

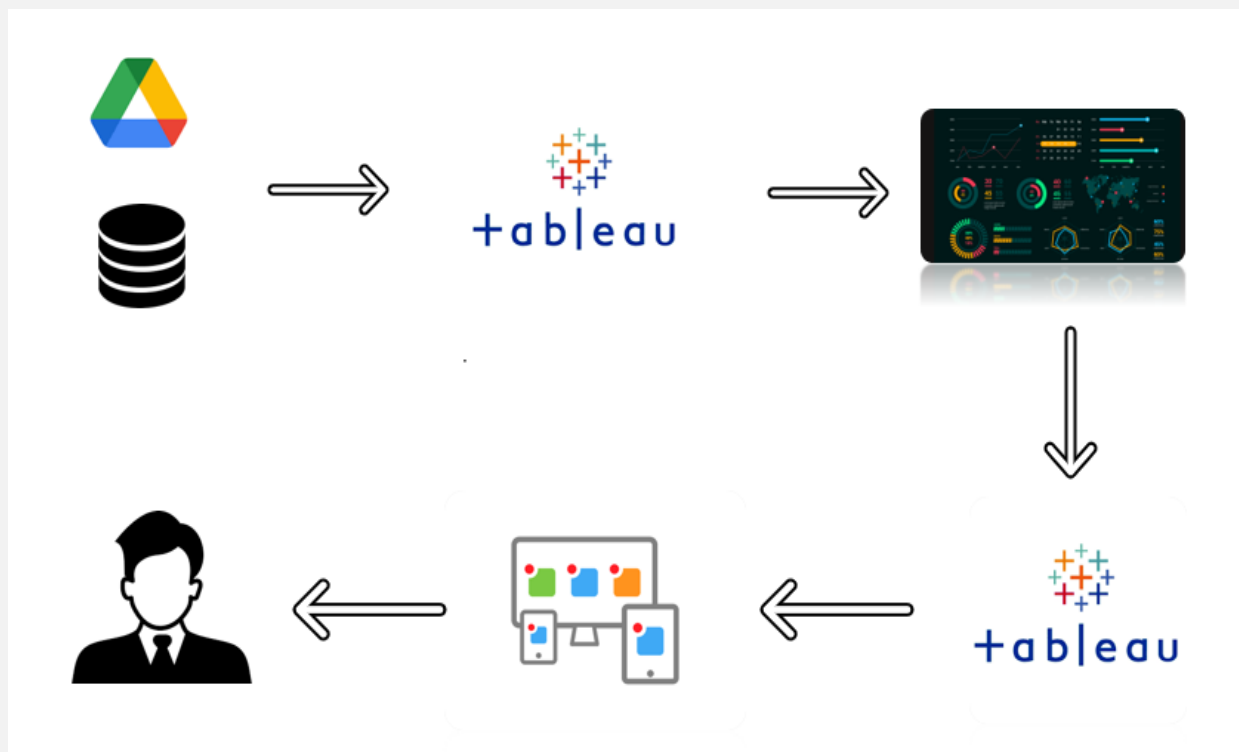
India Agriculture Crop Production Analysis

(1997-2021)

Our report delves into the captivating realm of India's agricultural cultivation, providing a comprehensive visual exploration of key aspects and trends in the agricultural sector. Through our visual representations, readers can gain valuable insights into crop production, seasonal variations, regional distribution, and overall production trends. These visualizations enable intuitive analysis, allowing stakeholders to uncover patterns, identify areas of growth or concern, and make data-driven decisions.

By harnessing the power of Tableau, our report not only presents the data in a visually appealing manner but also provides an interactive experience for readers to explore the intricacies of India's agricultural cultivation. To Extract the Insights from the data and put the data in the form of visualizations, Dashboards and Story we employed Tableau tool.

Technical Architecture



Project Flow

To accomplish this, we have to complete all the activities listed below,

- Define Problem / Problem Understanding
 - Specify the business problem
 - Business requirements
 - Literature Survey
 - Social or Business Impact.
- Data Collection & Extraction from Database
 - Collect the dataset
 - Storing Data in DB
 - Perform SQL Operations
 - Connect DB with Tableau
- Data Preparation
 - Prepare the Data for Visualization
- Data Visualizations
 - No of Unique Visualizations
- Dashboard
 - Responsive and Design of Dashboard
- Story
 - No of Scenes of Story
- Performance Testing
 - Amount of Data Rendered to DB ‘
 - Utilization of Data Filters
 - No of Calculation Fields
 - No of Visualizations/ Graphs
- Web Integration
 - Dashboard and Story embed with UI With Flask
- Project Demonstration & Documentation
 - Record explanation Video for project end to end solution
 - Project Documentation-Step by step project development procedure

Milestone 1: Define Problem / Problem Understanding

Activity 1: Specify the business problem

Indian Agriculture Crop Production Analysis (1997-2021)

Activity 2: Business requirements

The primary business requirements for our report are to visualize and analyse business expenses, provide industry-specific insights, identify cost drivers, highlight outliers, and offer interactive functionality. Stakeholders need a visual representation of expenses to compare and analyse spending patterns across different businesses and industries. The report should facilitate the identification of key cost drivers, enabling stakeholders to understand the primary factors contributing to expenses. Additionally, it should flag any outliers or anomalies for further investigation. Our report provides a user-friendly and intuitive experience that empowers stakeholders to make data-driven decisions and drive positive change in the agricultural sector.

Activity 3: Literature Survey

The literature survey section of our report provides a concise overview of India's agricultural sector, focusing on key aspects and insights from existing studies and publications. It examines the historical context of agricultural practices in India and highlights the role of government policies and initiatives in supporting the sector's growth and development.

Our survey explores the diversity of crops cultivated across different regions, along with trends in production and the impact of climate variability. It also addresses the adoption of technology and innovation in agriculture, along with the challenges faced by farmers and potential research gaps.

Additionally, the section showcases best practices and success stories that have contributed to improved productivity and sustainability in Indian agriculture. This literature review forms the basis for the subsequent analysis and visualization of agricultural data in the report.

Activity 4: Social or Business Impact.

livelihood for a large portion of the population, especially in rural areas. It plays a crucial role in ensuring food security and alleviating poverty by providing Social Impact: On the social front, agriculture serves as a vital source of employment opportunities and income generation. Moreover, agricultural activities contribute to the overall socio-economic development of rural communities, fostering social cohesion and preserving cultural traditions.

Business Impact: From a business perspective, the agricultural sector plays a pivotal role in India's economy. It contributes to the country's GDP and serves as a source of raw materials for various industries, such as food processing, textile, and pharmaceuticals. The growth and productivity of the agricultural sector have direct implications for the overall economic performance and stability of the nation. Furthermore, advancements in agricultural practices and technology have the potential to enhance productivity, optimize resource utilization, and promote sustainable practices. This, in turn, can lead to increased profitability and competitiveness for agricultural businesses.

Milestone 2: Data Collection & Extraction from Database

We have gathered and measured information on variables of interest, in an established systematic fashion that enables one to answer stated research questions, test hypotheses, evaluate outcomes and generate insights from the data.

Activity 1: Downloading the dataset

Please follow link to download: <https://drive.google.com/file/d/13-hjgsYam5RAM9P6Bq1wS4FHjPN9SWPN/view?usp=drivesdk>

Activity 1.1: Understand the data

Our data consists of 345409 rows and 10 columns that correspond to different values.

Column Description of the Dataset

State : The name of the Indian states.

District : The name of the districts of Indian states.

Crop : Name of different crops grown in India

Year : Date

Season : India has 5 seasons for crop cultivation kharif, rabi, autumn, winter and summer.

Area: Area for crop cultivation in acres

Production : Production of crops in tonnes

Yield : Yield by the crops under cultivation

Activity 2: Storing Data in DB & Perform SQL Operations

In our database Indian Agriculture Crop Production the database, information is stored in tables, columns and rows for easy processing. That storage is managed by the DBMS – database management system. There are relational (SQL) and non-relational (NoSQL) databases. A relational database is generally said to be the most common kind.

One of the most common methods is using SQL statements: CREATE TABLE and INSERT INTO.

INSERT, UPDATE, and DELETE are SQL operations that are used to modify data in a database. INSERT is used to insert new rows into a table, UPDATE is used to modify existing rows, and DELETE is used to delete rows from a table.

Activity 3: Connect DB with Tableau:

Steps to connect database to tableau:

1: We need to click on the required database connection given in the data tab. For example, if we want to connect to MySQL database then, we'll click on the "MySQL" Option.



2: This will open MySQL connection window.

3: We can enter the MySQL server name and can edit the “Port” if needed.

4: Now we enter the username and password used to connect the database. Here we click on the “Sign in” button to connect to the database.

5: This procedure connects the database into the Tableau. We can select the tables from the database and import it into Tableau. We can also join multiple tables by creating a relationship between them.

Milestone 3: Data Preparation

Activity 1: Prepare the Data for Visualization

We have prepared the data for visualization which involves cleaning the data to remove irrelevant or missing data, transforming the data into a format that can be easily visualized, exploring the data to identify patterns and trends, filtering the data to focus on specific subsets of data, preparing the data for visualization software, and ensuring the data is accurate and complete. This process helps to make the data easily understandable and ready for creating visualizations to gain insights into the performance and efficiency.

Milestone 4: Data Visualization

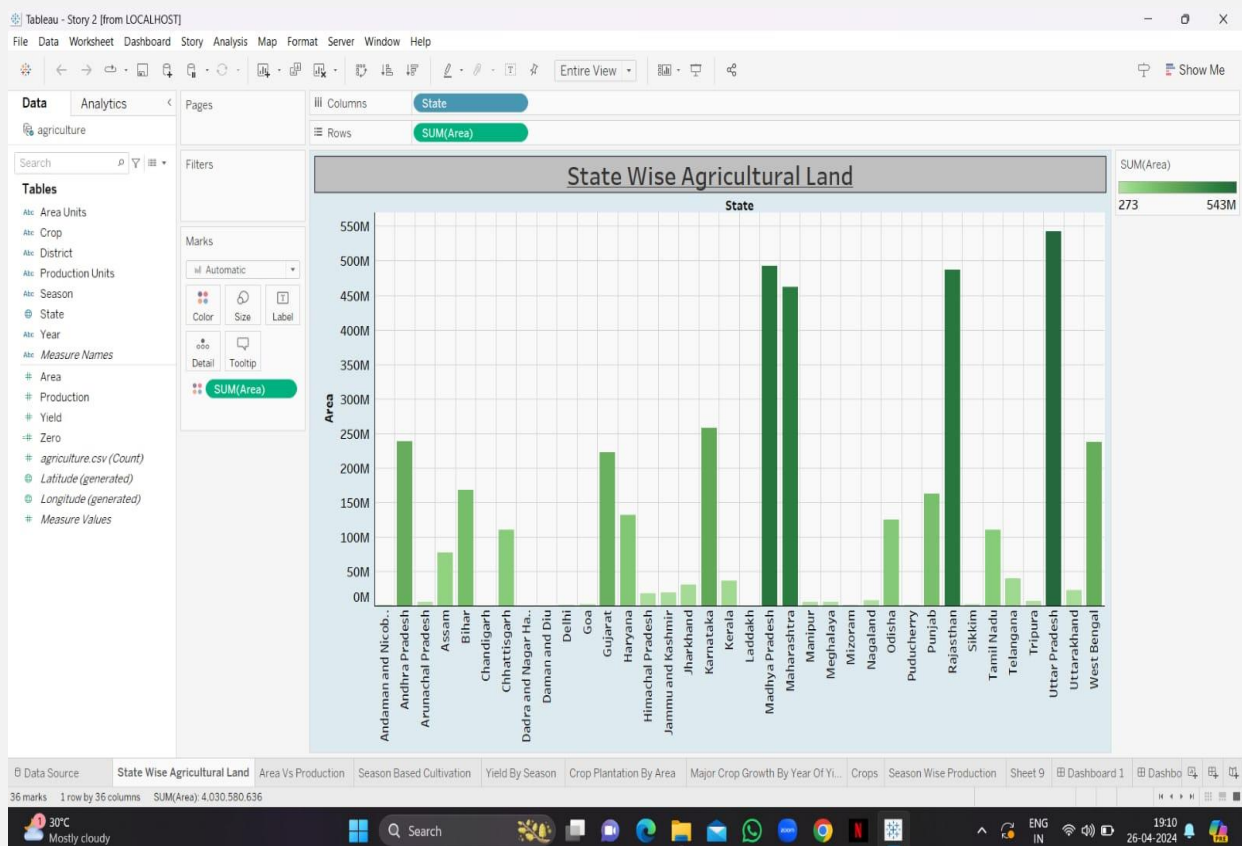
We have created a graphical representations of data to help people understand and explore the information. Our goal of data visualization is to make complex data sets more accessible, intuitive, and easier to interpret. By using visual elements such as charts, graphs, and maps, data visualizations can help people quickly identify patterns, trends, and outliers in the data.

