



India Agriculture Crop Production Analysis (1997 – 2021) using tableau

**Submitted by:
MOHAMMED FARHAN 4NI22CS410**

1. Introduction

India is prestigious for its farming area, which assumes an essential part in the nation's economy and food of its immense populace. Dissecting India's harvest creation from 1997 to 2021 gives experiences into the patterns, difficulties, and progressions in the horticultural area during this period.

Somewhere in the range of 1997 and 2021, India saw huge changes in horticultural practices, strategies, and innovation reception. These progressions planned to further develop crop creation, upgrade food security, and elevate the livelihoods of ranchers the nation over.

All through this period, India experienced changes in crop creation because of different factors like environment varieties, bother episodes, and market elements. Nonetheless, generally speaking, there has been significant advancement in agrarian result, basically determined by expanded land development, further developed water system offices, and the reception of high-yielding harvest assortments.

Moreover, the period somewhere in the range of 1997 and 2021 saw the quick reception of innovation and present day agrarian practices. Accuracy cultivating procedures, like the utilization of dribble water system, remote detecting, and agrarian robots, acquired prevalence. Ranchers likewise embraced hereditarily altered (GM) crops, for example, Bt cotton, to battle nuisances and increment yields.

The examination of yield creation during this period additionally features the changing harvest designs in India. While staple yields like rice, wheat, and heartbeats kept on ruling, there was a perceptible shift towards cultivation crops, organic products, vegetables, and business crops like sugarcane and cotton.

It is significant that territorial varieties existed in crop creation across various states in India. States like Punjab, Haryana, and Uttar Pradesh arose as significant supporters of wheat and rice creation, while Maharashtra, Gujarat, and Andhra Pradesh succeeded in agriculture yields and money crops.

By and large, the period from 1997 to 2021 saw huge turns of events and difficulties in India's horticultural area. The nation gained outstanding headway in crop creation through the reception of present day procedures, strategy mediations, and mechanical progressions. Notwithstanding, tenacious difficulties and territorial variations kept on forming the agrarian scene.

1.1 Overview

The examination of India's farming harvest creation from 1997 to 2021 includes analyzing different parts of harvest development, including the kinds of harvests developed, yield levels, changes in editing designs, and the effect of outer factors, for example, environmental change and government strategies. It means to grasp the general exhibition and efficiency of the agribusiness area during this period and recognize key elements impacting crop creation.

1.2 Purpose

The reason for examining India's agribusiness crop creation from 1997 to 2021 is multifold. First and foremost, it helps in surveying the development and execution of various harvests over the long run, recognizing patterns regarding crop expansion or specialization. This data is essential for ranchers, policymakers, and scientists to pursue informed choices with respect to trim determination, land usage, and asset distribution.

Besides, the investigation considers the ID of difficulties and requirements looked by the rural area during this period. This incorporates inspecting the effect of environmental change, catastrophic events, irritations, illnesses, and different elements that might have impacted crop creation. Understanding these moves helps in forming techniques to moderate dangers and upgrade crop versatility.

Thirdly, the examination helps in assessing the viability of agrarian approaches and mediations carried out by the public authority during the review time frame. It gives bits of knowledge into the results of different drives like sponsorships, crop protection, innovation reception, and market mediations. This data helps policymakers in refining and planning future horticultural approaches for feasible turn of events.

Ultimately, the examination of yield creation information works with the ID of chances for development and improvement in the agribusiness area. It assists in distinguishing regions with undiscovered capacity, for example, advancing high-esteem crops, further developing post-gather framework, improving rural innovative work, and reinforcing store network the board. This information upholds the definition of systems to increment efficiency, work on ranchers' pay, and add to food security in the country.

By and large, breaking down India's horticulture crop creation from 1997 to 2021 gives an exhaustive comprehension of the area's exhibition, difficulties, and open doors. It fills in as a significant asset for partners engaged with rural turn of events, strategy detailing, and exploration, empowering them to settle on informed choices and make suitable moves to improve the efficiency and manageability of India's farming area.

2. Literature Survey

2.1 Existing Problem

The current issue in India's farming area is the absence of effective examination and experiences into crop creation patterns from 1997 to 2021. This postures difficulties for policymakers, ranchers, and partners in settling on informed choices with respect to trim preparation, asset designation, and market determining. Without a complete comprehension of verifiable harvest creation designs, it becomes hard to distinguish factors influencing crop yield, foresee future patterns, and foster procedures to improve rural efficiency.

2.2 Proposed Solution

To address this problem, we can leverage the power of data visualization and analysis using Tableau. By analysing the available data on crop production in India from 1997 to 2021, we can derive valuable insights and propose informed solutions. Here's a step-by-step approach:

