

India
Agriculture
Crop
Production
Analysis
(1997 - 2021)

Team Members

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Project Report Format

1. INTRODUCTION

- a. Overview - A brief description about your project
- b. Purpose - The use of this project. What can be achieved using this.

2. LITERATURE SURVEY

- a. Existing problem - Existing approaches or method to solve this problem
- b. Proposed solution - What is the method or solution suggested by you?

3. THEORITICAL ANALYSIS

- a. Block diagram - Diagrammatic overview of the project.
- b. Hardware / Software designing
 1. Hardware and software requirements of the project

4. RESULT

Final findings (Output) of the project along with screenshots.

5. ADVANTAGES & DISADVANTAGES

List of advantages and disadvantages of the proposed solution

6. APPLICATIONS

The areas where this solution can be applied

7. CONCLUSION

Conclusion summarizing the entire work and findings.

8. FUTURE SCOPE

Enhancements that can be made in the future.

9. Weekly Reports (8 Weeks Report)

10. Student Self Evaluation of the Short-Term Internship

1. Evaluation by the Supervisor of the Intern Organization
2. EVALUATION
3. MARKS STATEMENT

→ INTRODUCTION

Over the span of more than eight centuries, India's agriculture landscape has undergone remarkable transformations, shaped by a myriad of socio-economic, environmental, and technological factors. From the beginning of the agrarian societies of ancient times to the Green Revolution of the mid-20th century and beyond, the nation's agriculture has been a pivotal to its economy, culture, and food security. This analysis delves into the historical trajectory of crop production in India from 1997 to 2021, examining key trends, innovations, challenges, and their implications for India's agricultural sustainability and future prospects.

→ OVERVIEW

This analysis provides a comprehensive overview of the historical trajectory of crop production in India spanning from 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 the 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, this 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 & Story and we employed Tableau tool.

⇒ Project Flow

To accomplish this, we have completed 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 Database
 - performing SQL operations.
 - connecting Database with tableau .
- Data Preparation & Visualization .
 - Prepare the data for visualizations.

- Data Visualizations
 - No. of unique visualizations
- Dashboard
 - Responsive & design of dashboard
- Story
 - No. of scenes of story
- Performance testing
 - Amount of data rendered to database.
 - Utilization of data filters.
 - No. of calculations fields.
 - No. of visualizations/ graphs.
- Web integration.
 - Dashboard & 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.

→ PURPOSE

The Purpose of analyzing India's agricultural crop production from 1997 to 2021 is multifaceted. Firstly it provides insights into the historical evolution of India's agriculture landscape offering a deeper understanding of the factors that have shaped its trajectory over centuries. This analysis helps identify patterns, trends, and key milestones in crop production shedding light on the historical context of agricultural practices, policies and innovations in India. Moreover, understanding the historical trends in crop production is essential for policymakers, researchers, and agricultural practitioners to formulate informed strategies and policies for the future. By examining past successes, challenges and innovations, stakeholders can derive lessons learned and best practices to improve agricultural productivity, sustainability and resilience in India.

→ LITERATURE SURVEY

A literature survey on India's agricultural crop production from 1997 - 2021 reveals a rich array of scholarly works spanning various disciplines such as agricultural economics, history, agronomy, and environmental studies. Early studies focus on historical records, archaeological findings, and ancient texts to understand agricultural practices in ancient India. As a discipline progresses, research

→ PROPOSED SOLUTIONS

• Enhancing sustainability :-

Proposed solutions for India's agricultural crop production analysis from 1997 - 2021 must prioritize sustainability to ensure long term productivity & environmental health. Strategies include promoting organic farming practices, implementing agroecological approaches and adopting precision agricultural techniques to minimize resource use and reduce environmental impact.

• Addressing water scarcity :-

Water scarcity poses a significant challenge to Indian agriculture, requiring targeted solutions to enhance water efficiency & conservation. Proposed measures include investment in water saving technologies such as drip irrigation & rainwater harvesting, promoting efficient water management practices & encouraging crop diversification towards less water intensive crops.

• Mitigating climate change impacts :-

To combat the adverse effects of climate change on crop production, adaptation & mitigation strategies are essential. Proposed solutions include developing climate-resilient crop varieties, implementing land reforms to ensure agroforestry and soil conservation measures to enhance resilience to extreme weather events, and promoting climate-smart agricultural practices.

• Promoting Inclusive Growth :-

Addressing socio-economic disparities within the agricultural sector (disparities) is crucial for promoting inclusive growth and improving livelihoods. Proposed solutions include providing access to credit, extension services and market linkages for smallholder farmers, implementing land reforms to ensure equitable distribution of land resources and fostering rural employment opportunities through skill development and infrastructure investment.

• Harnessing Technology :-

Technological innovations can revolutionize Indian agriculture by improving productivity, efficiency & resilience. Proposed solutions include leveraging digital agricultural tools such as satellite imaging, remote sensing, and mobile applications for real-time monitoring & decision-making, promoting the adoption of mechanization & automation to reduce labour intensity & harnessing biotechnology for crop improvement & pest management.

• Strengthening Policy Frameworks :-

Effective policy interventions are essential for creating an enabling environment for sustainable agricultural development. Proposed solutions include refining agricultural policies to incentivize sustainable practices, investing in agricultural research & extension services to disseminate knowledge & best practices, & strengthening regulatory frameworks to ensure food safety & quality.

derives into colonial influences, the impact of British rule on Indian agriculture, and the emergence of modern agricultural policies.