Activity 1: No of Unique Visualizations

We have created number of unique visualizations with a given dataset. Some common types of visualizations that can be used to analyse the performance and efficiency of banks include bar charts, line charts, heat maps, scatter plots, pie charts, Maps etc.

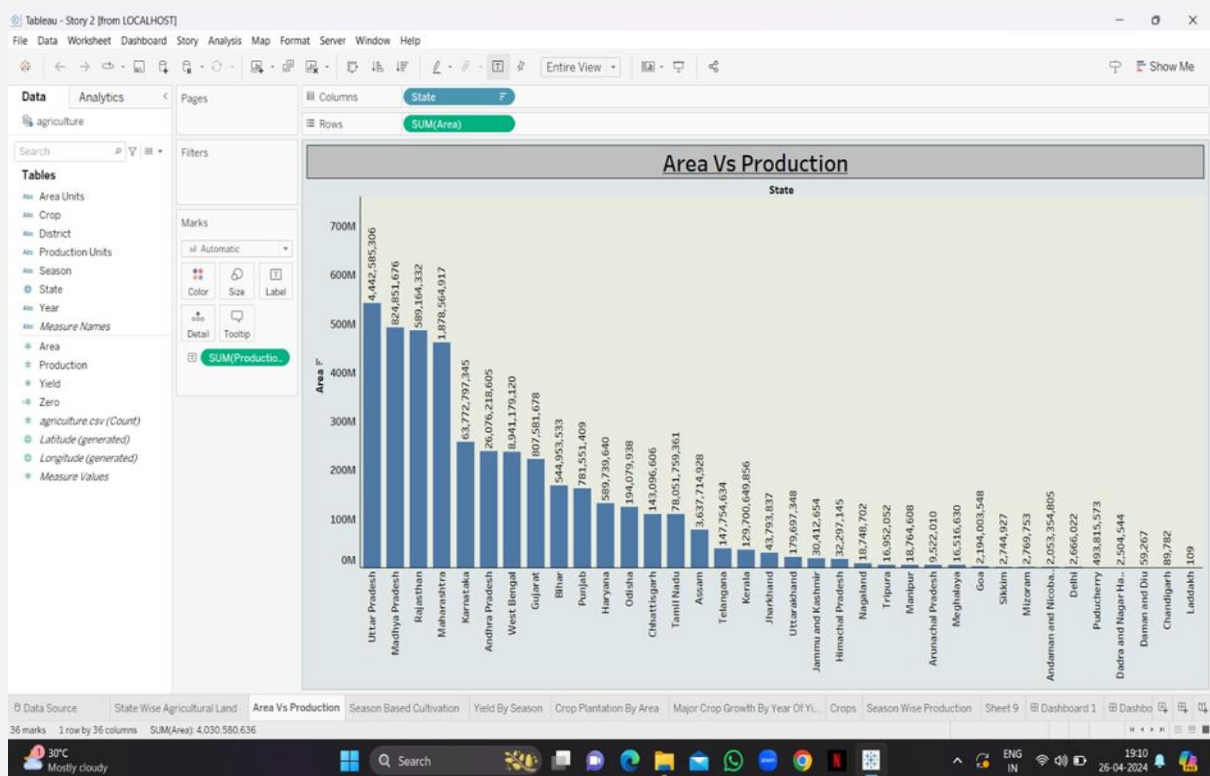
Activity 1.1: State wise Agricultural Land

In the sheet named State wise agriculture land we have analyzed the agricultural land by State wise. For this analysis we have taken state field in the column session and Sum (Area) field in the row column. By this analysis, we can say that the state Uttar Pradesh records as the highest State wise agriculture land compared to the other states in India



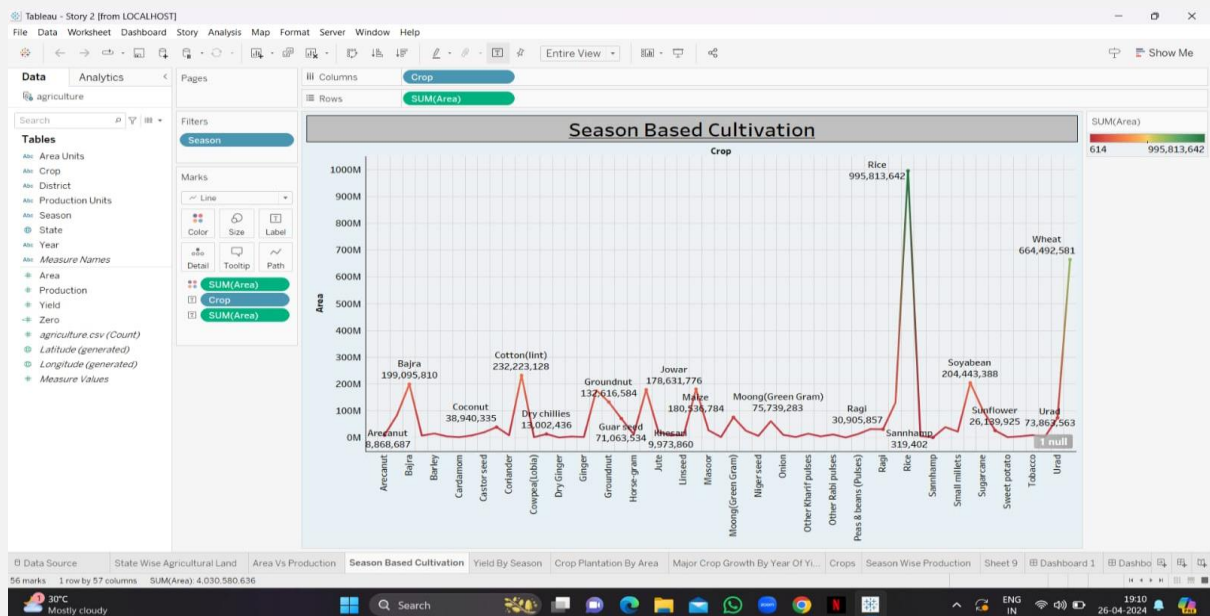
Activity 1.2: Area vs Production

In the sheet named Area vs Production, we have analysed area over the production rate by state wise. For this analysis we have taken state field in the column section and we have sorted it in the descending order from highest to the lowest. We have again taken Sum(Area) field in the rows column. This shows us the production rate over the various states in India. By this analysis we can say that the state Uttar Pradesh records the highest production rate over the area compared to the other states in India

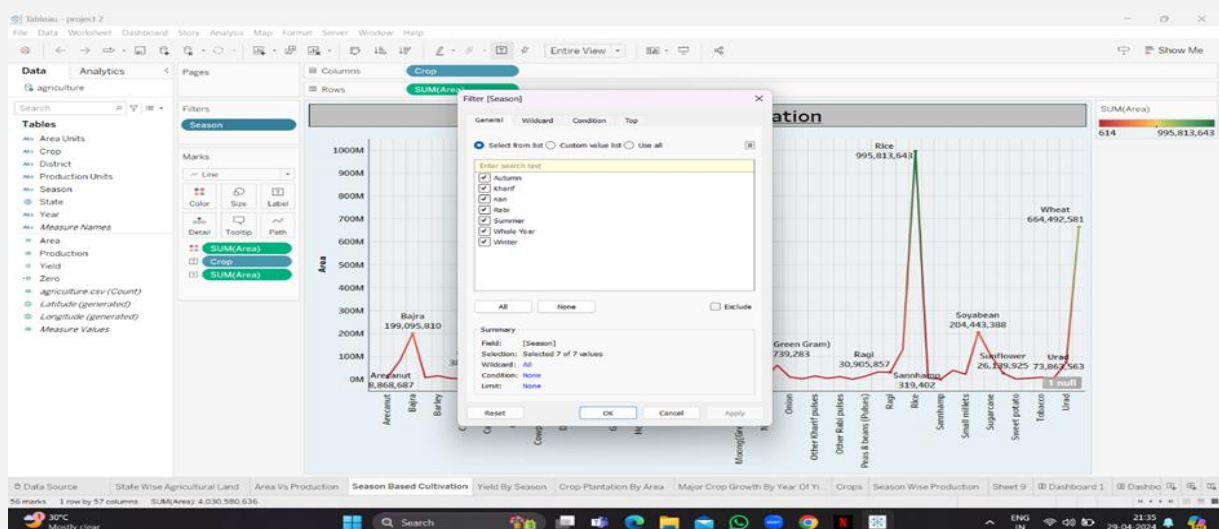


Activity 1.3: Season based cultivation

The sheet named season based cultivation is a line chart in which we have analysed season based cultivation. For this analysis we have taken the field crop to the column section and Sum (Area) to the row section. We have used the filter to filter out the seasons which we want. We have selected all the seasons in the filter section. By this analysis we can say that, rice and wheat crops are the most cultivated crops in all the seasons.

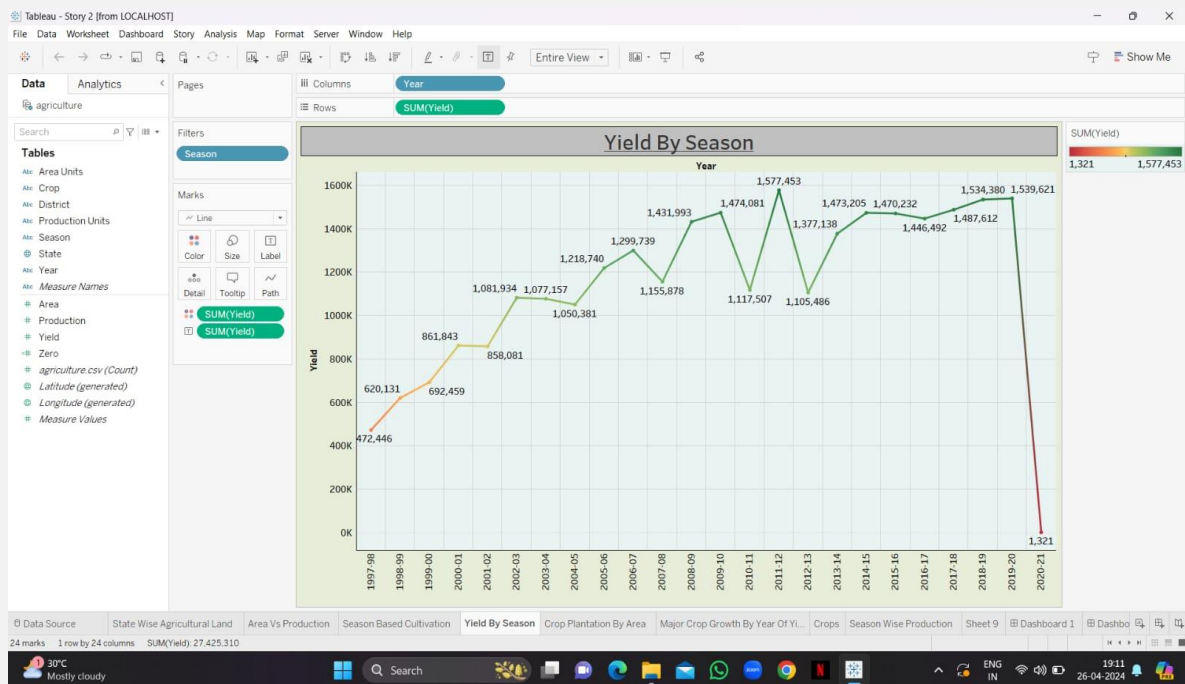


Filter used:

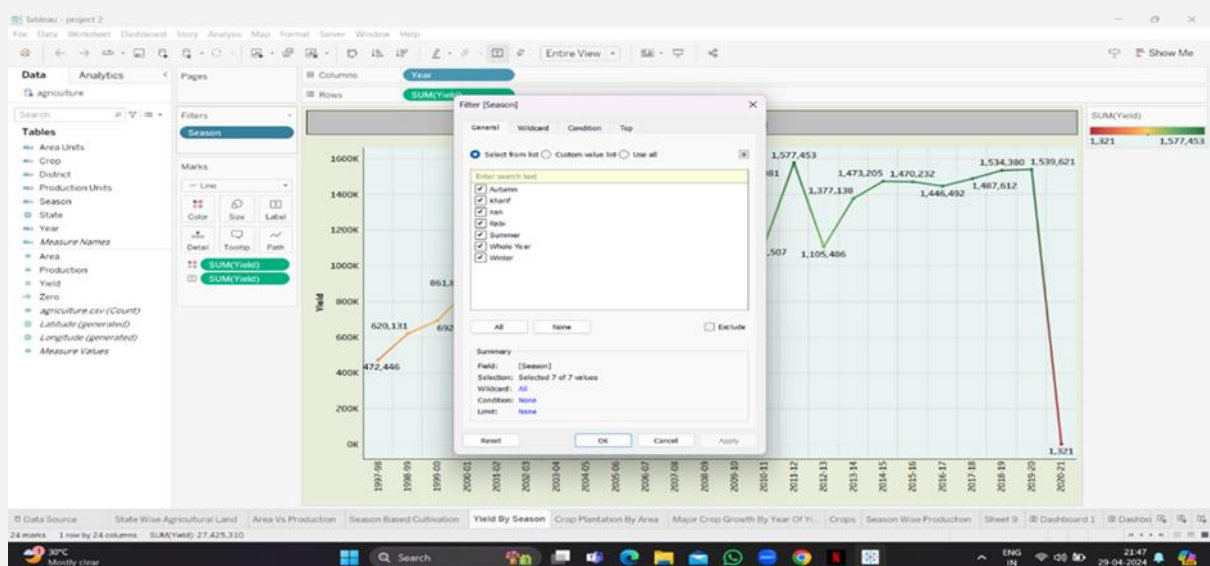


Activity 1.4: Yield by season

The sheet named yield by season is a line chart, in which we have analysed yield by season. For this analysis we have taken year field to the column section and Sum (Year) field to the row section. We have used filter by keeping season field into the filter section in which we have selected all the seasons in it

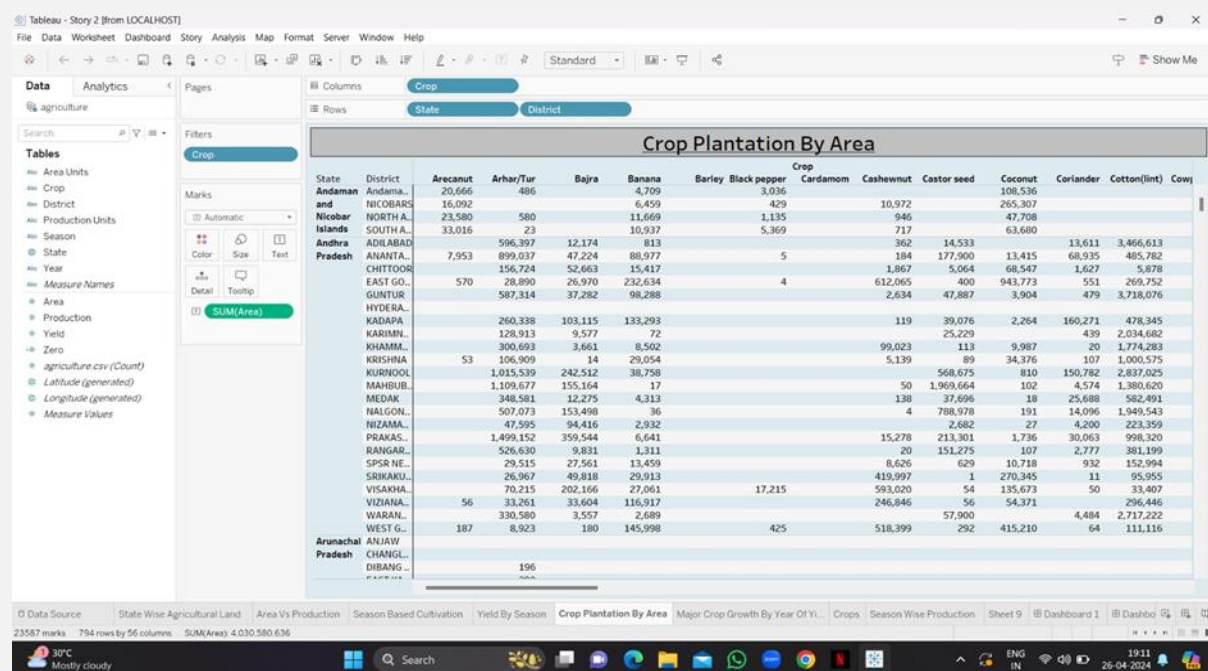


Filter used:

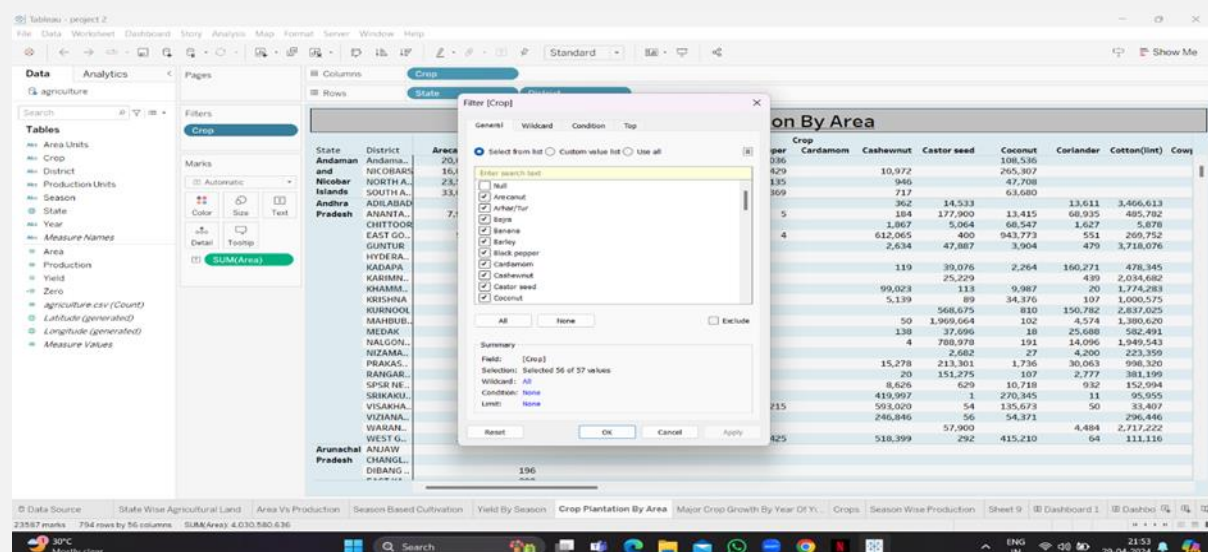


Activity 1.5: Crop plantation by area

In the sheet named crop plantation by area we have analysed the crop plantation to the area state. For this analysis we have taken crop field in the column section and we have taken state and district fields to the row section. We have applied a filter by taking the crop field into the filter section and deselected the null in it. This analysis gives us the detailed information of the crop plantation rate of various states in their districts in India

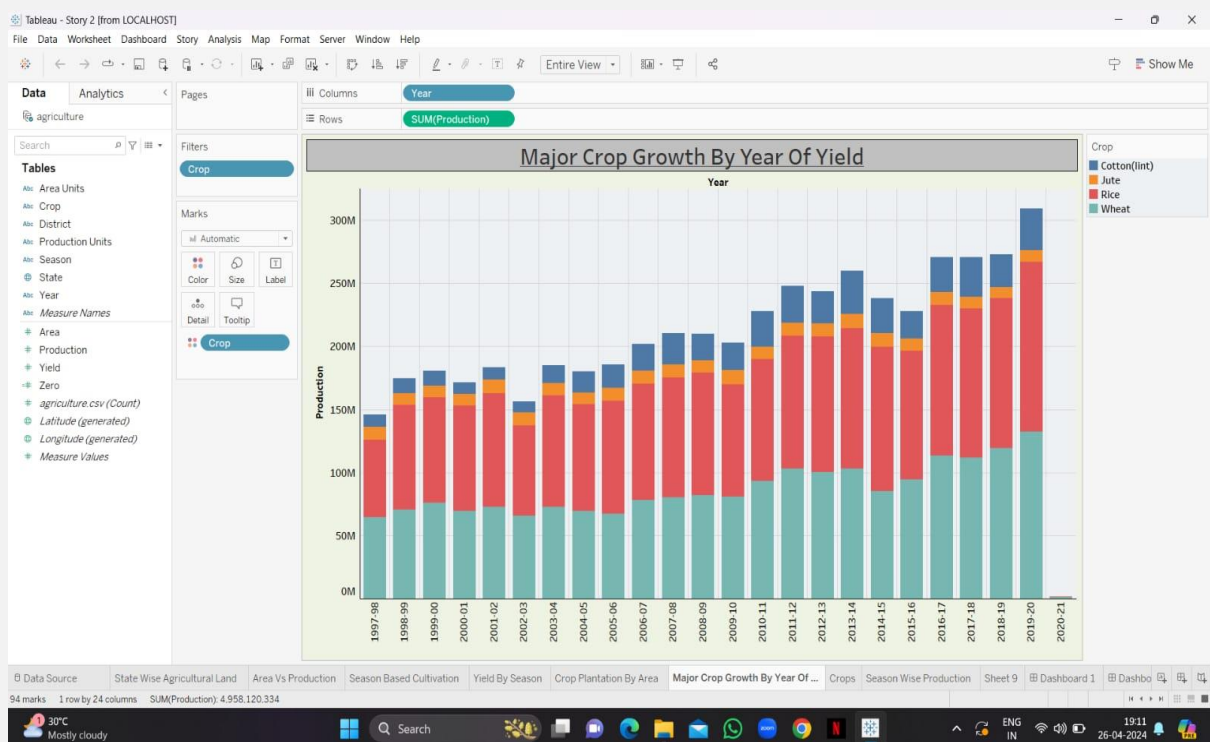


Filter used:

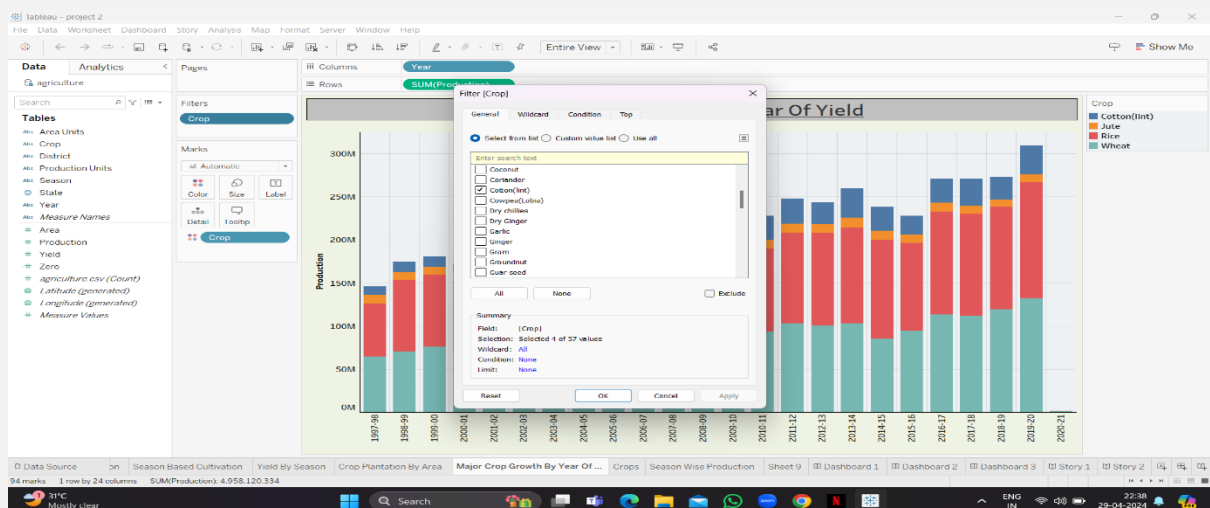


Activity 1.6: Major crops growth yield

In the sheet named major crop growth by year of yield, we have analyzed the major crops and their growth by the year of yield. For this analysis we have taken year in the column section and Sum (Production) in the row section. We have also applied the filter by taking crop field in the filter section and we have filtered the crops cotton, jute, rice and wheat. By this analysis, we can easily get to know about the production rate of the crops cotton, jute, rice, and wheat over the years from 1997 to 2021