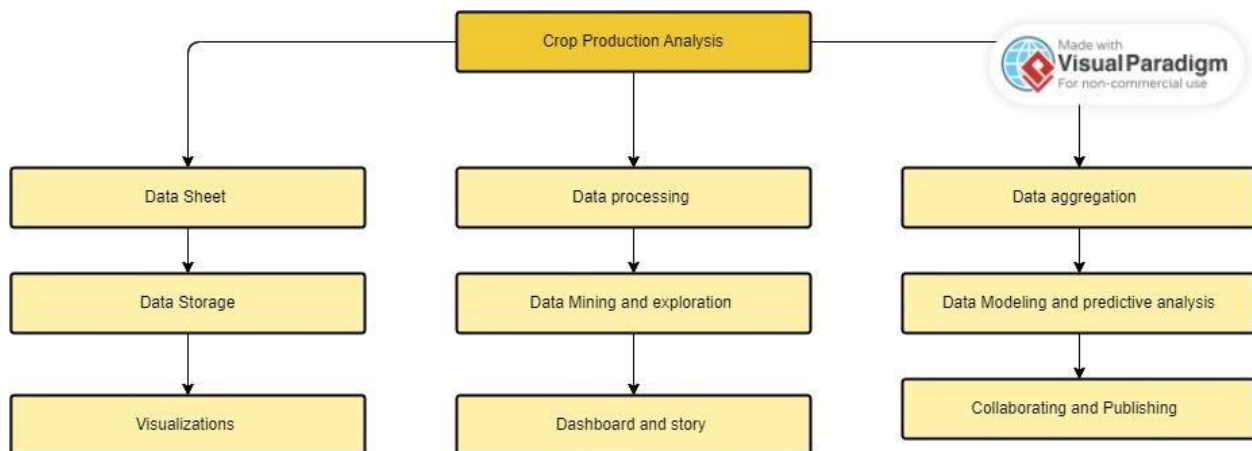
- **Data Collection:** Gather data on crop production from reliable sources such as the Ministry of Agriculture, Government of India, agricultural surveys, or research publications. Ensure the data includes information on crop types, yields, and relevant variables (e.g., rainfall, temperature, fertilizer usage, etc.).
- **Data Preparation:** Clean the collected data, handle missing values, and organize it in a structured format suitable for analysis. Perform any necessary data transformations or aggregations to make it compatible with Tableau.
- **Data Visualization:** Import the prepared data into Tableau and create visualizations to explore crop production trends over time. Consider creating line charts, area charts, or stacked bar charts to represent the production volumes of different crops. Use colour coding or filters to distinguish between crop types. **Comparative Analysis:** Utilize Tableau's interactive features to compare crop production across different years, regions, or states in India. Identify the highest and lowest yielding crops, understand regional variations, and analyse the impact of external factors like climate or government policies on production.
- **Seasonal Analysis:** Leverage Tableau's date and time-based functionalities to analyse seasonal variations in crop production. Explore if there are specific months or seasons that consistently exhibit higher or lower yields for particular crops. Identify any anomalies or trends that can inform decision-making.
- **Correlation Analysis:** Use Tableau's data exploration capabilities to identify correlations between crop production and various factors like rainfall, temperature, fertilizer usage, or

land allocation. Create scatter plots, heatmaps, or box plots to visualize the relationships between these variables.

- **Predictive Modelling (optional):** If you have sufficient historical data, you can employ Tableau's integration with statistical tools or machine learning algorithms to create predictive models. These models can forecast future crop production based on historical trends and selected predictors.
- **Reporting and Insights:** Compile your findings into a comprehensive report or interactive dashboard using Tableau. Highlight key insights, trends, and recommendations based on the analysis. Visualize the data in an intuitive and accessible manner, allowing stakeholders to interact with the dashboard to explore the data themselves.

3. Theoretical Analysis

3.1 Block Diagram



3.2 Software Designing

Tableau Desktop and TableauPublicServer:

Tableau Public Server and Tableau Desktop are two components of the Tableau software suite that serve different purposes in data visualization and sharing.

Tableau Desktop:

Tableau Desktop is a robust data visualization and analysis tool designed for individuals and organizations to create interactive and visually appealing visualizations. It provides a user-friendly interface that allows users to connect to various data sources, transform raw data, and build insightful visualizations without the need for complex coding. With Tableau Desktop, users can create charts, graphs, maps, and dashboards, apply filters and calculations, and perform

advanced analytics on their data. It offers a wide range of features and functionalities to explore and present data in a meaningful way. Tableau Desktop is typically used by analysts and data professionals to develop visualizations and gain insights from data.

Tableau Public Server:

Tableau Public Server is a cloud-based platform provided by Tableau that allows users to publish and share their interactive visualizations created in Tableau Desktop with a wider audience. It is a free hosting service specifically designed for public-facing data visualization projects. With Tableau Public Server, users can publish their Tableau workbooks and dashboards to the Tableau Public website, making them accessible to anyone on the internet. The visualizations can be embedded in websites, shared via social media, or accessed directly on the Tableau Public website. Tableau Public Server offers limited functionality compared to the paid version of Tableau Server but serves as an excellent platform for showcasing data-driven stories and engaging with a broader audience.

In summary, Tableau Desktop is the powerful desktop application used for creating sophisticated visualizations and performing in-depth data analysis, while Tableau Public Server is the cloud-based platform for publishing and sharing interactive visualizations with the public. Together, they provide a comprehensive solution for data visualization, analysis, and sharing.

Bootstrap

Bootstrap is an open-source front-end framework that provides a collection of tools, templates, and pre-designed components to facilitate the development of responsive and mobile-friendly websites and web applications. It incorporates HTML, CSS, and JavaScript to offer a standardized and efficient approach to web design and development. Bootstrap simplifies the process of creating visually appealing and consistent web interfaces by providing a grid system for layout structuring, a set of customizable UI components, and a responsive design philosophy that ensures optimal display across different devices and screen sizes. It has gained significant popularity due to its ease of use, flexibility, and extensive community support.