→ EXISTING PROBLEMS with proposed solution

• Historical trajectory :-

India's agricultural crop production from 1997 - 2021 reflects a captivating journey marked by significant historical milestones and transformations, from ancient agrarian societies to the modern era of technological advancements, the sector has evolved in response to changing socio-economic, environmental, and political landscape.

• Challenges amidst Progress :-

Despite notable achievements, India's agricultural sector grapples with a myriad of challenges that threaten its sustainability and resilience, issues such as land degradation, water scarcity, climate change impacts and socio-economic disparities pose formidable obstacles to long-term productivity and food security.

• Green Revolution & Beyond :-

The Green Revolution of the mid-20th century stands as a pivotal moment in India's agricultural history, ushering in unprecedented increases in crop yields and productivity. However, subsequent challenges have emerged, including environmental degradation, input-intensive farming practices, and concerns over food quality & safety.

• Green Revolution & Beyond :-

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• Technological Innovations :-

Technological innovations advancements have played a crucial role in shaping India's agriculture, from traditional methods to modern mechanization, biotechnology and digital agriculture. Embracing innovative solutions holds the key to overcoming challenges and unlocking the sector's potential for sustainable growth.

• Policy Interventions :-

Policy interventions have been instrumental in guiding India's agricultural development addressing issues such as land reforms, water management, crop diversification etc.

→ THEORETICAL ANALYSIS

• Hardware & Software Designing :-

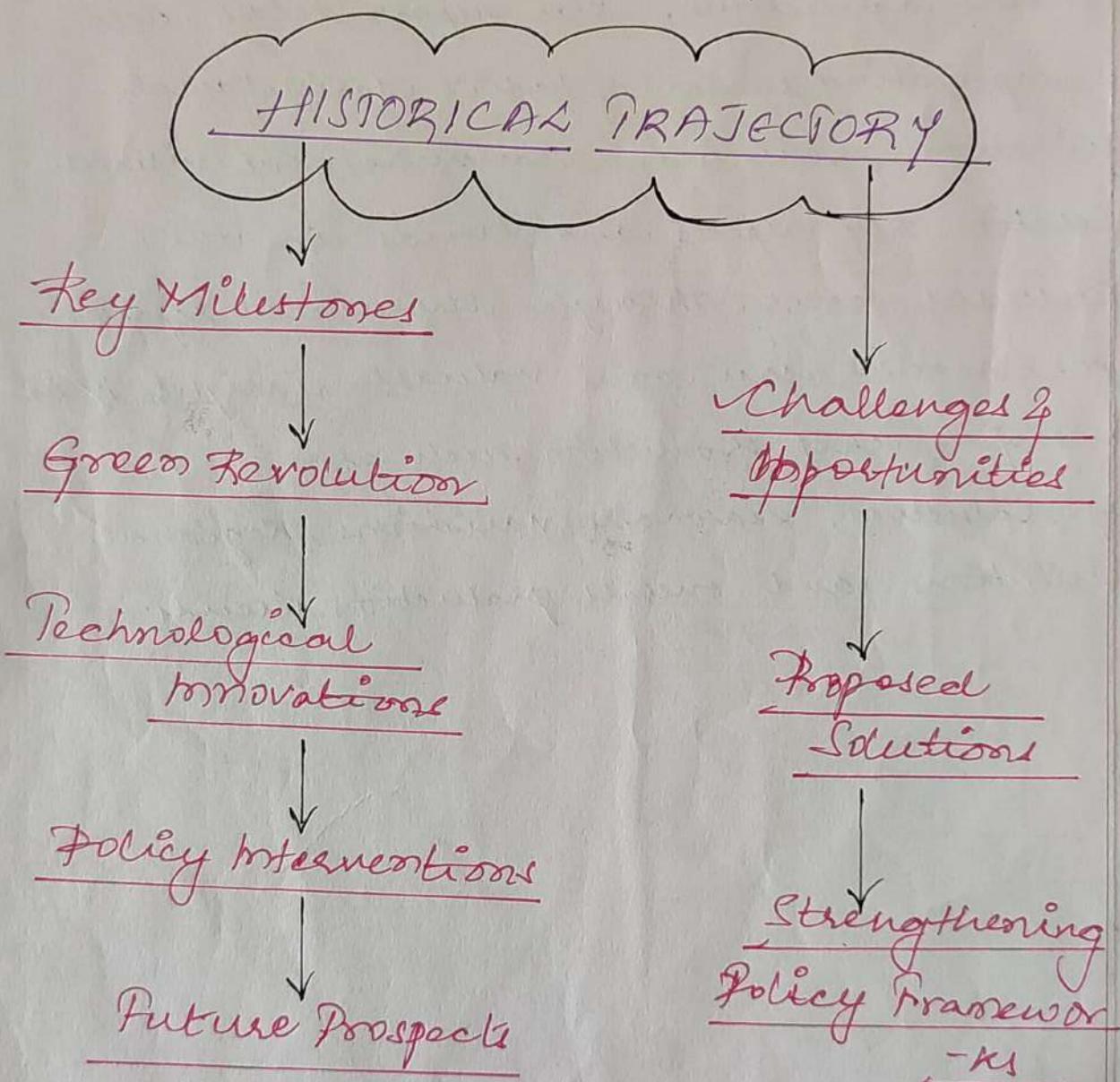
→ Data processing software -

Software designing plays a crucial role in processing and analyzing the collected data. This could include data processing tools for cleaning and formatting raw data, statistical software and for analyzing trends and patterns and machine learning algorithms for predictive modeling.