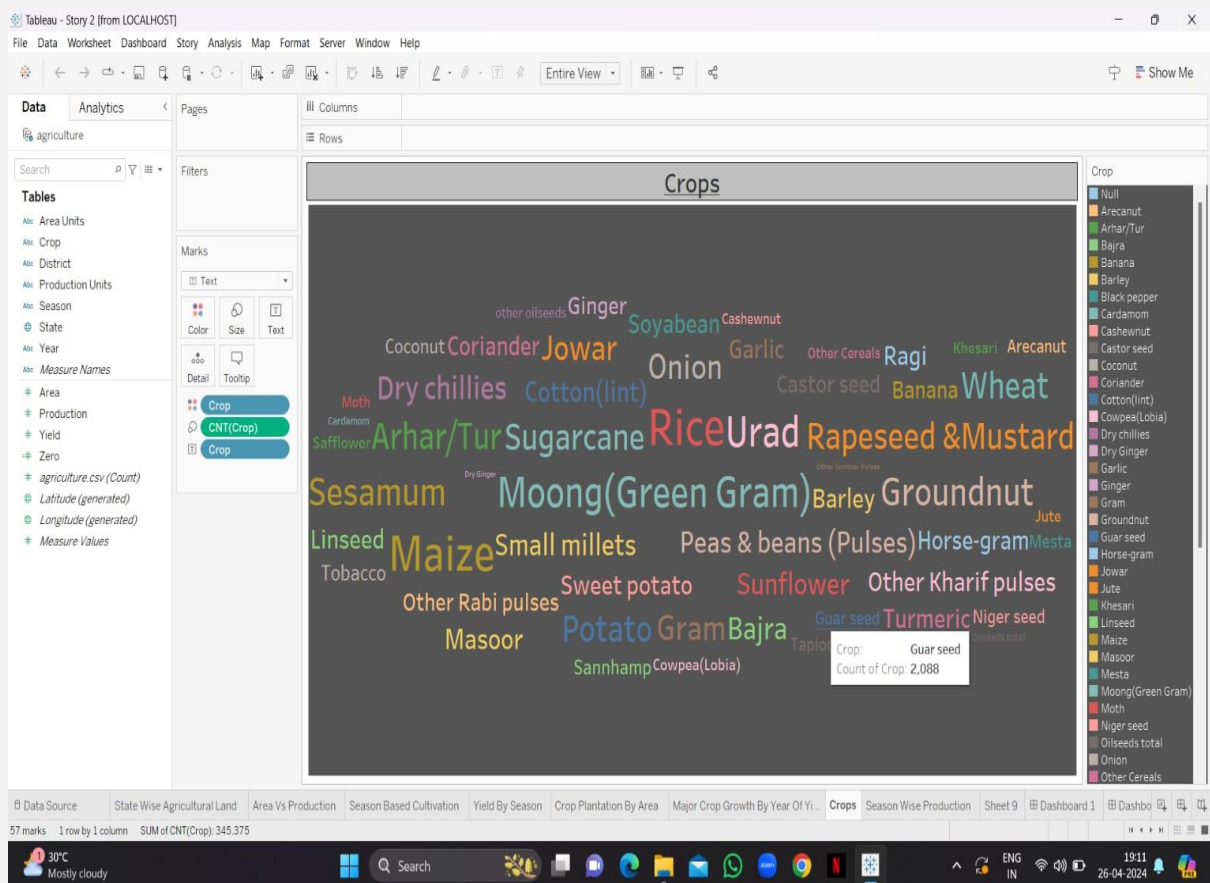


Filter used:



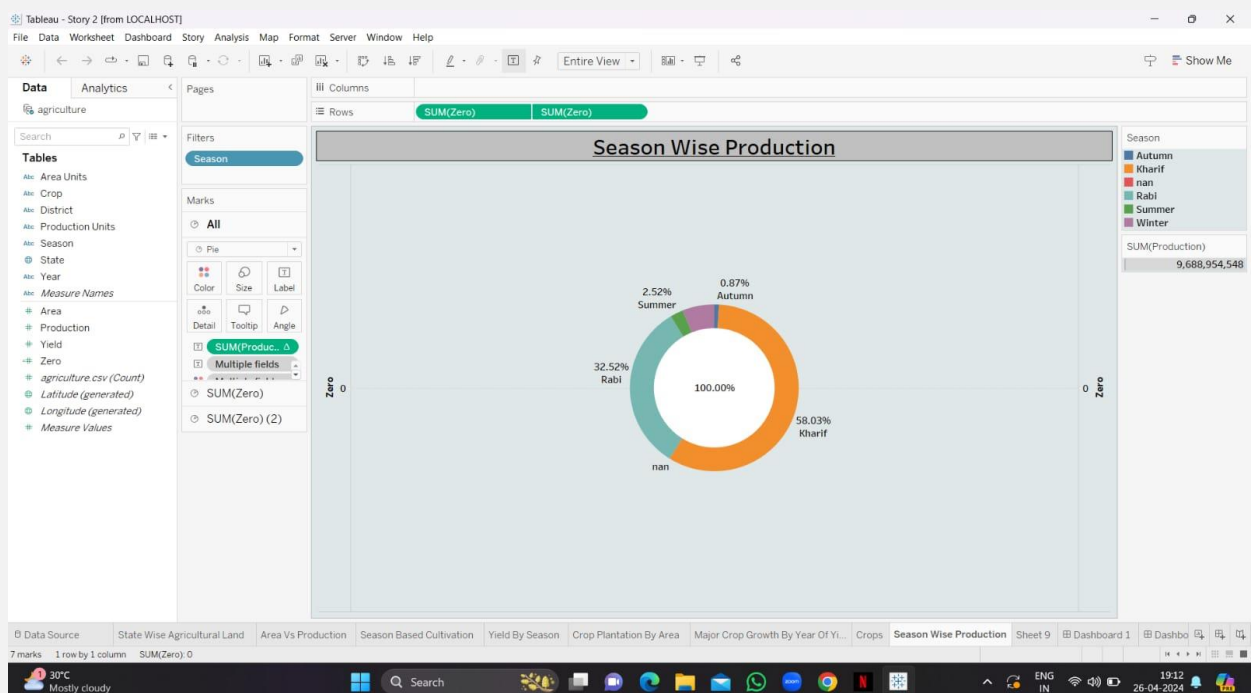
Activity 1.7: Crops

The sheet named crops, shows us the various varieties of crops that are cultivated in India. For this analysis, we have taken the crop field into the marks table and kept it in the size and then we have applied measure(count) to it.

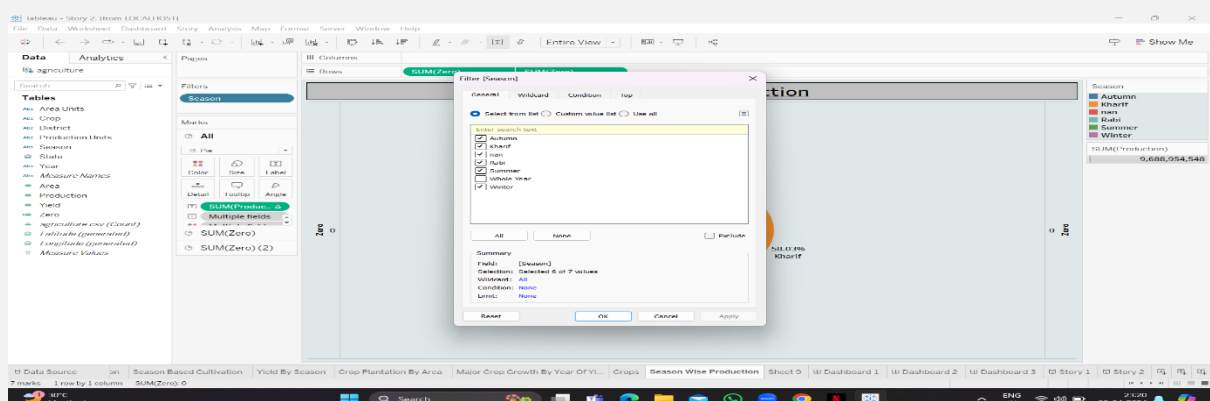


Activity 1.8: Season wise production

The sheet named season wise production, we have analysed the season wise production rate in India. For this, we have chosen the donut chart. First, we have created a calculation field with the name zero and entered the value 0 in it. So, calculation a field is created in the measure table. Now we will drag the " zero" calculation field over to the row section twice. for the second sum(zero) in the row section, we have chosen the dual axis for the donut chart. We have also applied a filter by keeping season field in the filter section. We have added the necessary fields to both sum(zero) sum(zero)2 in the marks table. By this, we can easily get to know the total production rate in the percentage of the season to the 100% production rate.



Filter used:



Milestone 5: Dashboard

We have created a graphical user interface (GUI) that displays information and data in an organized, easy-to-read format. Dashboards are often used to provide real-time monitoring and analysis of data and are typically designed for a specific purpose or use case. Dashboards can be used in a variety of settings, such as business, finance, manufacturing, healthcare, and many other industries. They can be used to track key performance indicators (KPIs), monitor performance metrics, and display data in the form of charts, graphs, and tables.

Activity 1: Responsive and Design of dashboard

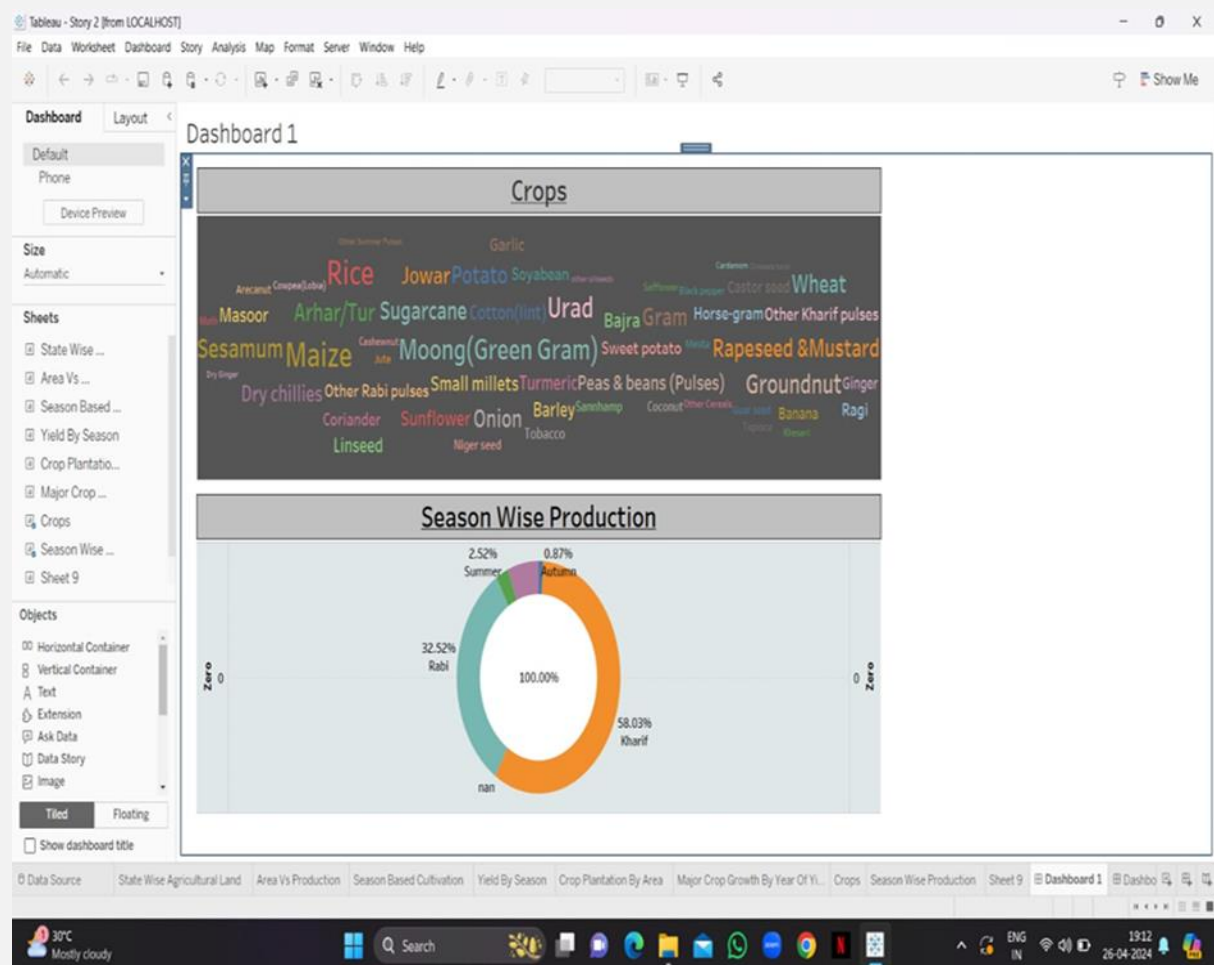
Dashboard:

The dashboard is a summary of different but related data sets presented in a way that makes the related information easier to understand

Once we have created views on different sheets in Tableau, you can pull them into a dashboard.