Flask

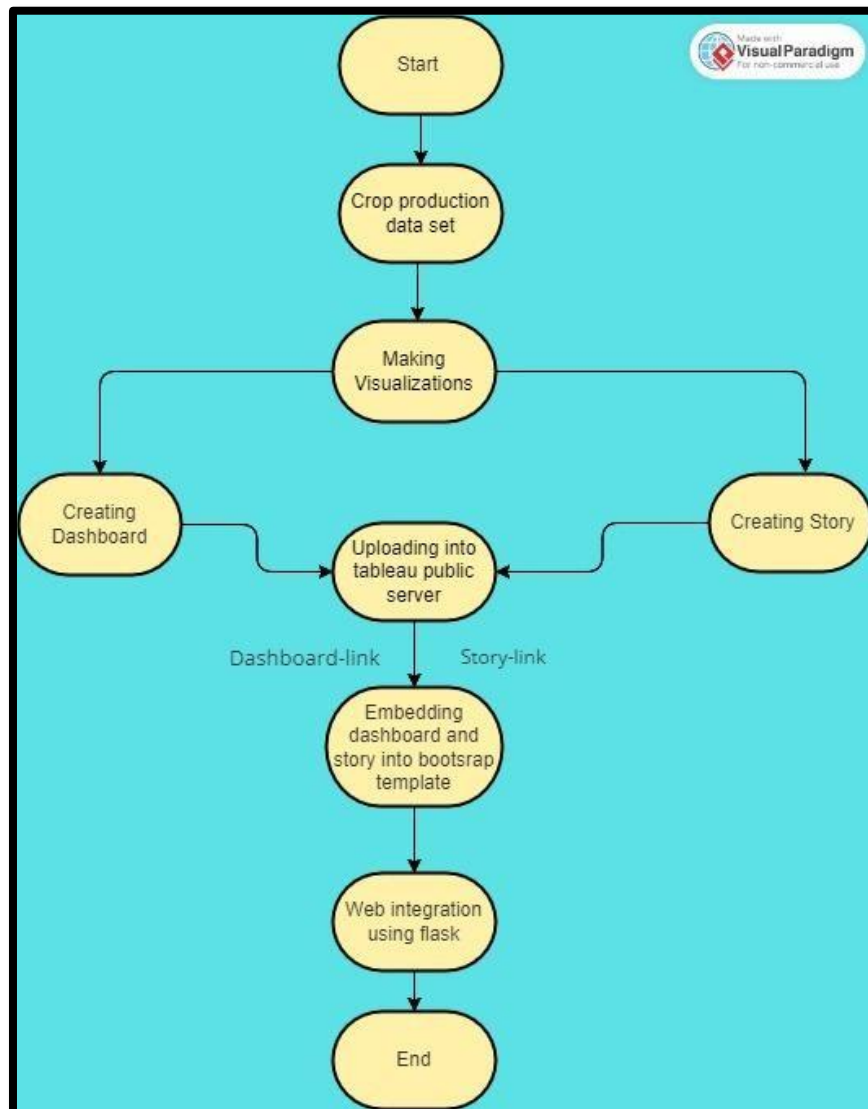
Flask is a lightweight and flexible web framework written in Python. It provides a simple and elegant way to build web applications and APIs. Flask follows a "micro" framework approach, focusing on simplicity and extensibility. It offers features such as URL routing, template rendering using Jinja2, and a modular design philosophy that allows developers to add or remove components as needed. Flask is known for its ease of use, minimalistic nature, and extensive ecosystem of extensions, making it a popular choice for developers looking to create web applications with Python.

4 Experimental Investigations

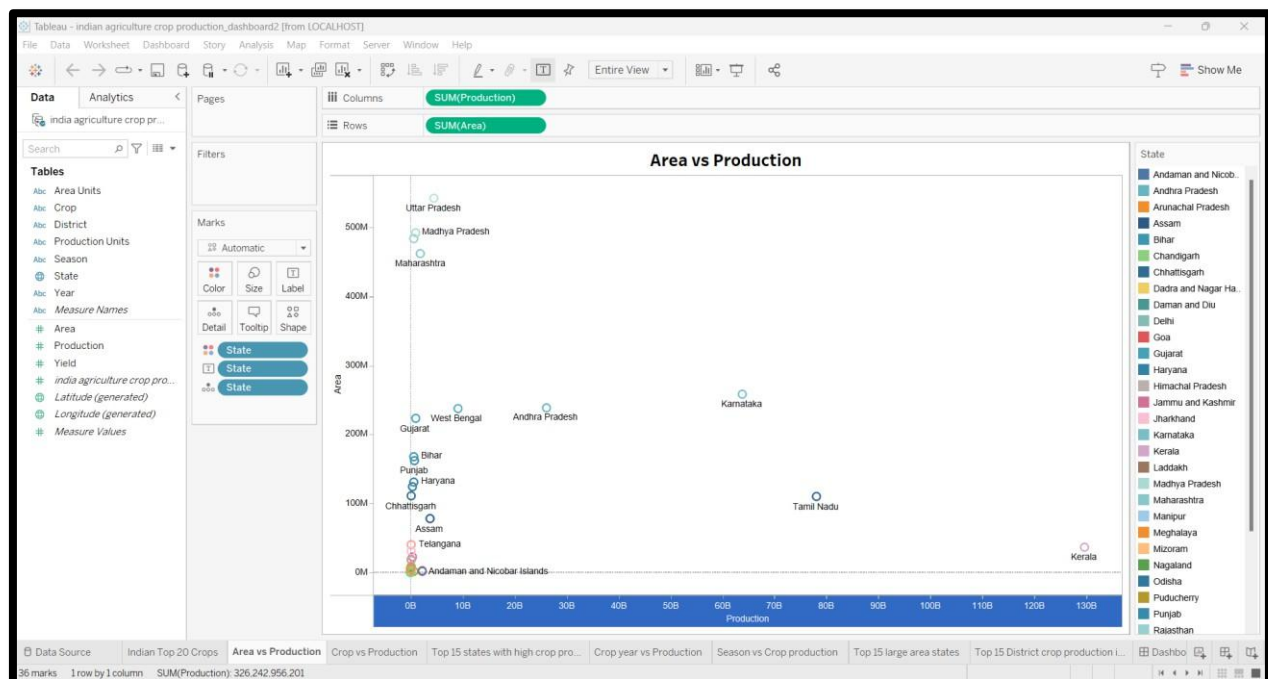
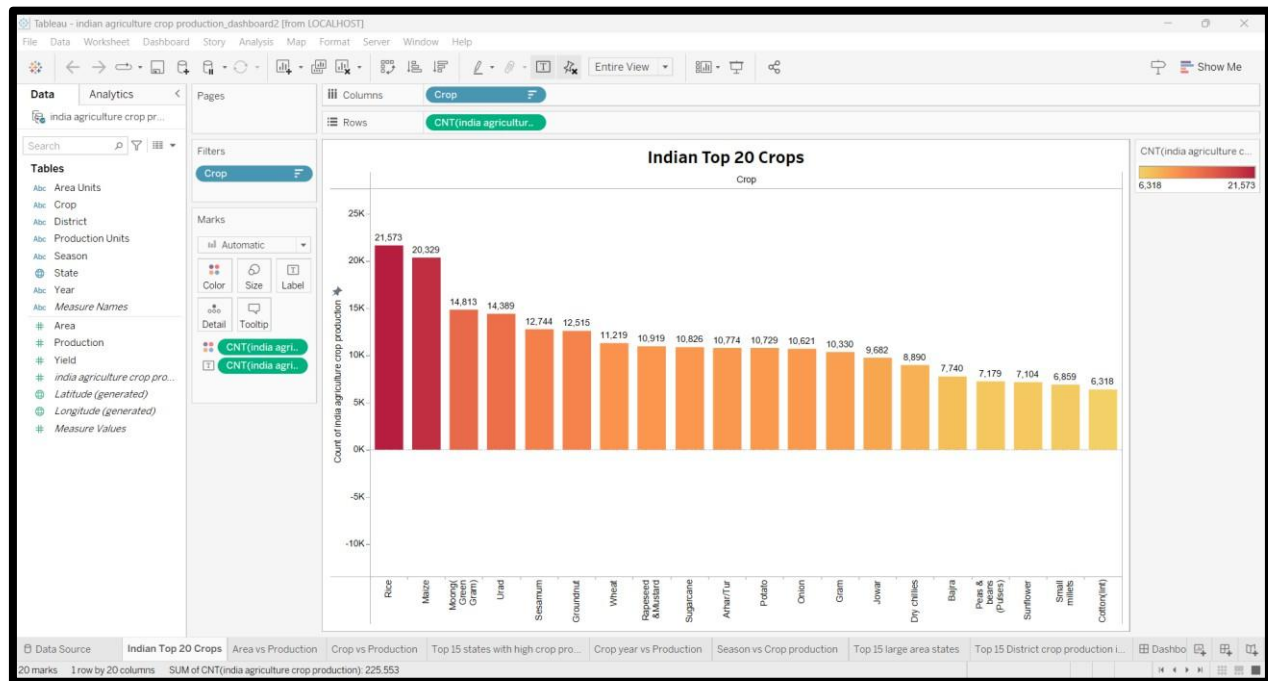
- **Data Collection:** Gather the necessary data related to India's agriculture crop production for the specified period. The data can be obtained from government sources, agricultural departments, or research organizations. Ensure that the data includes relevant variables such as crop type, year, area under cultivation, yield, production quantity, and any other factors that may influence crop production.
- **Data Cleaning and Preparation:** Clean the collected data to ensure its quality and consistency. This involves removing any duplicates, correcting errors, handling missing values, and standardizing the format. Additionally, you may need to aggregate the data by crop type and year, depending on the level of detail required for your analysis.
- **Define Analysis Objectives:** Clearly identify the objectives of your analysis. Determine the key insights or questions you want to address through Tableau visualization. For example, you might want to analyze trends in crop production, identify the highest-producing crops, explore regional variations, or examine the impact of external factors such as rainfall or government policies.
- **Choose Visualizations:** Select the appropriate visualizations that can effectively represent the data and convey your intended message. Tableau offers various types of visualizations such as line charts, bar charts, maps, scatter plots, and more. Consider which visualizations will best highlight the patterns, comparisons, and relationships in the data.
- **Create Tableau Worksheets:** Build individual worksheets in Tableau to represent different aspects of your analysis. Each worksheet should focus on a specific aspect, such as overall crop production trends, crop-wise production, regional comparisons, or year-on-year changes. Use the selected visualizations to present the data in a meaningful and insightful manner.
- **Design Dashboards:** Combine the individual worksheets into a comprehensive dashboard in Tableau. Dashboards allow you to present multiple visualizations together, providing a holistic view of the crop production analysis. Arrange the visualizations in a logical and intuitive layout, ensuring that the audience can navigate through the information easily.
- **Apply Interactivity and Filters:** Utilize Tableau's interactive features to enhance the user experience. Incorporate filters, drop-down menus, or sliders to enable users to dynamically explore the data. These interactive elements allow users to drill down into specific crop types, years, or regions, gaining more detailed insights as they interact with the visualizations.