→ Geographic Information Systems (GIS) :-

Gis software is vital for spatial analysis of agricultural data, allowing researchers to visualize crop

→ BLOCK DIAGRAM



distributions, land use patterns, and environmental factors. These tools enable the integration of diverse datasets and the creation of maps & spatial models for understanding agricultural dynamics.

→ Visualization & Reporting Tools :-

Effective visualizations and reporting tools are essential for communicating insights derived from the analysis. This could involve the use of dashboard platforms, interactive visualizations, and reporting software to present findings in clear & understandable manner to stakeholders.

→ Collaboration & Integration Platforms :-

Software designing should also focus on collaboration and integration platforms to facilitate knowledge sharing and interdisciplinary collaboration. This could involve the use of project management tools, version control systems and collaborating platforms to streamline teamwork and coordination among researchers & stakeholders.

By designing and implementing appropriate hardware and software solutions, researchers can effectively analyze India's agricultural crop production from 1997 to 2021, uncovering valuable insights and informing evidence-based decision-making for sustainable agriculture development.

→ VISUALIZATIONS

• State wise agriculture land.

In this sheet named state wise agricultural land we have analyzed the agricultural land by state wise to the area of the state.

For this analysis visualization we have taken state field in column section and sum (Area) field in the row section (column). By this analysis we can say that the state Uttar Pradesh records as the highest state wise agricultural land compared to the other states in India.

• Area Vs. Production.

In this sheet named Area Vs Production we have analyzed area over the production rate by state wise to the area for this analysis we have taken state field in the column section and we have sorted it in the descending order from highest to lowest, we have again taken sum (Area) field in the row column. Now, for the labeling part we have taken the field sum production onto the label section in the Marks table. This shows us the production rate over the various states in India.

By this analysis we can say that Uttar Pradesh records the highest production rate over the area compared to the other states in India.

• Season Based Cultivation.

This sheet named season wise Based cultivation is a line chart we have analyzed in which we have taken the field crop to the column section of sum (Area) to the row section. We have used the filter to filter

out seasons which we want. we have selected all the seasons in the filter section. By this analysis we can say that Rice & wheat crops are the most cultivated in all the seasons.

• Yield by season

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 & sum(Yield) to the row section. we have used filter by keeping season field into the field filter section & selected all the seasons in it.

• Crop plantation by area

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

• Major crop growth by year of yield

In this sheet named major crop growth by year of yield we have analysed the major crops & their growth by the year of yield. for this analysis we have taken year field 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 named cotton, jute, rice & wheat. By this analysis we can easily get to know about the production rate of the ^{major} crops named like rice & wheat & cotton from the year 1997 to 2021.

Crops

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

Season wise production

This sheet named Season wise production. We have analyzed 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. This calculation field is created in the measures table. Now we will drag that zero calculation field over to the rows section twice.

For the second row(zero) in the rows section. We have chosen the dual axis for the donut chart. We have also applied filter by keeping season, field in the filter section. We have included the necessary fields into the both sum(zero), sum(zero)2, in the marks table. By this we can easily get to know the total production rate in percentage of the season to the 100% production.

DASHBOARDS

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

Dashboard 1 :-

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

Dashboard 2 :-

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

Dashboard 3 :-

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

STORY

The tableau story narrates key insights to answer the data question via series of logically connected visuals.

Story 1 :-

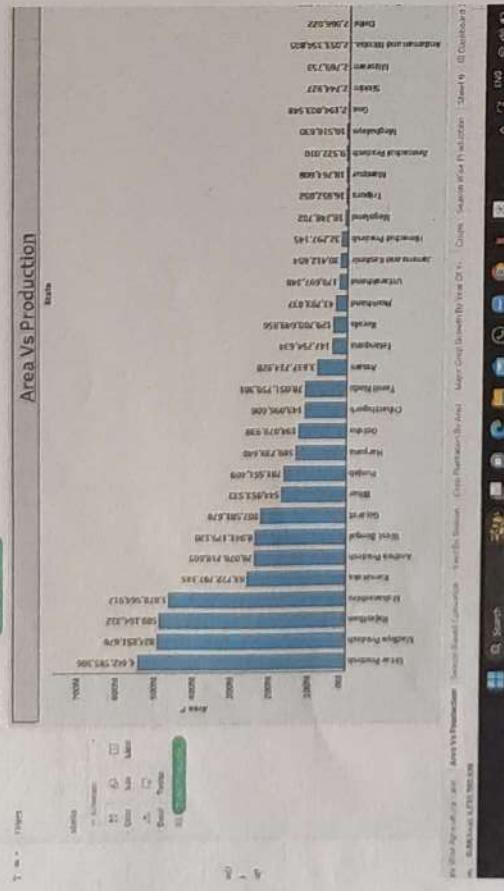
We have created Story 1 by connecting all the visuals of the analysis we have created. This helps in easy Story narration of all the visuals connected in one Story.