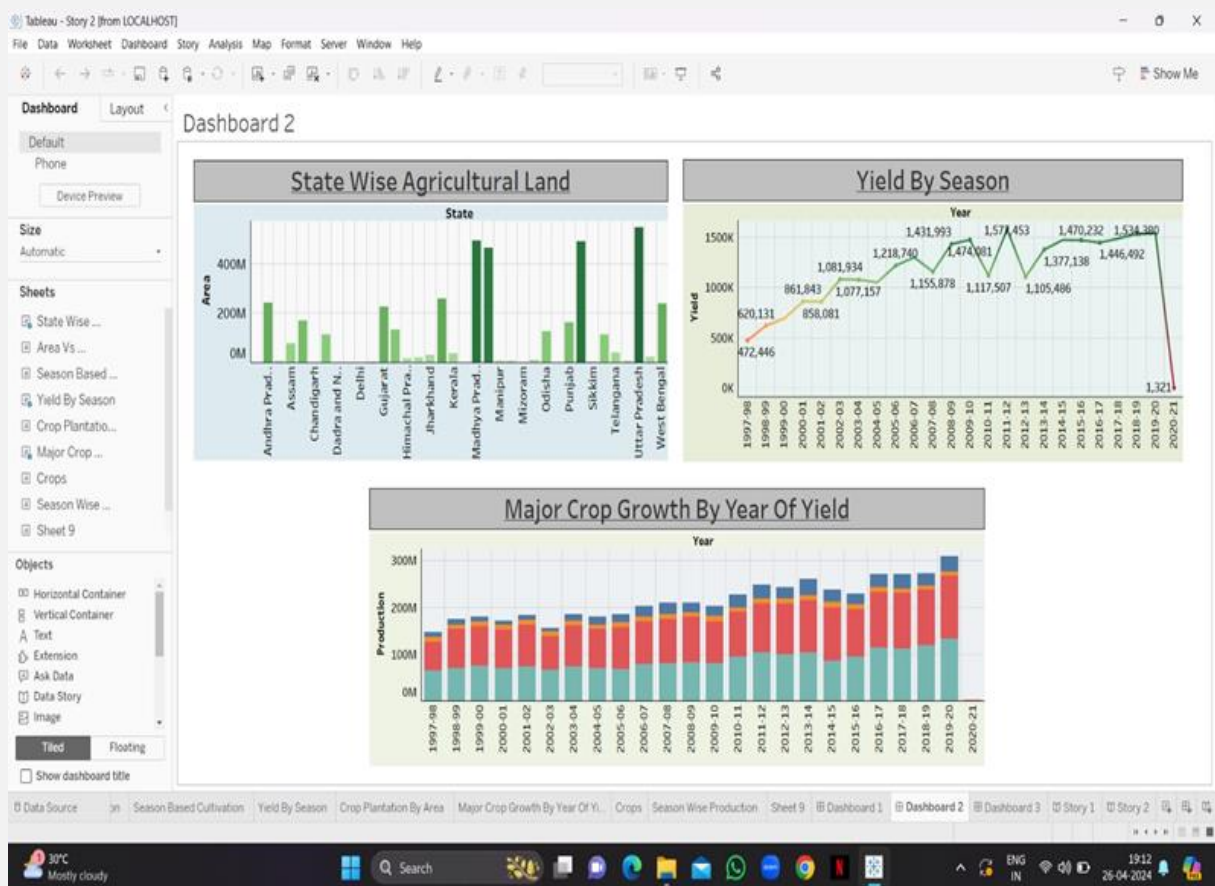
Activity 1.1: Dashboard 1

We have created dashboard 1 with two sheets those are crops and season wise agricultural land.



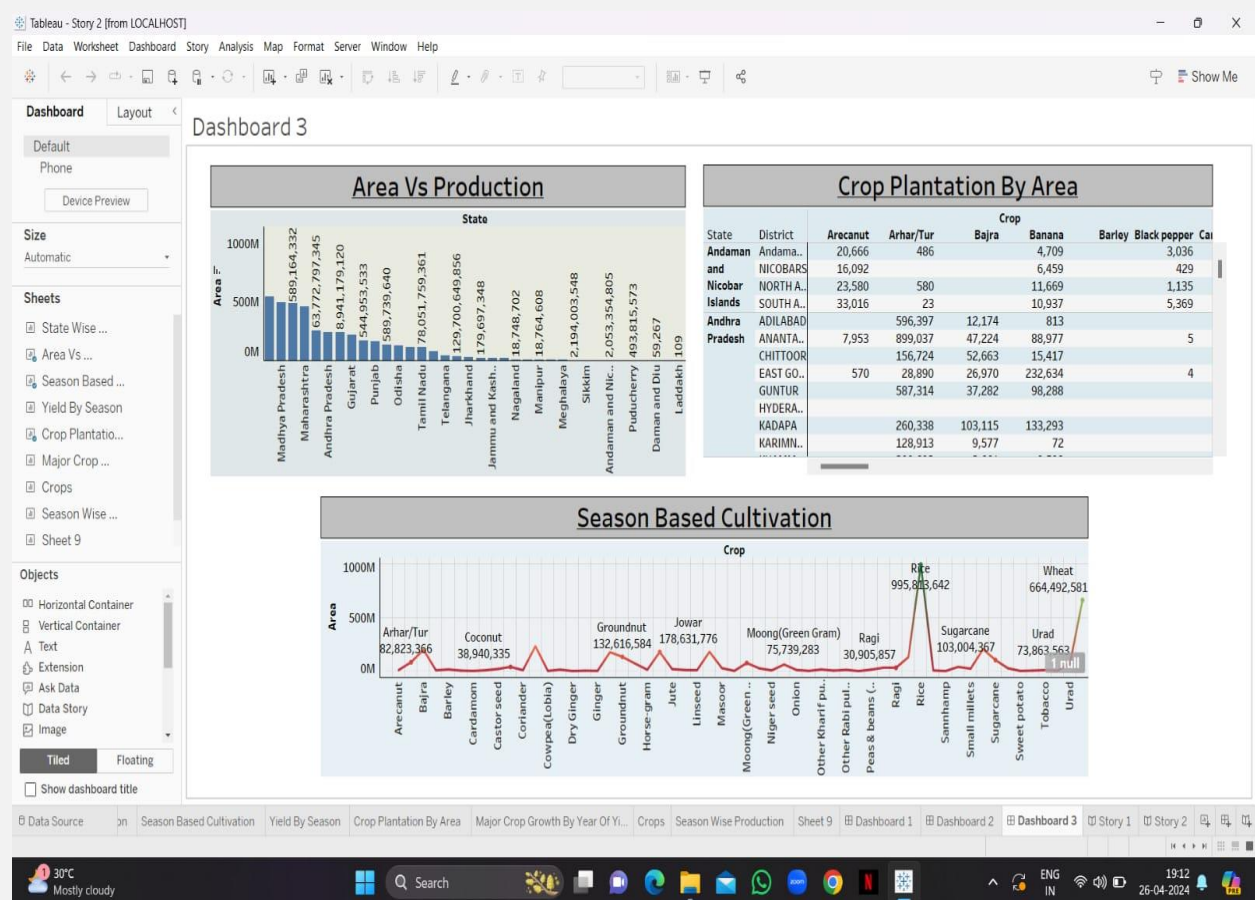
Activity 1.2: Dashboard 2

We have created dashboard 2 with the three sheets those are state wise agricultural land, yield by season, major crop growth by year of yield.



Activity 1.3: Dashboard 3

We have created the dashboard 3 with three sheets those are area vs production, crop plantation by area, season based cultivation



Milestone 6: Story

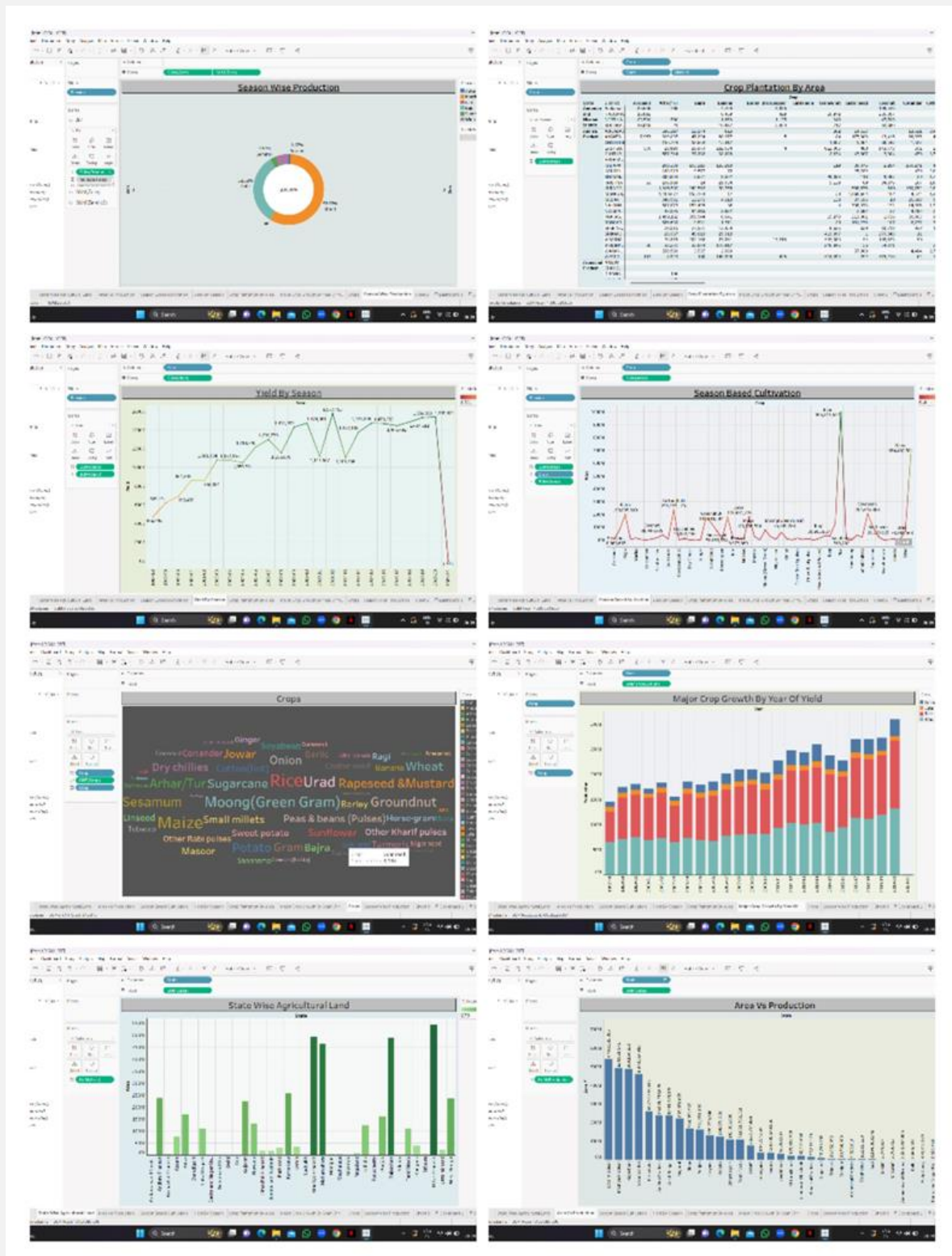
We have presented data and analysis in a narrative format, intending to make the information more engaging and easier to understand. A data story typically includes a clear introduction that sets the stage and explains the context for the data, a body that presents the data and analysis logically and systematically, and a conclusion that summarizes the key findings and highlights their implications. Data stories can be told using a variety of mediums, such as reports, presentations, interactive visualizations, and videos.

