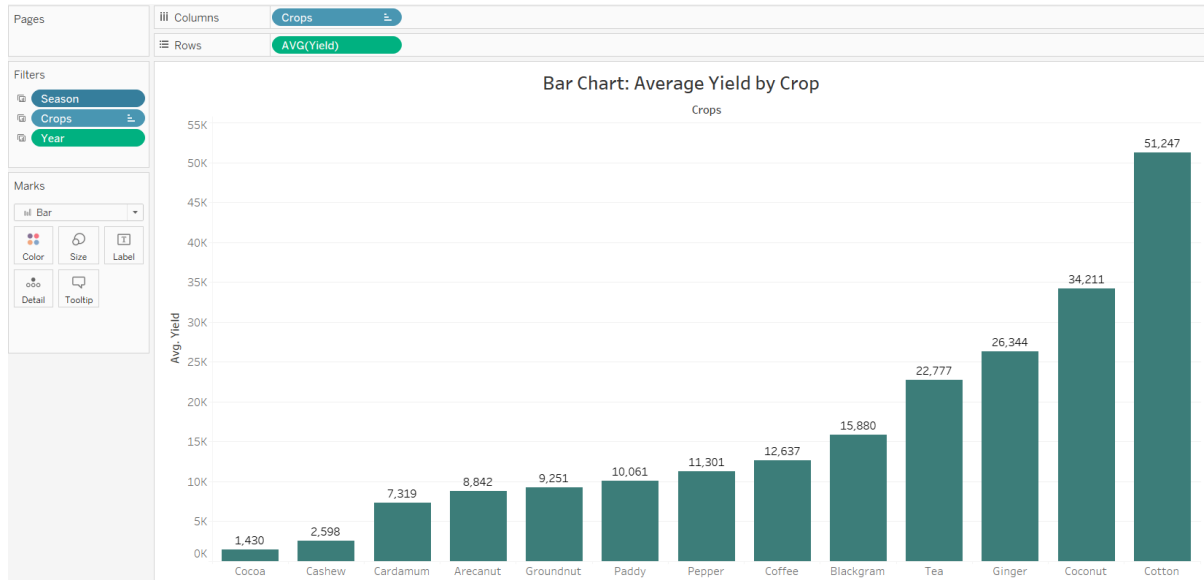

Overall Interpretation

The dashboard paints a multidimensional portrait of Karnataka agriculture:

- **Yield and rainfall** are not strictly correlated, confirming that mere precipitation does not determine output—technology, irrigation, and crop management play crucial roles.
- **Crop and soil selection** have direct, measurable impacts on productivity; targeted planning based on these insights can significantly raise yields.
- **Regional and seasonal differences** are highly pronounced—some districts and seasons are repeatedly more productive, offering clear opportunities for area-specific and time-sensitive interventions.
- **Dashboard filters** encourage dynamic exploration, allowing users to customize views for crops, locations, years, and seasons, maximizing the relevance of insights for diverse stakeholders.

Agricultural Insights Dashboard: Yield, Resources, and Crop Trends in Karnataka (2004–2019)
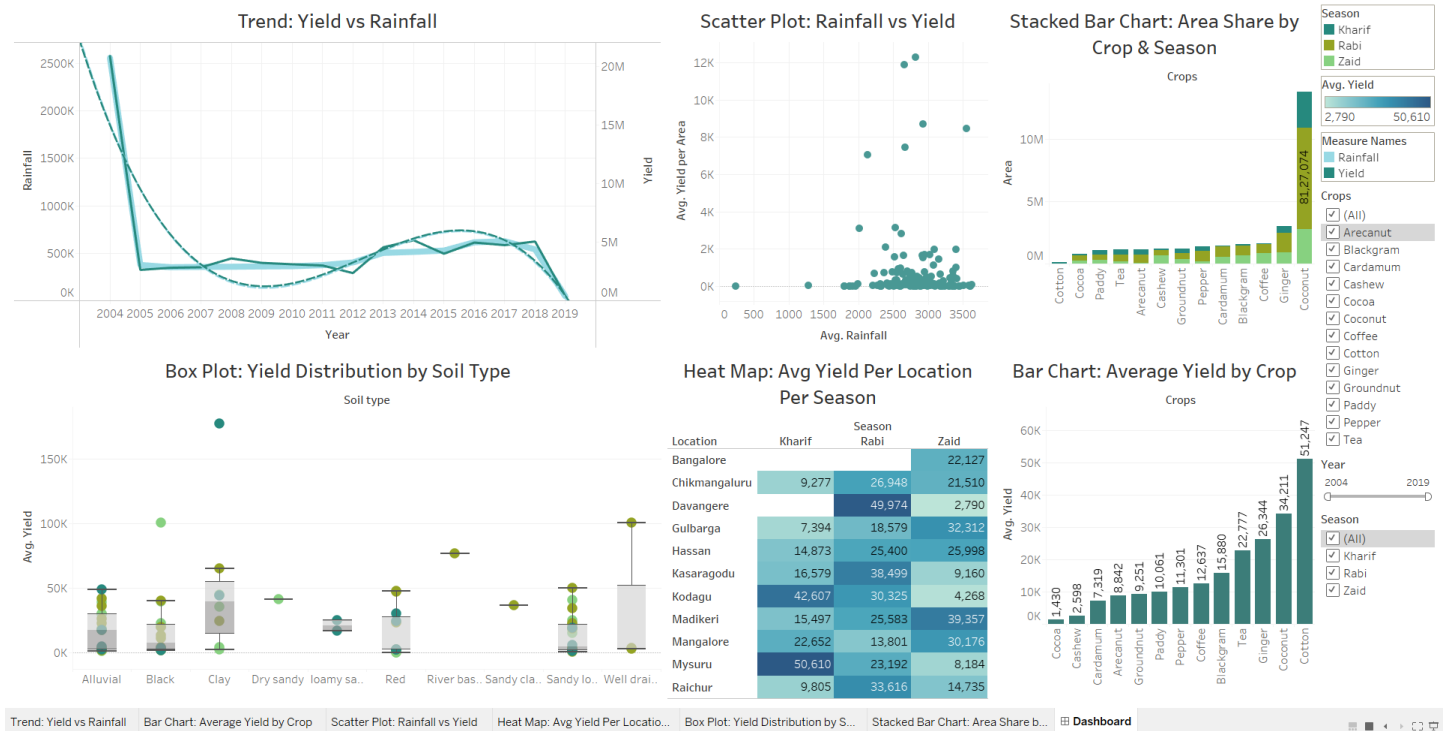
Recommendations:

- **Prioritize High-Yield Crops and Optimal Seasons:**
  Agricultural planners should focus on Coconut and Ginger in leading districts like Mysuru and Kodagu, especially during Rabi and Zaid seasons. These crops and timeframes consistently deliver superior yields according to historical data.
- **Expand Soil Management Programs:**
  Invest in improving suboptimal soils and encourage cultivation on high-performing types (e.g., Clay, Black) to boost district-wide productivity.
- **Enhance Irrigation and Climate Adaptation:**
  Since rainfall alone does not dictate yield, targeted irrigation upgrades and crop management strategies will mitigate climate risks and stabilize output.
- **Empower Regional Tailored Support:**
  Policymakers and extension agents should design programs tailored for specific districts and seasons, maximizing the effectiveness of subsidies, training, and technology deployment.
- **Promote Data-Driven Crop Diversification:**
  Use the dashboard insights to encourage crop rotation and diversification based on measurable yield, price trends, and resource efficiency, reducing risk and increasing farmer resilience.