Story 2 :-

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

Area Vs Production → VISUALIZATIONS

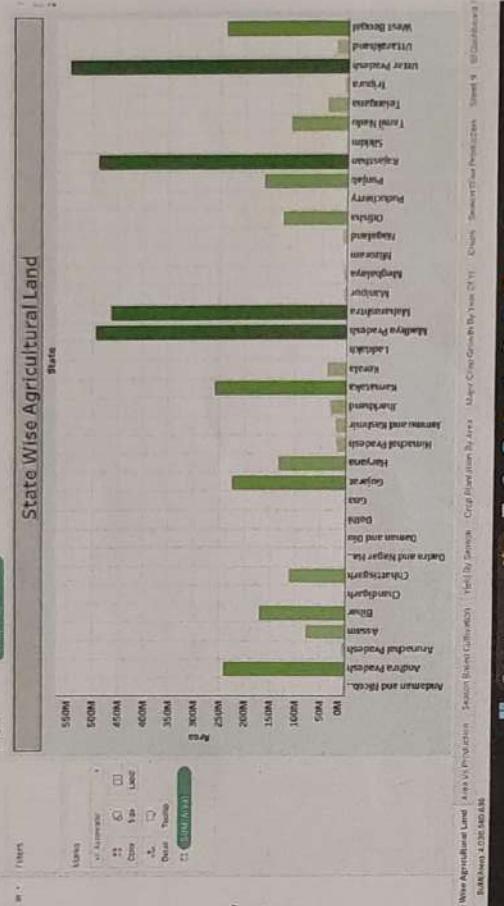
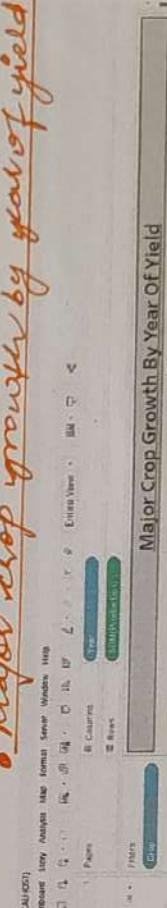
- State will agricultural land



suegros

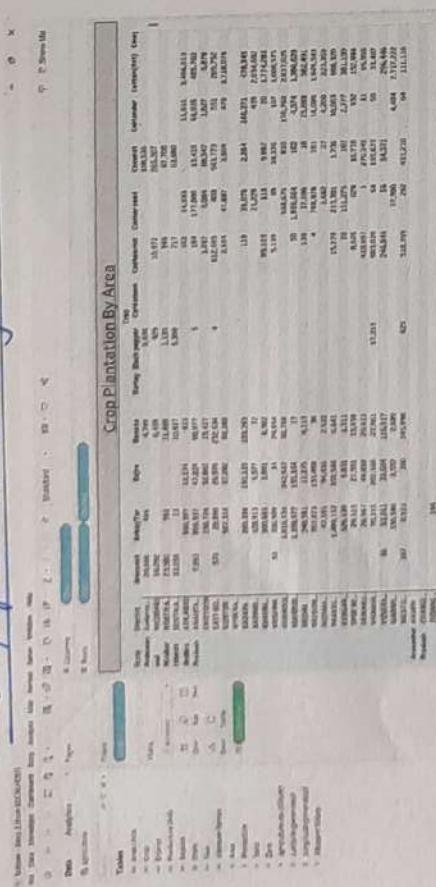


Major crop growers by year of yield.