Activity 1: Number of scenes in a story

The number of scenes in our storyboard for a data visualization analysis of the performance of banks will depend on the complexity of the analysis and the specific insights that are trying to be conveyed. A storyboard is a visual representation of the data analysis process and it breaks down the analysis into a series of steps or scenes.

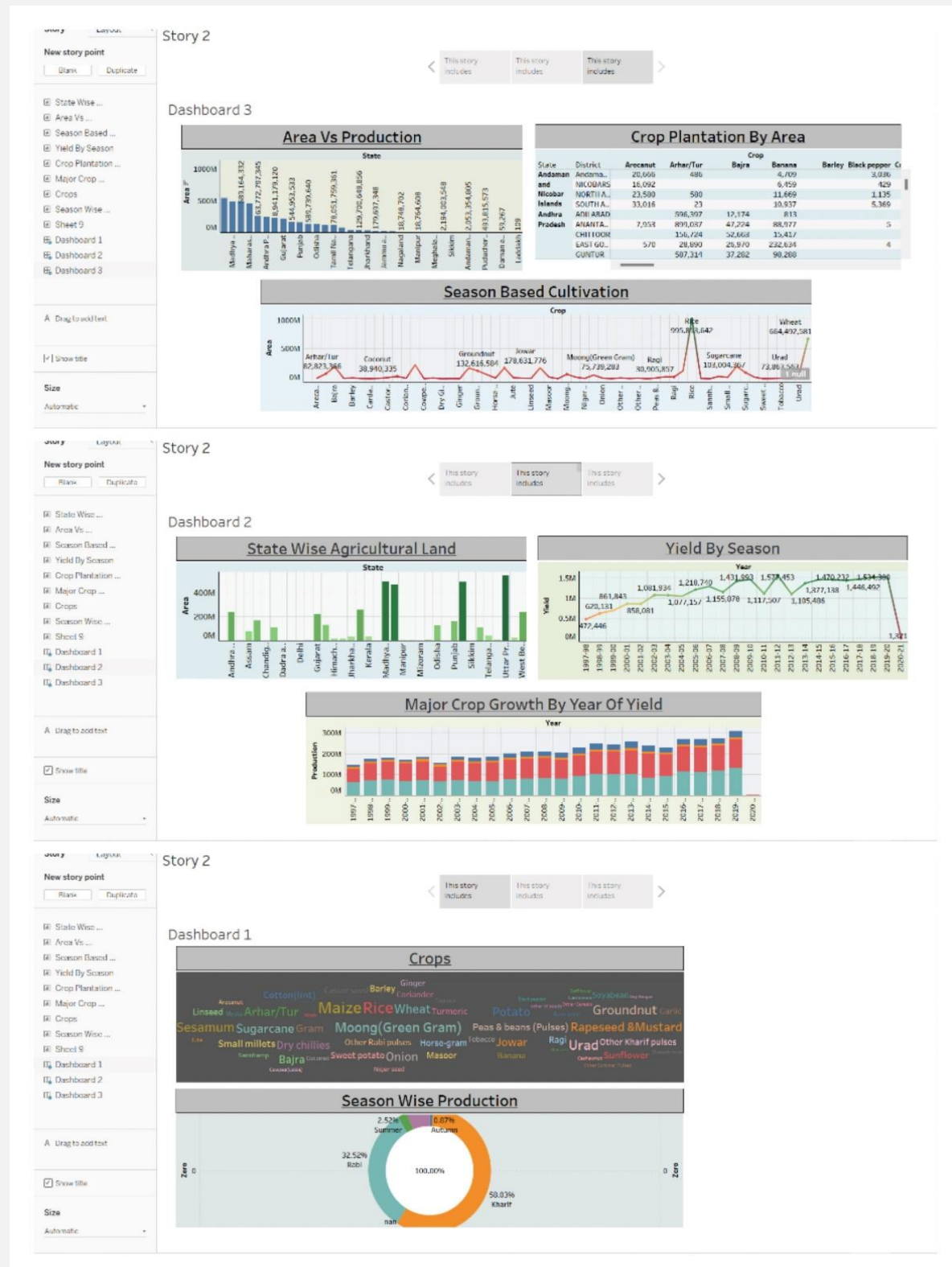
Activity 1.1: Story 1

We have created story 1 by connecting all the visuals or the analysis we have created. This helps in easy story narration of all the visuals connected in a story.



Activity 1.1: Story 2

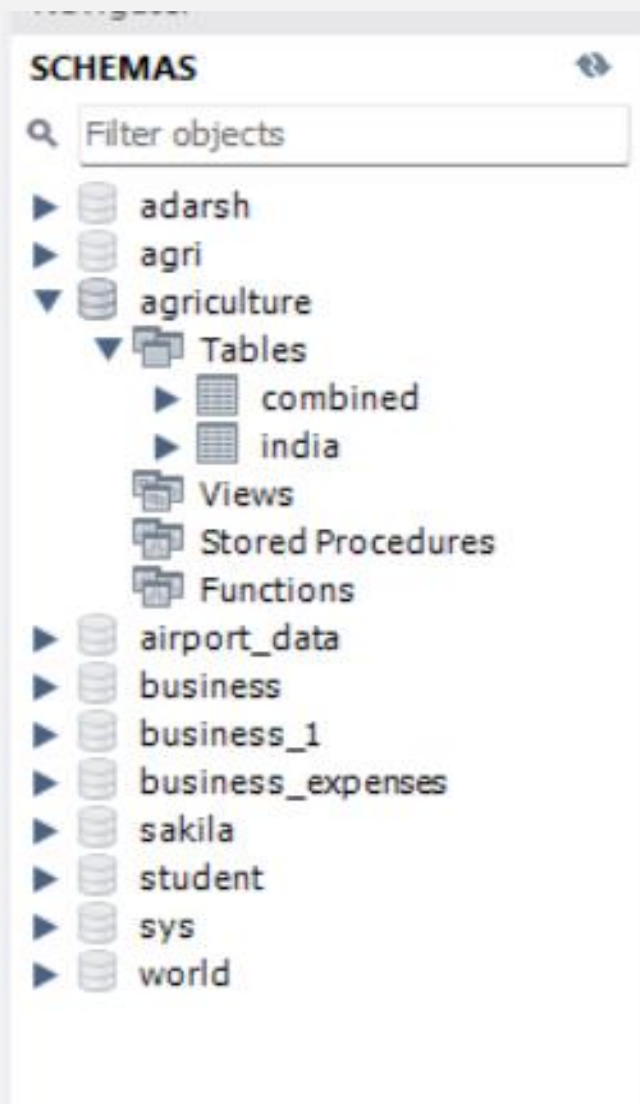
We have created story 2 by connecting all the three dashboards which we have created.



Milestone 7: Performance Testing

Activity 1: Amount of Data Rendered to DB

- We have rendered our data to a database depends on the size of the dataset and the capacity of the database to store and retrieve data.
- Open the MySQL Workbench, go to the database then click to expand the tables, select the table and click on (i) button to get the information related to table such as column count, table rows etc.



SCHEMAS

Filter objects

adarsh

agri

agriculture

Tables

combined

india

Views

Stored Procedures

Functions

airport_data

business

business_1

business_expenses

sakila

student

sys

world

AdministrationSchemas

Information

No object selected

InfoColumnsIndexesTriggersForeign keysPartitionsGrantsDDL

Local instance MySQL80
agriculture.india

Table Details

Engine:

InnoDB

Row format:

Dynamic

Column count:

9

Table rows:

321317

AVG row length:

116

Data length:

35.6 MiB

Index length:

0.0 bytes

Max data length:

0.0 bytes

Data free:

7.0 MiB

Table size (estimate):

35.6 MiB

File format:

Data path:

C:\ProgramData\MySQL\MySQL Server 8.0\Data\agriculture\india.ibd

Update time:

Create time:

2023-06-12 15:48:15

Auto increment:

Table collation:

utf8mb4_0900_ai_ci

Create options:

Comment:

Information on this page may be outdated. Click

Analyze Table

 to update it.

SCHEMAS

Filter objects

adarsh

agri

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airport_data

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business_expenses

sakila

student

sys

world

AdministrationSchemas

Information

No object selected

InfoColumnsIndexesTriggersForeign keysPartitionsGrantsDDL

Local instance MySQL80
agriculture.combined

Table Details

Engine:

InnoDB

Row format:

Dynamic

Column count:

3

Table rows:

5

AVG row length:

3276

Data length:

16.0 KiB

Index length:

0.0 bytes

Max data length:

0.0 bytes

Data free:

0.0 bytes

Table size (estimate):

16.0 KiB

File format:

Data path:

C:\ProgramData\MySQL\MySQL Server 8.0\Data\agriculture\combined.ibd

Update time:

Create time:

2023-06-14 17:26:50

Auto increment:

Table collation:

utf8mb4_0900_ai_ci

Create options:

Comment:

Information on this page may be outdated. Click

Analyze Table

 to update it.

Activity 2: Number of calculation fields

DataAnalytics<

Combined

india (agriculture)

Search

Tables

Abc

Crop

Abc

District

Abc

Production Units

Abc

Season

State

Year

Abc

Measure Names

#

Area

#

Production

#

Yield

#

Zero

#

Zero Line

#

india (Count)

Latitude (generated)

Longitude (generated)

#

Measure Values

DataAnalytics<

Combined

india (agriculture)

Search

Tables

Abc

Region

Abc

Measure Names

#

Area

#

Production

#

Zero

#

Combined.csv (Count)

#

Measure Values

Activity 3: Number of visualizations

1. State wise Agricultural Land
2. Area vs Production
3. Season based cultivation by area
4. Yield by season
5. Crop plantation by area
6. Major crops growth Yeild
7. Crops Plantation By count
8. Season wise production

Milestone 8: Web integration

We have published the track and monitor key performance metrics and to communicate results and progress. help a publisher stay informed, make better decisions, and communicate their performance to others.

Activity 1: Publishing dashboard and reports to tableau public

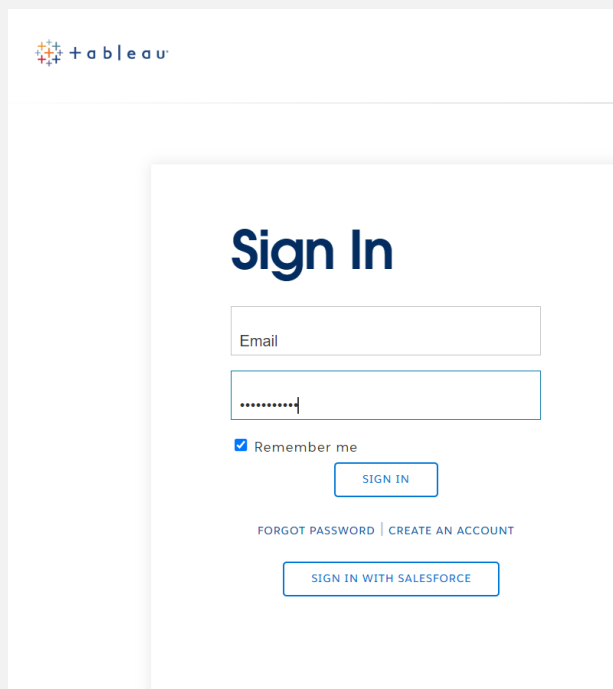
Tableau Public:

Tableau Public is a free platform to explore, create and publicly share data visualizations online

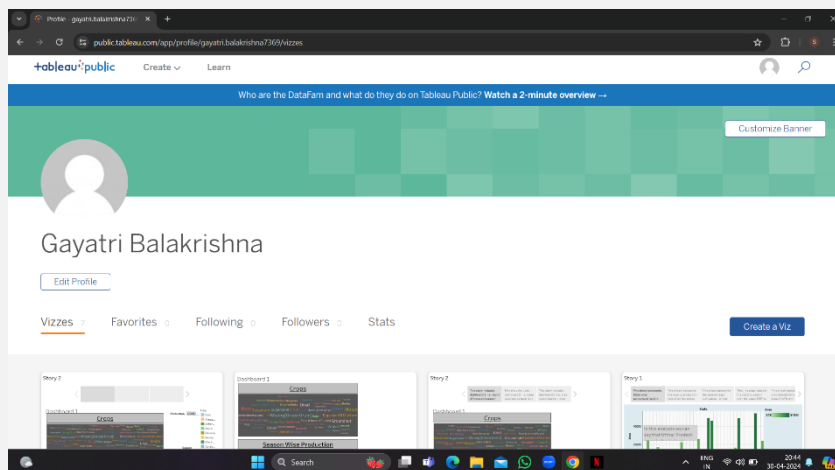
Tableau Public provides a good learning experience for those starting out in analytics. We can get reasonable access to the application, and in addition, Tableau has a helpful community. We can share our work, build hands-on experience, and increase our knowledge and skills.