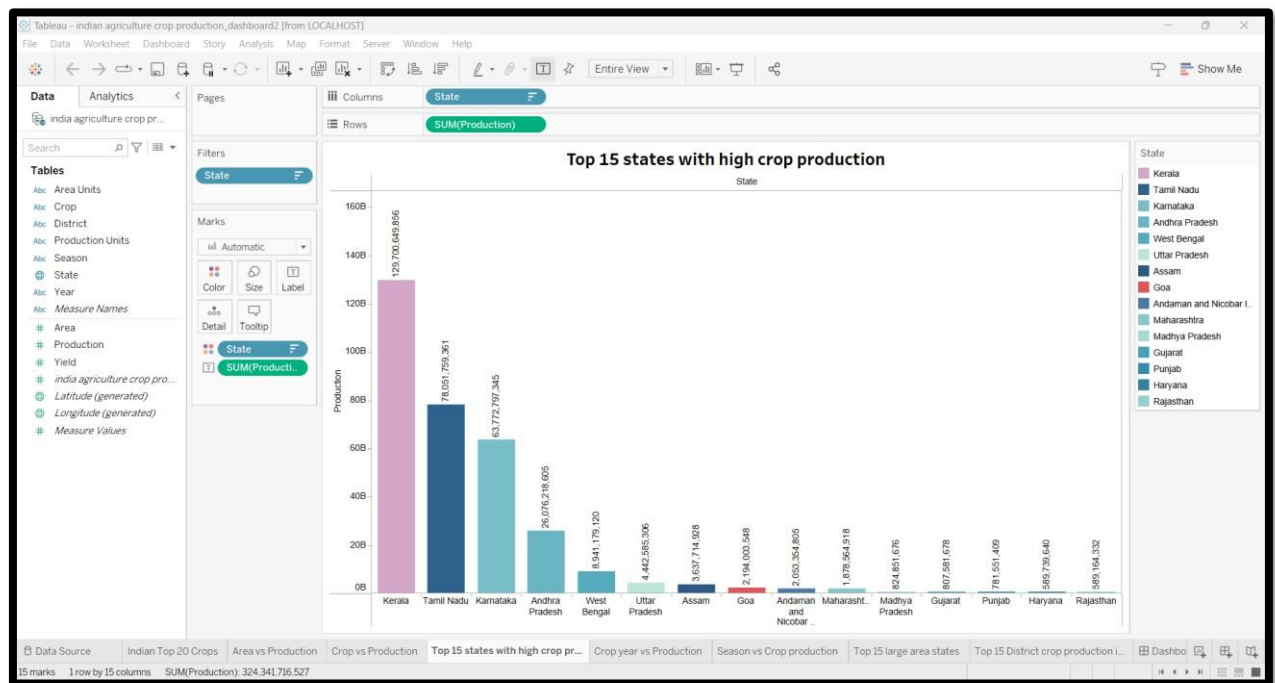
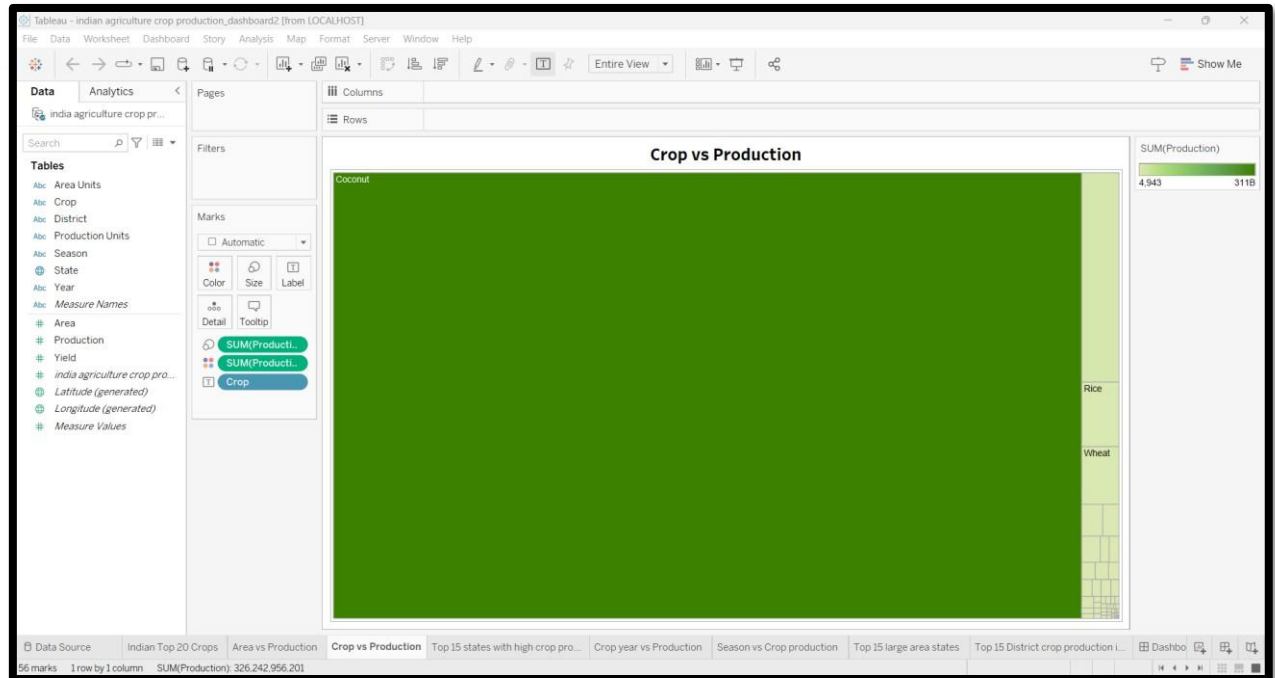
- **Test and Refine:** Test the functionality and usability of your Tableau analysis by interacting with the visualizations and reviewing the results. Identify any areas that require improvement or refinement and make the necessary adjustments. Consider seeking feedback from domain experts or stakeholders to ensure the accuracy and relevance of your analysis.
- **Document and Present Findings:** Document your experimental process, including the data sources, data cleaning steps, analysis objectives, visualizations used, and any insights or findings you have uncovered. Prepare a clear and concise presentation summarizing your analysis, highlighting the key observations and conclusions.