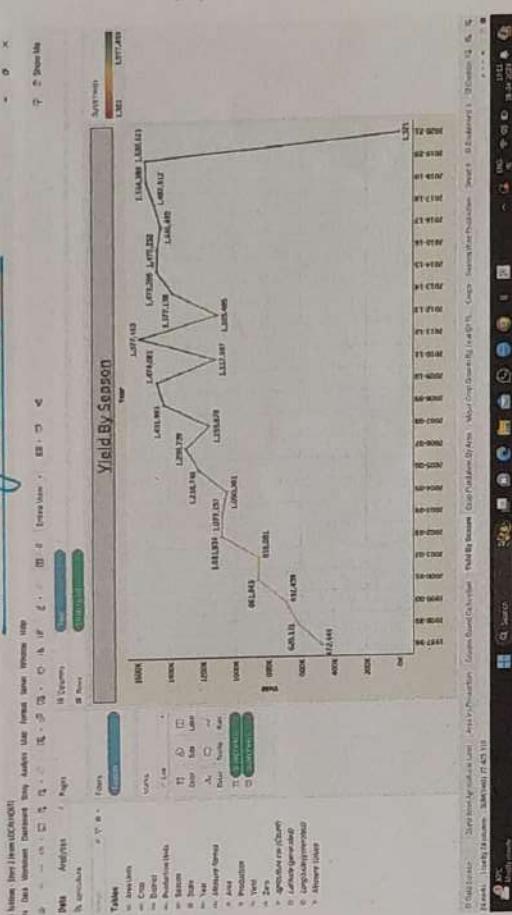


→ VIZUALIZATIONS

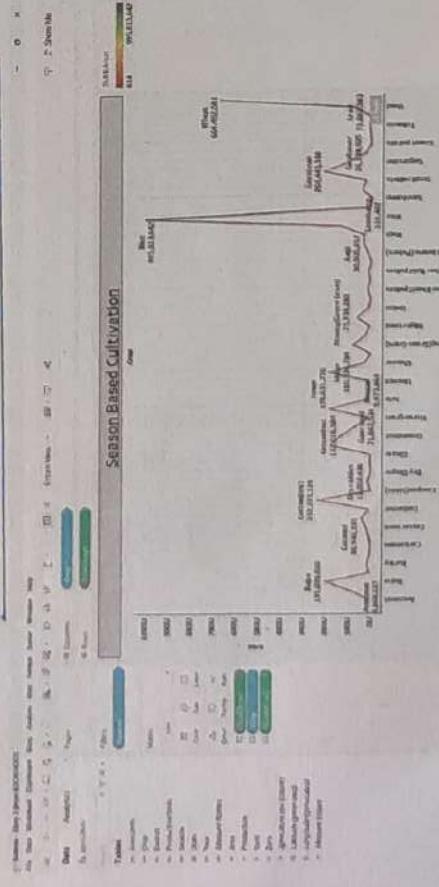
• Crop plantation by area



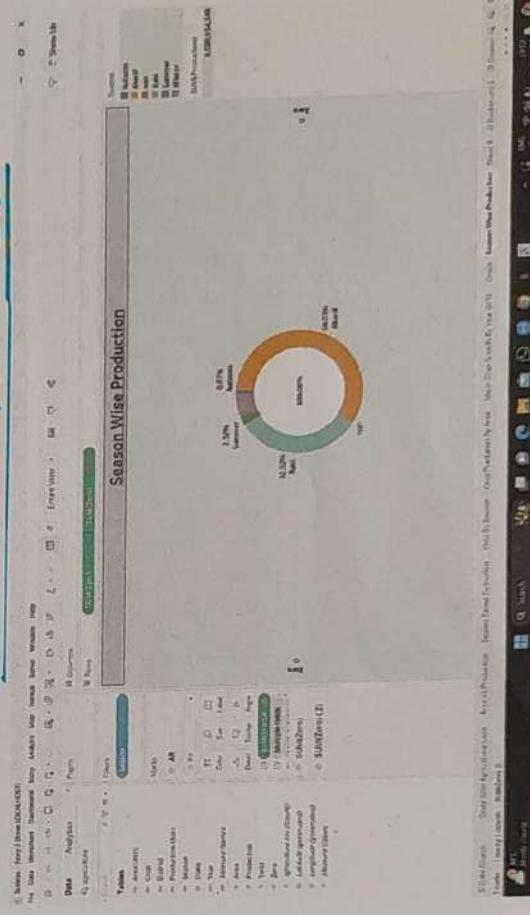
• Yield by season



• Season based Cultivation

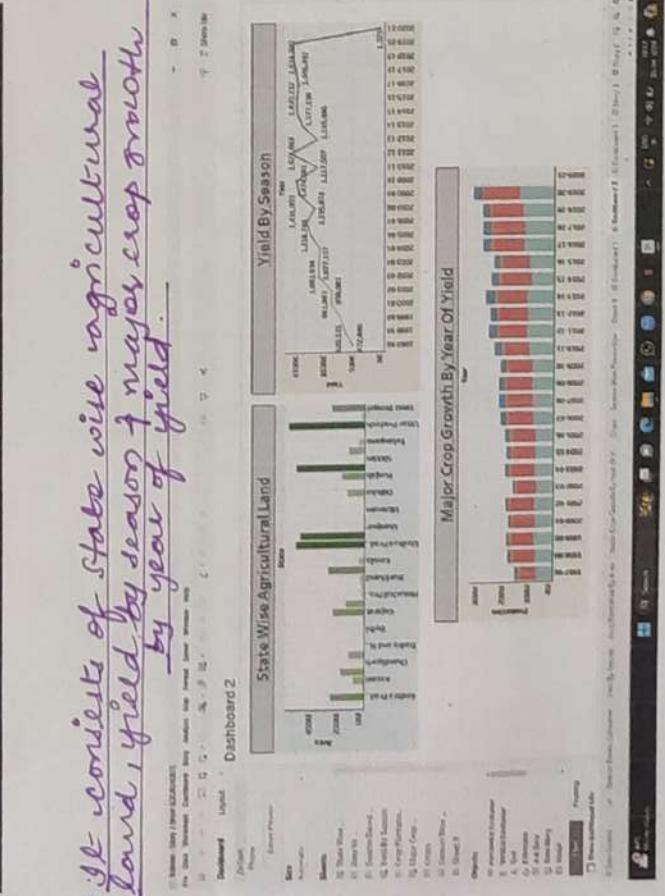
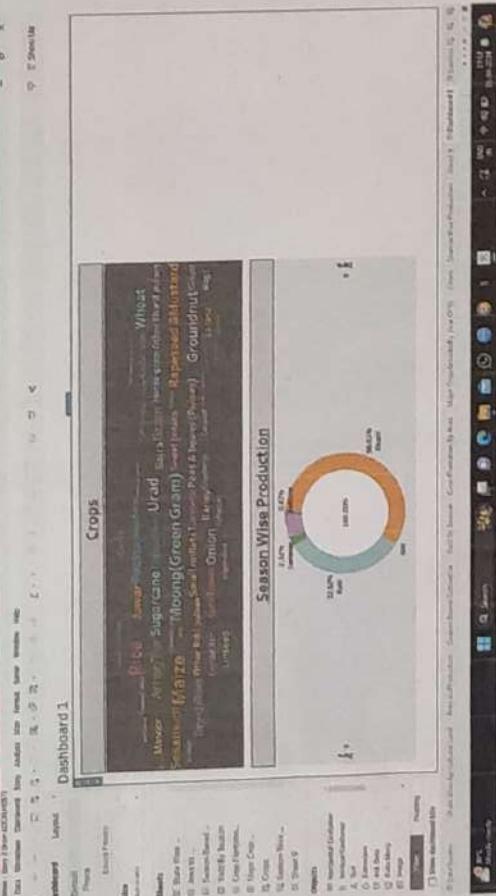