The steps to publish dashboards, stories and reports to tableau public:

1: Firstly, we need to create an account in tableau public platform.



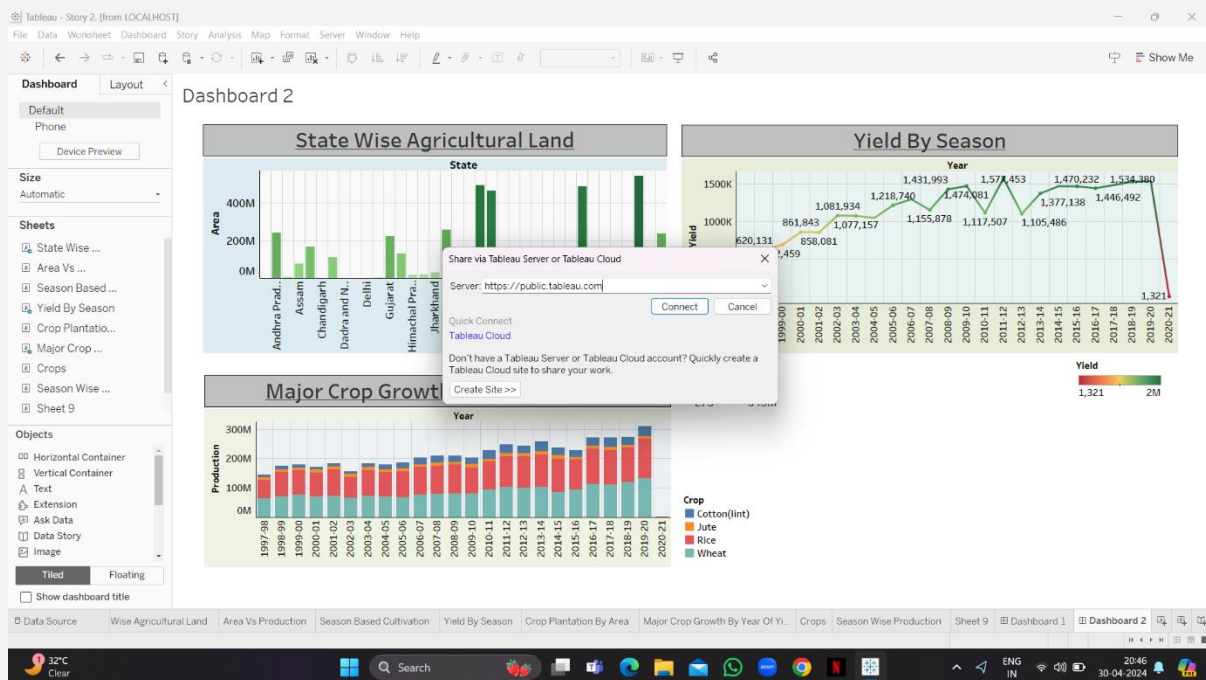
2: After creating an account in the tableau public, our profile will be created in it



3: Later after the creation of the profile in tableau public, we need to connect our dashboards and stories to this. For that we need to open our tableau file which we have created. In that we need to go to the data source and change the live to extract.

4: After this process it will ask us to save the workbook in a desired location. So, we need to save the workbook.

5: Now, we need to go to our desired dashboard or story. Over there we need to click on the share icon on the top of the analysis. Then we can get a pop up message as below,



6: Here, we need to select the connect option.

7: After connecting it our dashboard or story will be directly published into tableau public in our account.

Activity 2: Embed dashboard and story with bootstrap

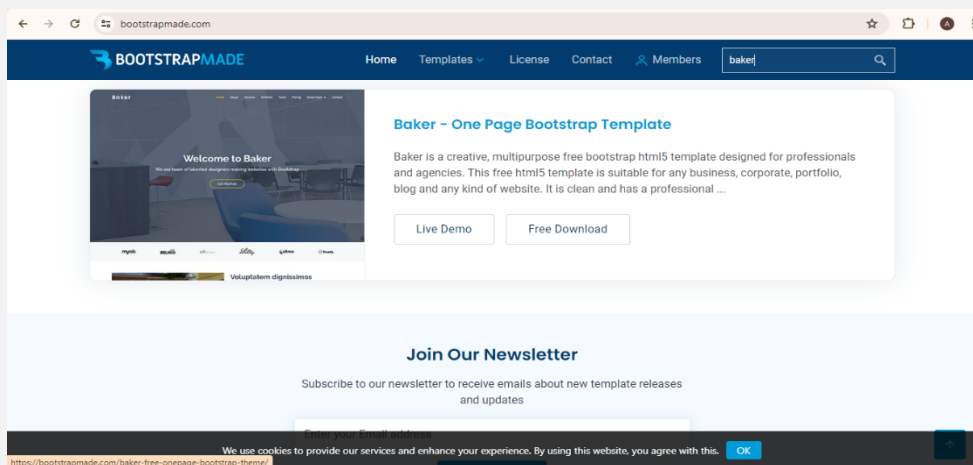
This activity focuses on advanced tableau functionalities including annotations, dashboard interactions, web application development with Flask, Bootstrap integration and embedding table visualisations into web applications. We aimed to gain proficiency in these areas to enhance data visualisations and web applications development skills.

Building tableau web application with Flask and Bootstrap.

1.We need to acquire an introduction to flask, a python web framework, for building web applications including its core concepts and functionalities.

2.We need to work with flask framework to develop dynamic and interactive web application, engaging its features for routing, templating and handling user request.

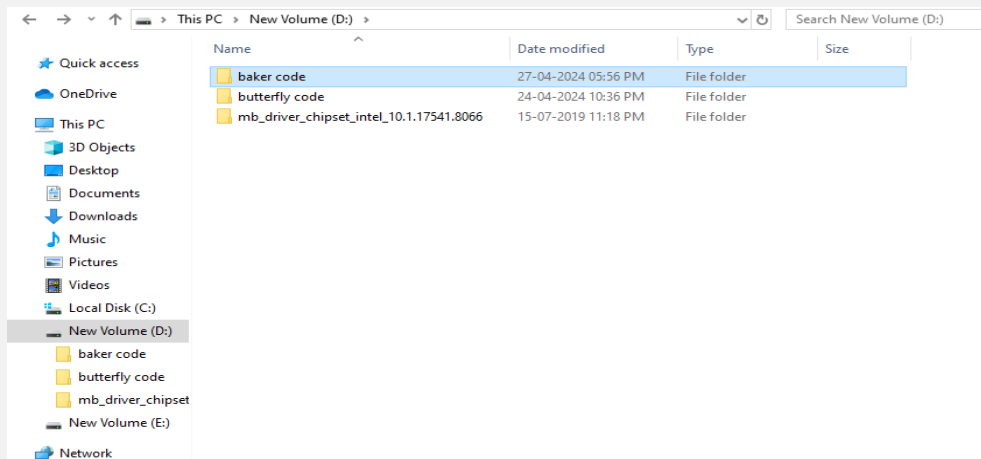
3.We have downloaded a free bootstrap template which act as a front-end framework and is used for creating responsive and visually appealing web interface in tableau applications.



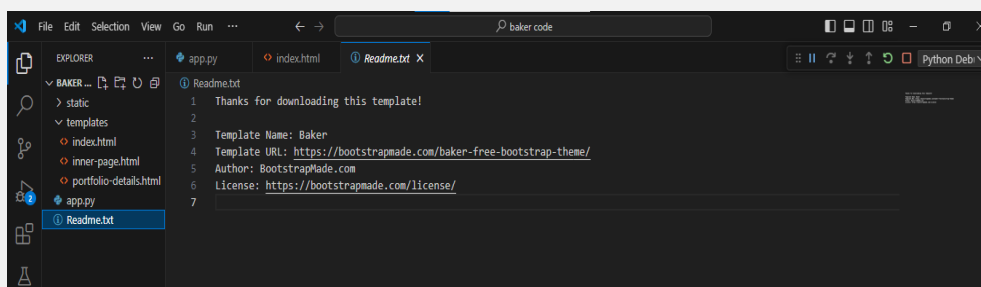
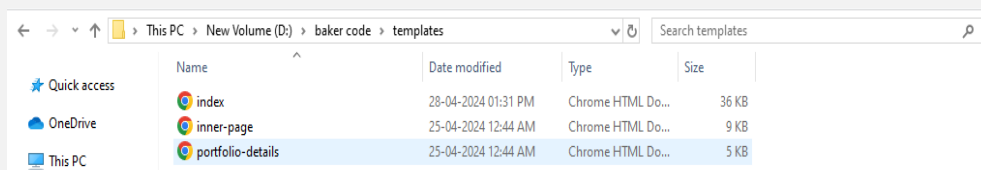
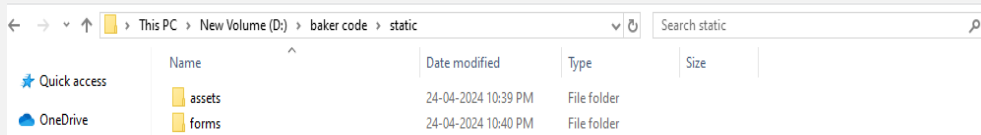
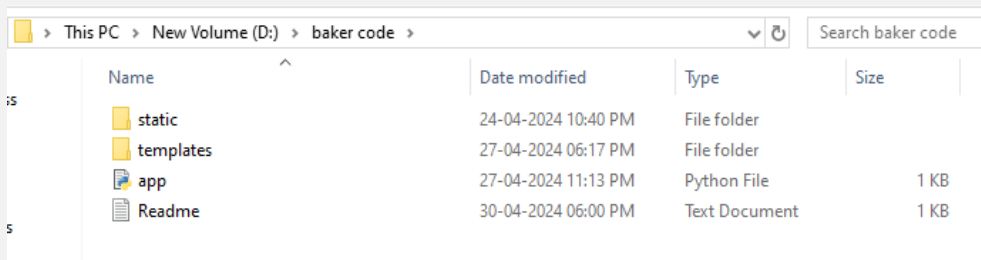
4.Download VS (Visual Studio Code) in which we have to acquire flask and install all the packages of flask.

Working with bootstrap

1.After downloading bootstrap templates, we have to create a new folder named as Baker code (as we have downloaded Baker template) in the D-drive of our PC.