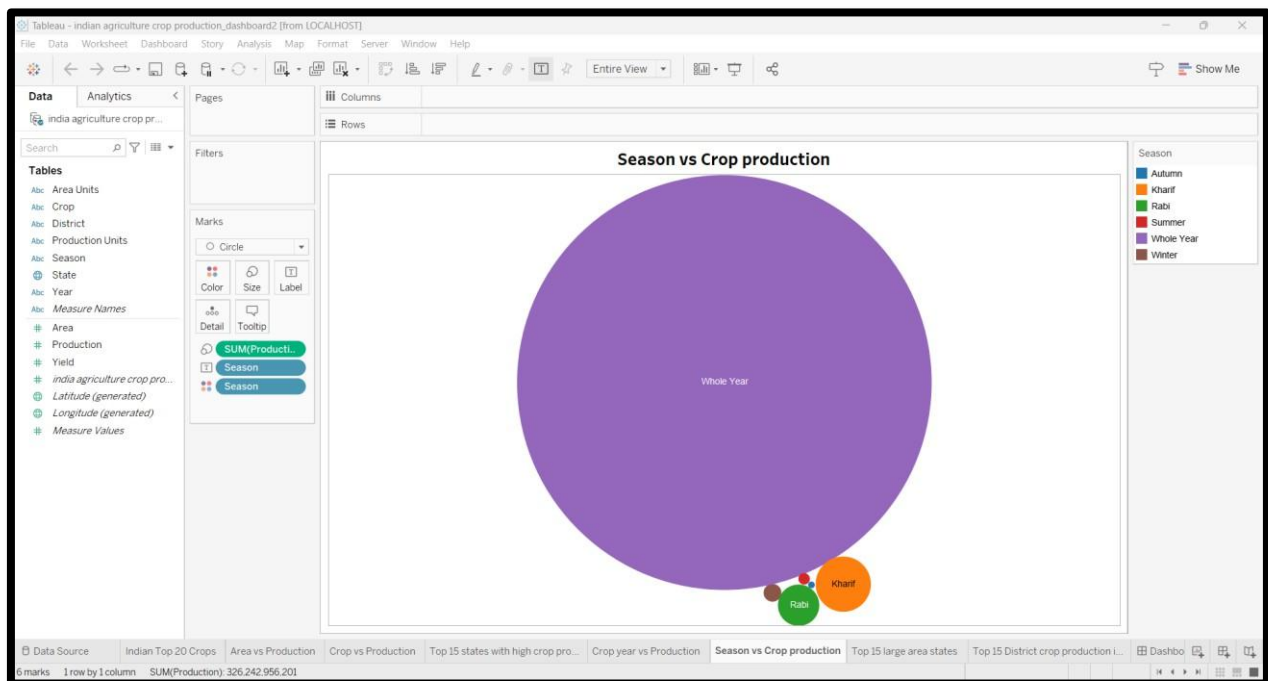
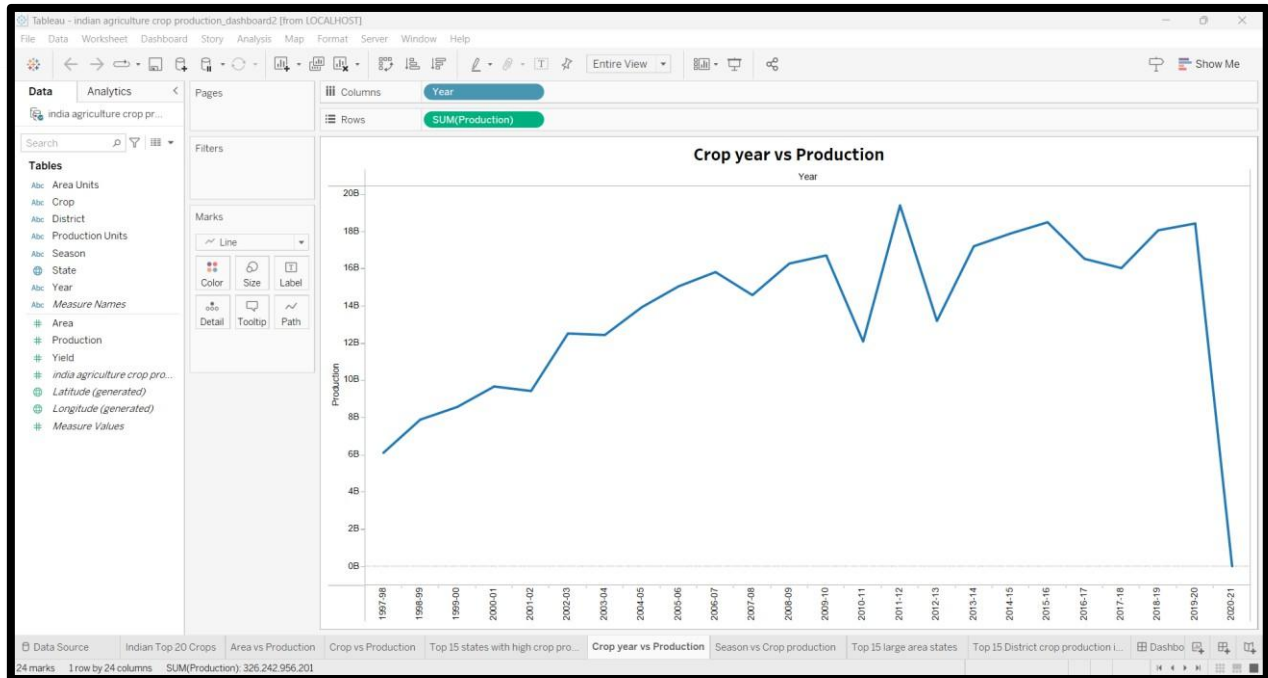
5Flowchart