• Season wise Production



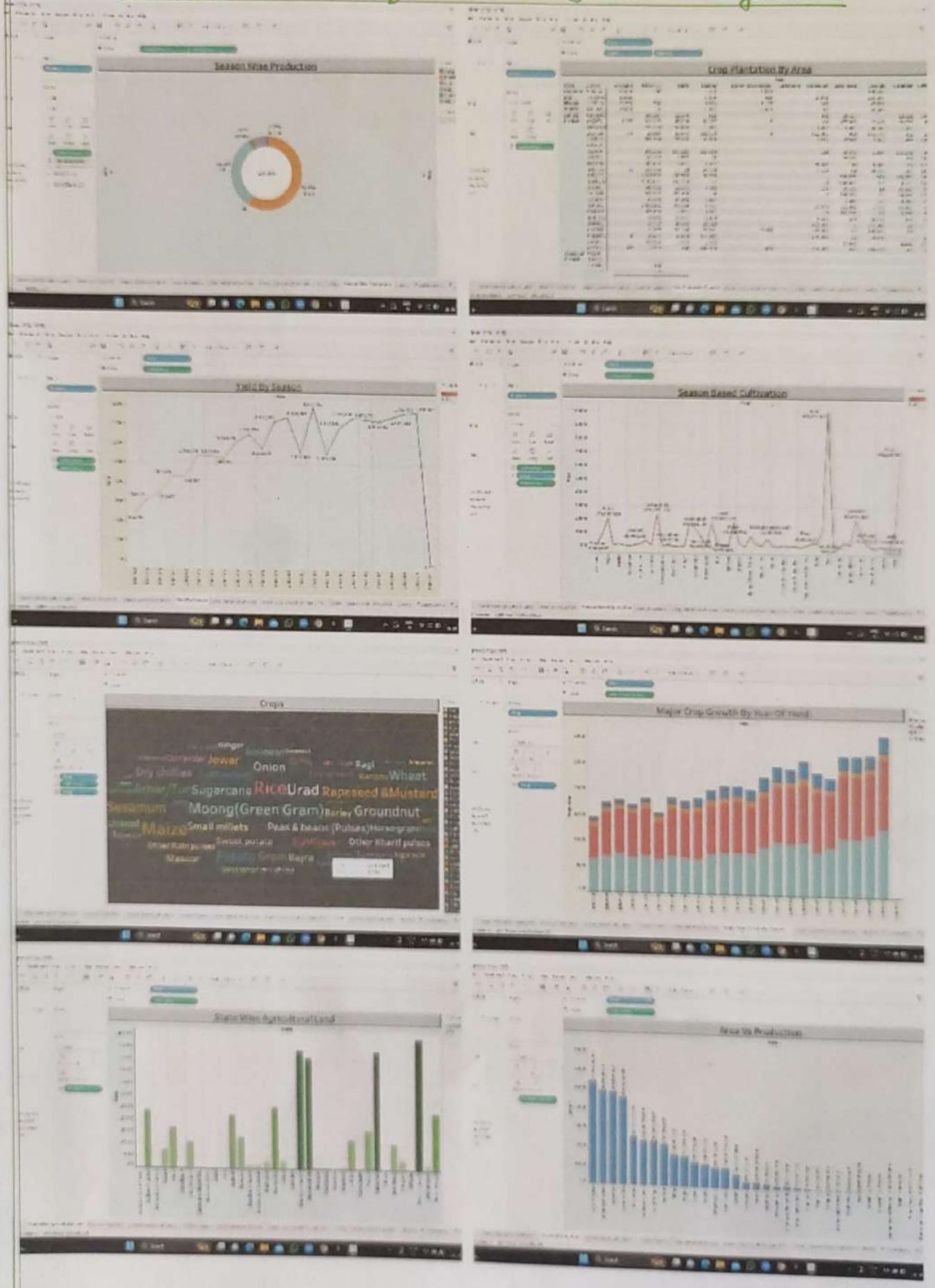
⇒ DASHBOARDS

- It consists of various crop production
- Season wise production of Indian agriculture



→ STORY-1

Story 1 consists of all the eight visualizations.



I have to select some ...
... from the top 10 villages

WEB INTEGRATION

We have published our track and monitor key performance metrics and communicated results and progress because it helps publisher stay informed, make better decisions, and communicate their performance to others.

→ Publishing dashboard and reports to tableau public!