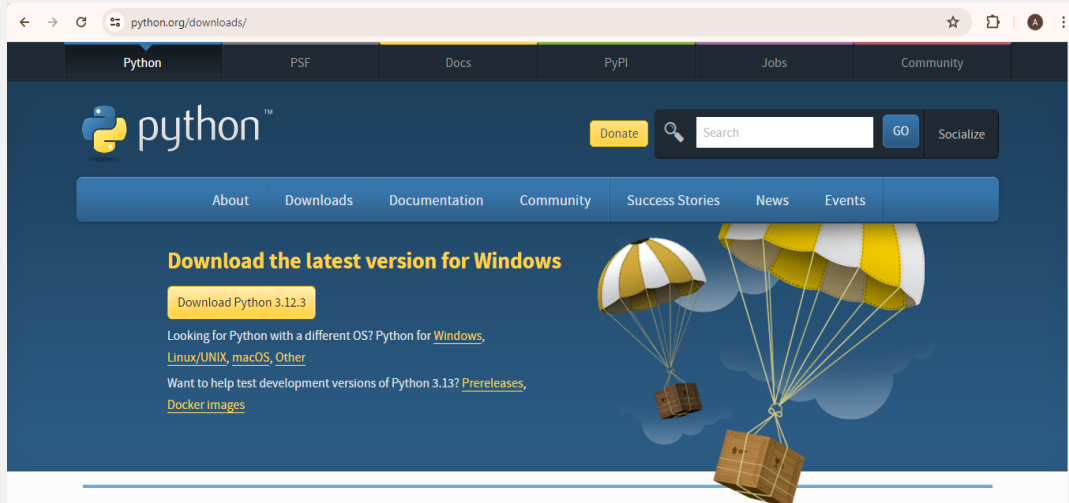
2. After that we need to copy all the folders in Baker template (static template, readme.txt) and upload in the above created new folders in which static will include assets and forms. Template folder will include files named index.html, inner-page, portfolio details.



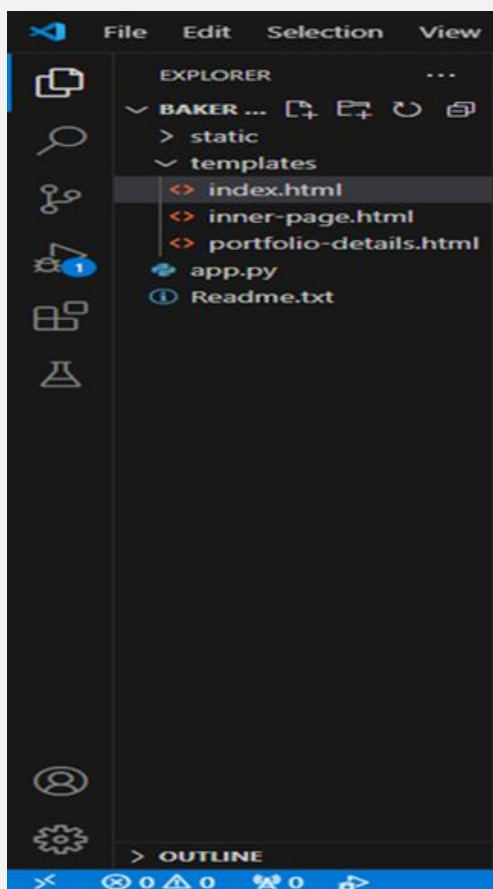
3. Later we will explore all these folders of Baker template in VS code or flask.

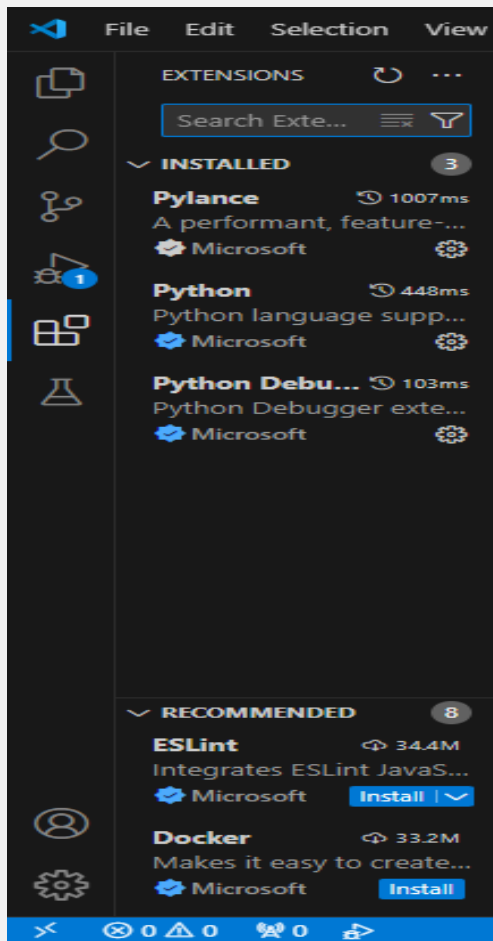
Building application with Flask Framework

1.First, we have to download python application of current version and need to generate pip, idle console etc while downloading it.



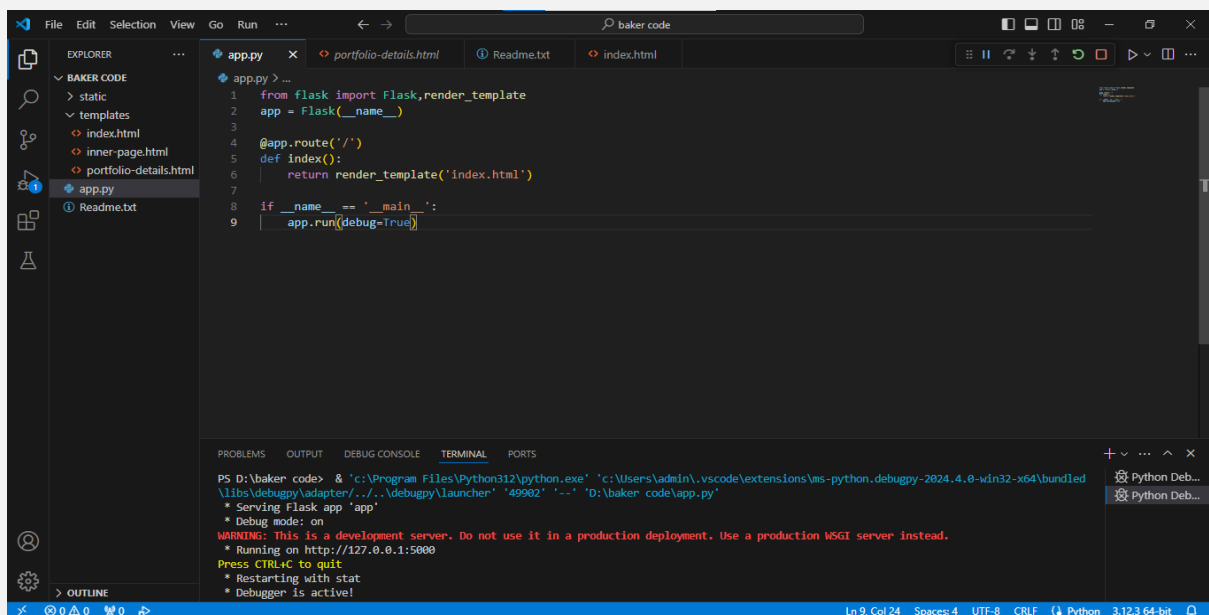
2.Now we will select a folder named as Baker code in VS code (Visual Studio) and we will download the python extensions that will also be used for debugging python file.



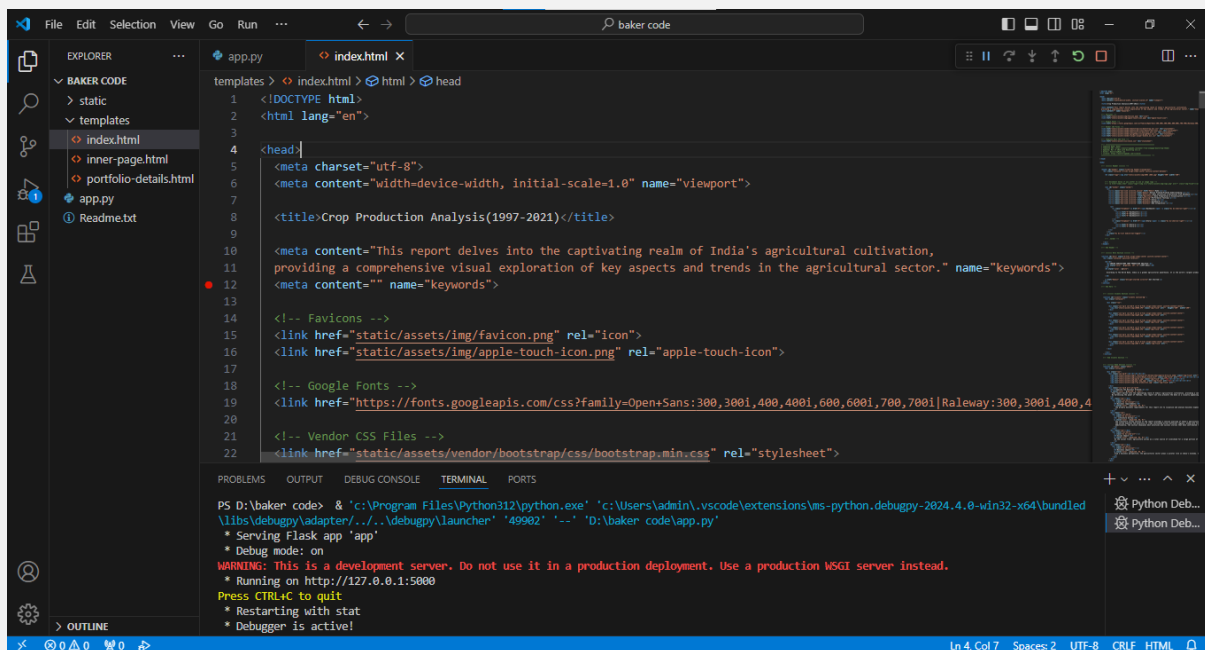


3. Later we have to create a python file named as (app.py) to run simultaneously with HTML code i.e., (index.html) file for the desired output.

app.py code:



Index.html code:



The screenshot shows the Visual Studio Code editor with the 'index.html' file open. The Explorer sidebar on the left shows the project structure: 'BAKER CODE' containing 'static' and 'templates' folders, and 'index.html', 'inner-page.html', 'portfolio-details.html', 'app.py', and 'Readme.txt'. The main editor area displays the HTML code for 'index.html', which includes a head section with meta tags for charset, viewport, and keywords, and links for favicons, Google Fonts, and Bootstrap CSS. The bottom panel shows the 'TERMINAL' tab with the following output:

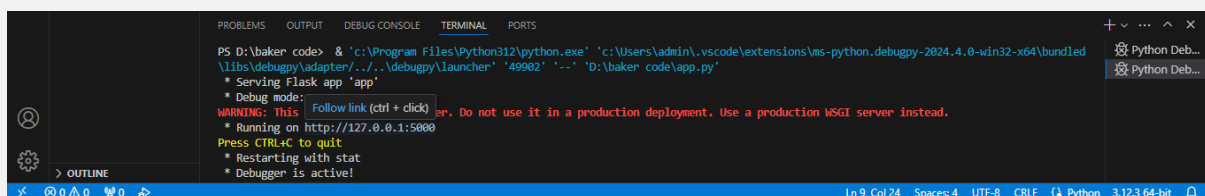
```
PS D:\baker code> & 'c:\Program Files\Python312\python.exe' 'c:\Users\admin\.vscode\extensions\ms-python.debugpy-2024.4.0-win32-x64\bundle...  
* Serving Flask app 'app'  
* Debug mode: on  
WARNING: This is a development server. Do not use it in a production deployment. Use a production WSGI server instead.  
* Running on http://127.0.0.1:5000  
Press CTRL+C to quit  
* Restarting with stat  
* Debugger is active!
```

4.Now, we will debug (app.py) file to take a demo whether the file is being responding or not.

5.We will completely edit HTML file (Index.html) according to our project (Indian Agriculture Crop Production Analysis) by utilizing bootstrap components such as grids, navigation bars, button and forms to enhance the user experience.

6.After editing we have to run the two files app.py and index.html codes simultaneously and later we will terminate code and in our terminal output after debugging we will acquire a `http: \` link which is the output of app.py file. If we will open that link by following it, a web interface will be opened in the browser that will be our desired output for building interface.

Final Out Put:



The screenshot shows the Visual Studio Code editor with the 'TERMINAL' tab active. The terminal output is the same as the previous one, but it now includes a red text prompt: 'Follow link (ctrl + click)'. The status bar at the bottom indicates 'Ln 9, Col 24', 'Spaces: 4', 'UTF-8', 'CRLF', and 'Python 3.12.3 64-bit'.

From this activity we have acquired data visualisations and web application development skills.

THANK YOU