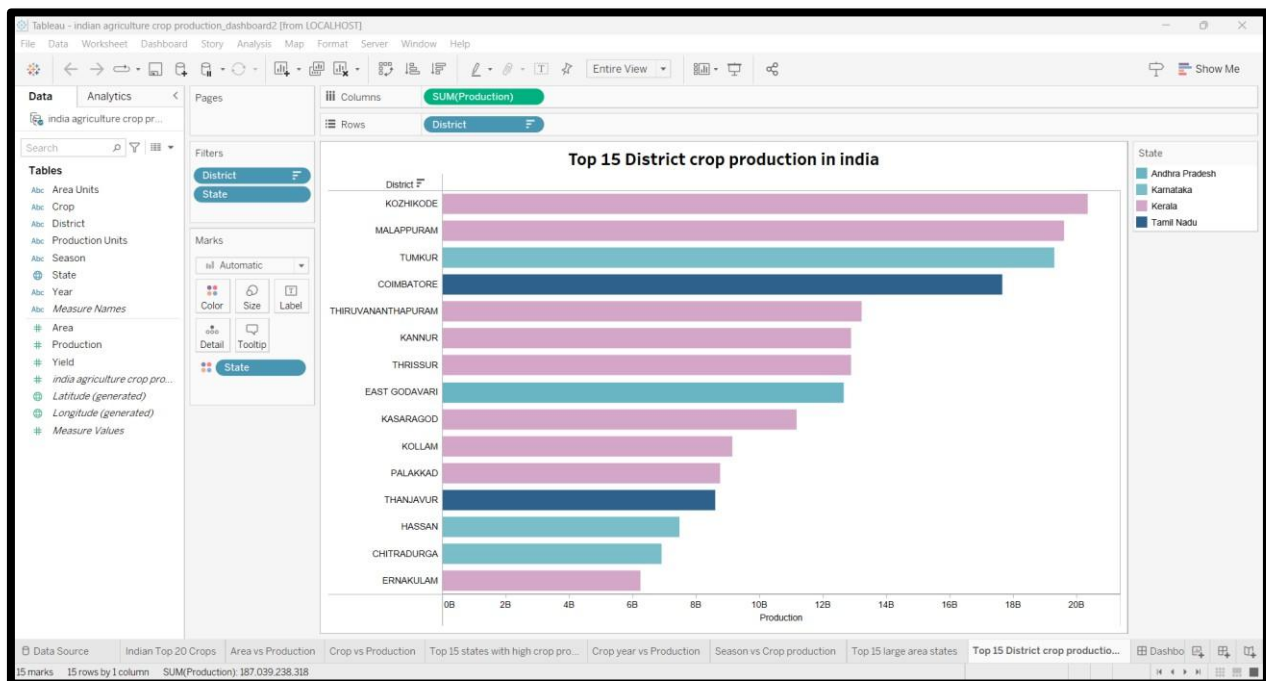
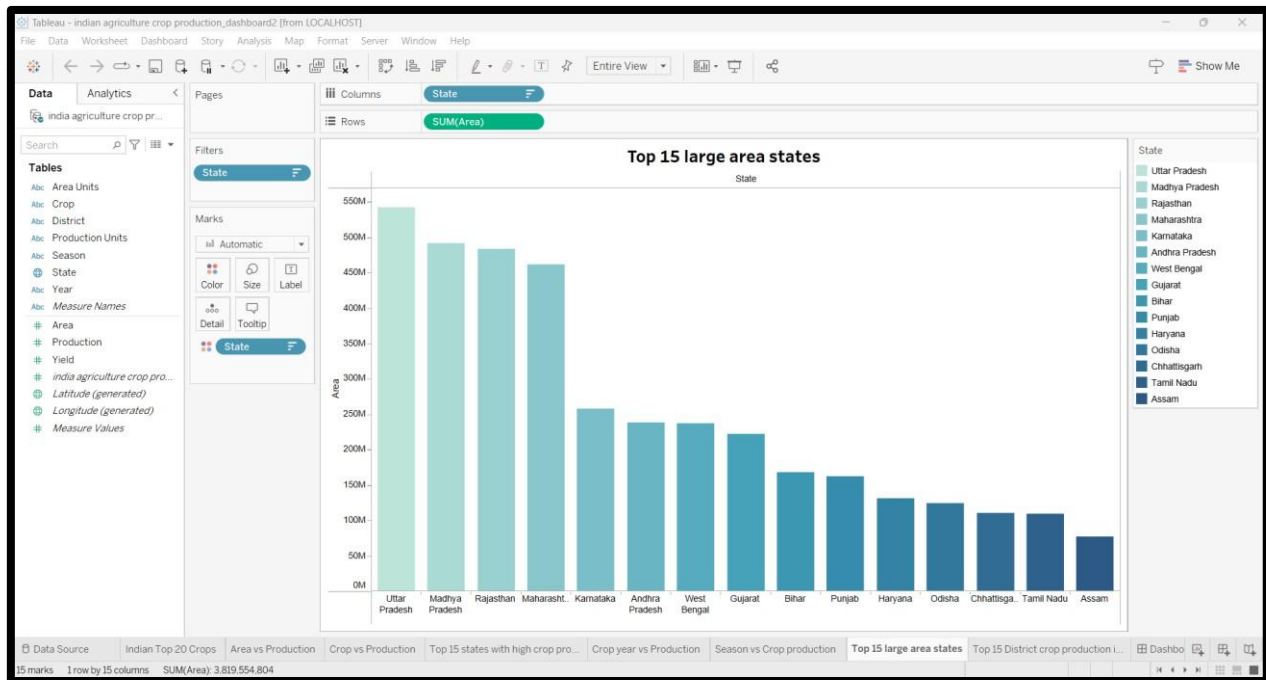