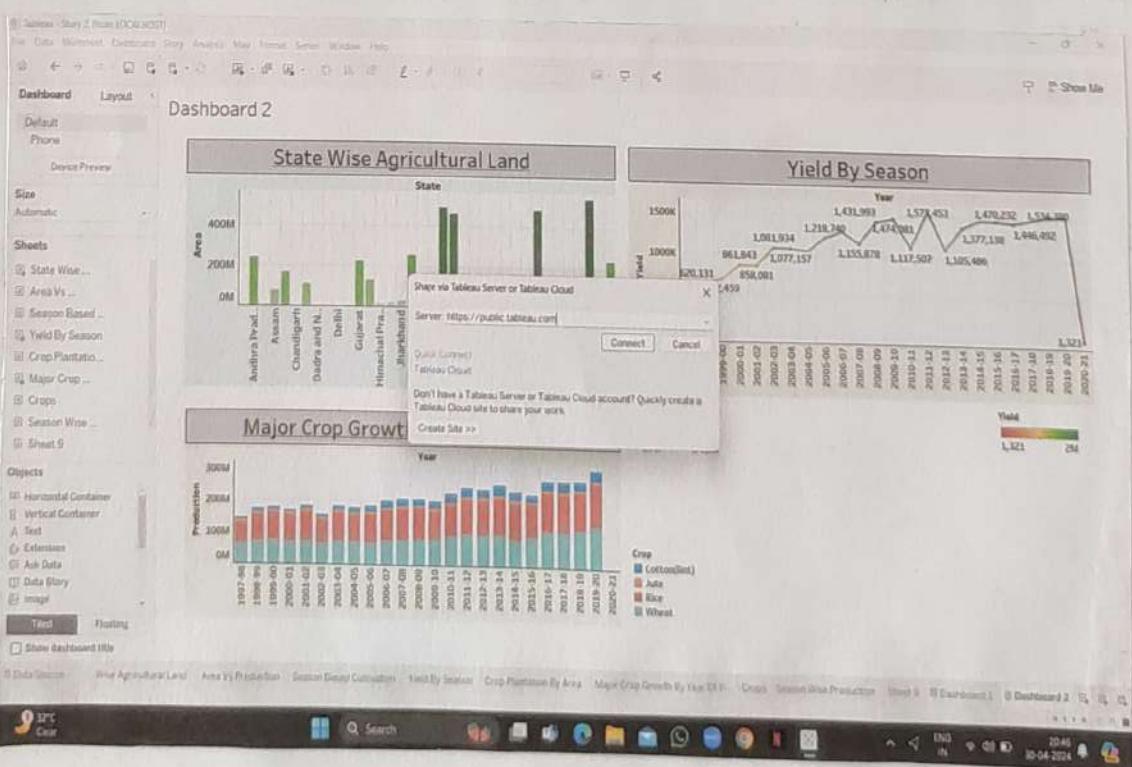
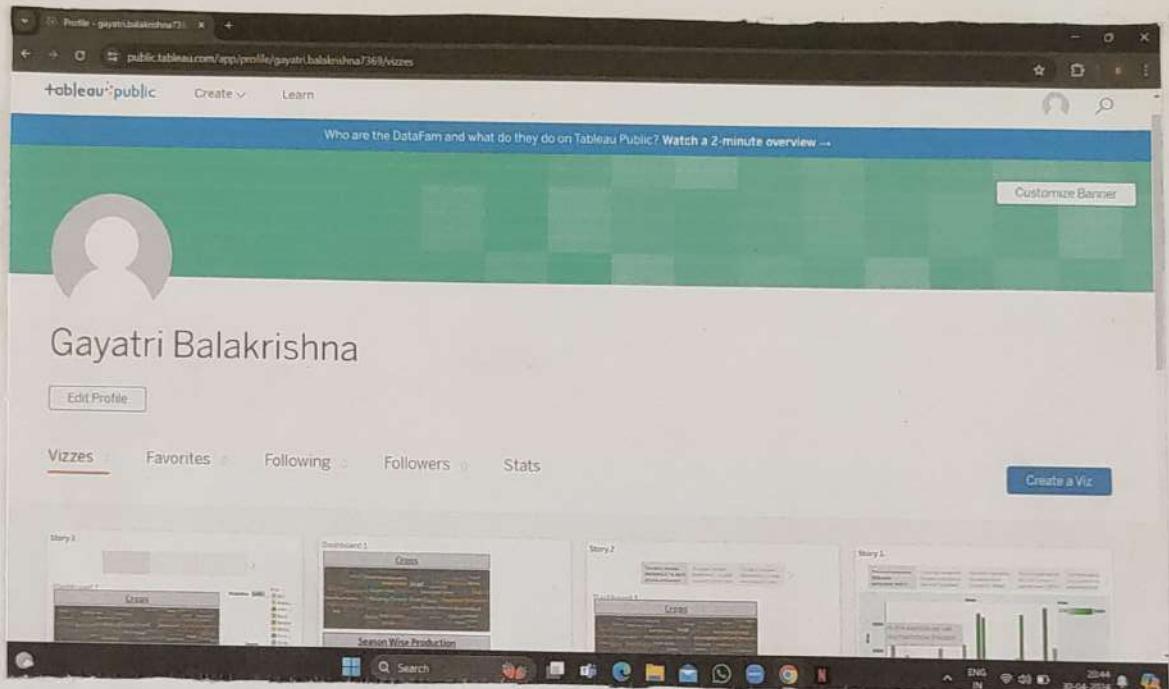
Tableau public is a free platform to explore, create and publicly share data visualizations online.

Tableau public provides a good learning experience for those starting in data analytics. We can get reasonable access to the application, and in addition, Tableau has 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 :

- Firstly, we need to create an account in Tableau public platform.
- After that, our profile will be created in Tableau public.
- Next, we need to connect our dashboards and stories to the application, and for this we need to open our Tableau file which we have created earlier. In that we need to go to data source and change the line to extract.
- After this process it will ask us to save the workbook in a desired location so, we need to save it.
- Now we need to go to our dashboard & story, over there we have to select share icon on the top of the analysis. Then we will get a pop up message.

- over there we need to select connect option.
- After connecting, one dashboards & stories will directly publish into tableau public account.