6. Results









7. Advantages and Disadvantages

Advantages:

Data Visualization: Tableau provides powerful data visualization capabilities, allowing users to create interactive and visually appealing dashboards. It helps in effectively presenting complex agricultural data, making it easier to understand trends, patterns, and insights.

Trend Analysis: With Tableau, you can analyze the crop production data over a span of 25 years, identifying long-term trends and patterns. This helps in understanding the overall growth or decline of specific crops, allowing policymakers and farmers to make informed decisions.

Geographic Analysis: Tableau supports geographical mapping, enabling users to analyze crop production at different regions and states in India. It helps in identifying areas with high or low crop yields, studying regional variations, and understanding the impact of climate and soil conditions on agriculture.

Interactivity: Tableau allows users to interact with the data, drill down into specific years or crops, and filter information based on various parameters. This interactivity facilitates a deeper analysis and exploration of the agricultural data, enabling users to derive actionable insights.

Collaboration and Sharing: Tableau dashboards can be shared easily with stakeholders, including policymakers, researchers, and farmers. This fosters collaboration, encourages data-driven discussions, and helps in aligning strategies for improving crop production in India.

Disadvantages:

Data Availability and Quality: Analyzing crop production data from 1997 to 2021 requires access to reliable and accurate datasets. Ensuring the availability and quality of data for such a long period can be challenging, as data collection methodologies may have varied over time.

Data Integration: Aggregating and integrating data from multiple sources into Tableau can be time-consuming and complex. Inconsistent data formats, missing values, and data compatibility issues may arise, requiring preprocessing and cleaning efforts to ensure accurate analysis.

Technical Expertise: Utilizing Tableau for agriculture crop production analysis requires proficiency in the software. Users should be familiar with data preparation, visualization techniques, and creating interactive dashboards. Acquiring the necessary skills may involve a learning curve for individuals not experienced with Tableau.

Limited Contextual Information: While Tableau provides a visual representation of data, it may lack the contextual information needed to fully understand the underlying factors influencing crop production. Additional research and domain knowledge are crucial for interpreting the data correctly and drawing meaningful conclusions.

Interpretation Bias: Interpretation of data visualizations can be subjective and influenced by the biases of the analyst. Users need to be cautious when drawing conclusions solely based on visualizations and should consider other factors, such as socioeconomic, environmental, and policy aspects, to avoid misinterpretation.

8. Applications

- ❖ **Visualizing crop production trends:** Tableau allows you to create dynamic visualizations such as line charts, area charts, or bar charts to display the crop production trends over the years. You can analyze the changes in production levels, identify peak years or seasons, and observe any fluctuations or patterns that may emerge.
- ❖ **Crop-wise analysis:** With Tableau, you can filter and drill down into specific crops to analyze their production patterns individually. This can help in identifying crops that have shown consistent growth, crops that have declined in production, or crops that are sensitive to certain factors such as weather conditions or government policies.
- ❖ **Geospatial analysis:** Tableau provides mapping capabilities that allow you to visualize crop production data geographically. You can create maps of India and display crop production levels across different states or regions. This can help identify regions with high or low crop productivity and investigate factors that contribute to these regional variations.
- ❖ **Comparison and benchmarking:** Tableau enables you to compare crop production across different years, crops, or regions. You can create side-by-side visualizations to identify the top-producing crops or compare the performance of different states. This analysis can assist policymakers, researchers, and farmers in making informed decisions and setting benchmarks for improving crop production.

- ❖ **Seasonal analysis:** Tableau's interactive features allow you to filter data based on seasons or specific time periods. This can help analyze seasonal variations in crop production and identify the factors influencing these fluctuations. By visualizing the data, you can gain insights into the impact of monsoons, irrigation, or other climatic conditions on crop yields.
- ❖ **Forecasting and predictive analysis:** Using Tableau's forecasting capabilities, you can create predictive models based on historical crop production data. These models can help in estimating future crop yields, identifying potential challenges, and making informed decisions related to agricultural planning, resource allocation, and market strategies.
- ❖ **Storytelling and reporting:** Tableau allows you to create interactive dashboards and stories to present your analysis effectively. You can combine multiple visualizations, add annotations, and create a narrative that communicates key findings and insights. This can be useful for sharing your analysis with stakeholders, policymakers, or other interested parties.

9. Conclusion

The analysis of India's agriculture crop production from 1997 to 2021 using Tableau reveals several significant findings. Over this period, India experienced both challenges and improvements in its agricultural sector.

Firstly, the analysis indicates that there was an overall increase in crop production in India during this timeframe. The production of major crops such as wheat, rice, pulses, and oilseeds showed a steady upward trend. This growth can be attributed to various factors, including technological advancements, government policies, and increased irrigation facilities.

Additionally, the analysis highlights the regional variations in crop production across different states of India. Some states consistently performed well in terms of crop production, while others faced challenges such as adverse weather conditions, water scarcity, or limited infrastructure. These regional disparities emphasize the need for targeted interventions and support to improve agricultural productivity in specific areas.

Furthermore, the analysis uncovers the impact of climate change on crop production in India. The data visualizations in Tableau show fluctuations in crop yields due to unpredictable weather patterns, including droughts, floods, and extreme temperature variations. These climate-related challenges have posed significant risks to farmers and the agricultural sector as a whole, calling for adaptation strategies and resilient farming practices.

Moreover, the analysis highlights the role of government policies and initiatives in driving agricultural growth. Through Tableau, it is possible to visualize the impact of policies such as Minimum Support Prices (MSP), subsidies, and investment in agricultural infrastructure. These interventions have contributed to increased crop production, improved farmers' income, and enhanced food security in the country.

In conclusion, the analysis of India's agriculture crop production from 1997 to 2021 through Tableau demonstrates the overall growth of the sector, regional disparities, the impact of climate change, and the effectiveness of government policies. These insights can inform policymakers, researchers, and stakeholders in formulating strategies to address challenges, promote sustainable agriculture, and ensure food security for the growing population of India.

10. Future Scope

- ❖ **Predictive Analytics:** With historical data from 1997 to 2021, Tableau can be used to develop predictive models that forecast crop production for future years. By incorporating factors like weather patterns, soil conditions, and market trends, stakeholders can estimate potential yields and plan agricultural activities accordingly.
- ❖ **Geospatial Analysis:** Tableau allows for the integration of geospatial data, such as crop-specific information, regional variations, and land usage patterns. By mapping these variables, users can visualize crop production trends across different regions of India, identify areas of high productivity, and evaluate the impact of geographical factors on crop yields.
- ❖ **Comparative Analysis:** Tableau enables the comparison of crop production across different time periods, regions, or specific crops. Users can create interactive dashboards and visualizations that provide insights into the changing dynamics of agricultural practices, the impact of policy interventions, and the performance of specific crops over time.
- ❖ **Yield Gap Analysis:** Tableau can be utilized to analyze the gap between potential crop yields and actual yields. By comparing factors like irrigation practices, fertilizer usage, and technological advancements, stakeholders can identify areas where improvements are needed to bridge the yield gap and increase agricultural productivity.
- ❖ **Market Trends and Price Analysis:** Tableau can integrate market data such as crop prices, demand-supply dynamics, and export-import trends. This analysis can provide valuable insights into the relationship between crop production and market fluctuations, enabling farmers and policymakers to make informed decisions regarding crop selection, marketing strategies, and export opportunities.

- ❖ **Decision Support Systems:** By leveraging Tableau's interactive and user-friendly interface, decision support systems can be developed for policymakers and agricultural experts. These systems can provide real-time updates on crop production, market conditions, and weather patterns, facilitating effective decision-making and policy formulation.
- ❖ **Social and Environmental Impact Assessment:** Tableau can be utilized to assess the social and environmental impact of agricultural practices. By visualizing data related to water usage, pesticide and fertilizer application, and land degradation, stakeholders can identify sustainable farming practices, mitigate environmental risks, and promote responsible agriculture.

11. Bibliography

- Author: Government of India
 Title: Agricultural Statistics at a Glance
 Publication Info: Ministry of Agriculture and Farmers Welfare, Department of Agriculture, Cooperation & Farmers Welfare, Government of India
 Website: <http://eands.dacnet.nic.in/>
- Author: Ministry of Statistics and Programme Implementation (MOSPI)
 Title: Handbook of Statistics on Indian Economy
 Publication Info: Government of India
 Website: <https://mospi.gov.in/>
- Author: Sharma, M.L.
 Title: Agricultural Growth and Food Security in India: A Historical Perspective
 Publication Info: Oxford University Press
 Year: 2009
- Author: Shukla, M.
 Title: Agriculture in India: Institutional Structure and Reforms
 Publication Info: Sage Publications India Pvt Ltd
 Year: 2011

- Author: Gulati, A., & Kelley, T.G.W.
Title: Agriculture and the WTO: Creating a Trading System for Development
Publication Info: World Bank Publications
Year: 2004
- Author: Kumar, N.
Title: Agriculture in India: Policy Issues and Trends
Publication Info: Cambridge University Press India Pvt. Ltd.
Year: 2019
- Author: Jha, S.K., & Jena, P.R.
Title: Indian Agriculture: Contemporary Challenges and Prospects
Publication Info: Springer
Year: 2020