This activity focuses on advanced Tableau functionalities including annotations, dashboard interactions, web application development with Flask, Bootstrap integration, and embedding Tableau visualizations into web applications. We aimed to gain proficiency in these areas to enhance data visualizations 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 & interactive web application, leveraging its features for routing, templating, and handling user requests.
- ③ We have downloaded a free Bootstrap template which acts 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.

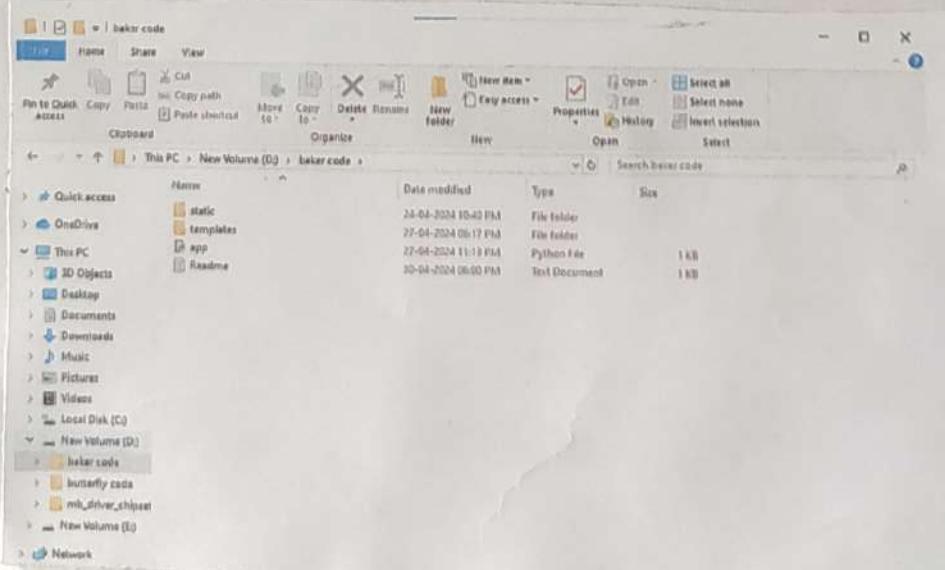
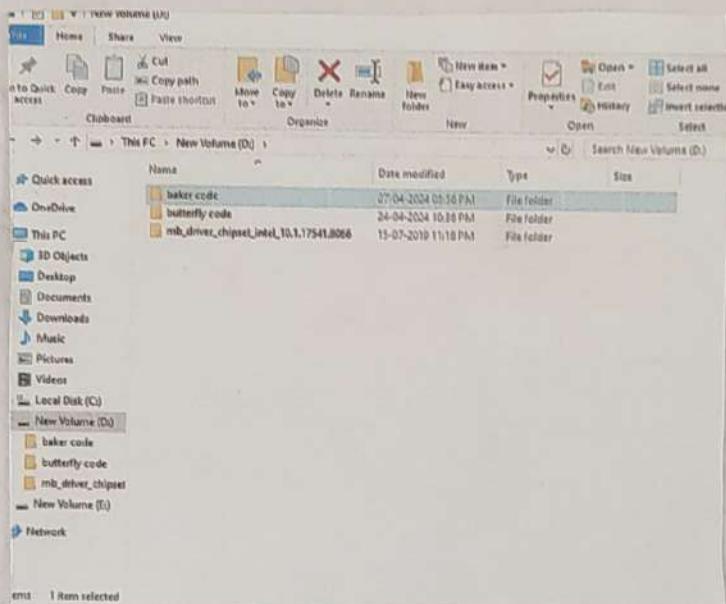
Working with Bootstrap

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

Downloading Bootstrap template (Baker)

The screenshot shows a web browser displaying the BootstrapMade website. The main content is titled "Baker - One Page Bootstrap Template". It features a large image of a modern interior space, a brief description of the template, and two buttons: "Live Demo" and "Free Download". Below this, there's a newsletter sign-up section and a footer with a privacy policy link.

copy all the
folders of Baker
template in
baker code



Creating new
folders inside
Baker code that
are static,
templates, __app,
Readme, etc.

② After that we need to copy all the folder of Baker template (static, templates, README.txt) and upload in the above created new folders in which static will include assets & fonts. 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 / flask .

Building application with flask framework.

① first, we have to download python application of current version and needs 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 (ie, index.html) file for the desired output .

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

⑤ Also 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, buttons and forms to enhance the user experience .

⑥ After editing we have to run the two files app.py & index.html simultaneously and later we

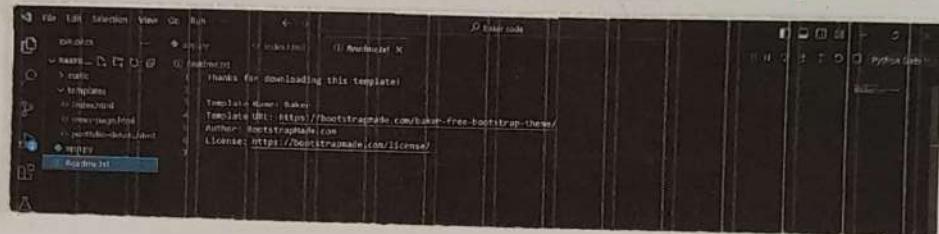
- create assets of yours inside static folder.

	Name	Date modified	Type	Size
Quick access	assets	14-04-2024 10:39 PM	File folder	
OneDrive	fonts	14-04-2024 10:40 PM	File folder	

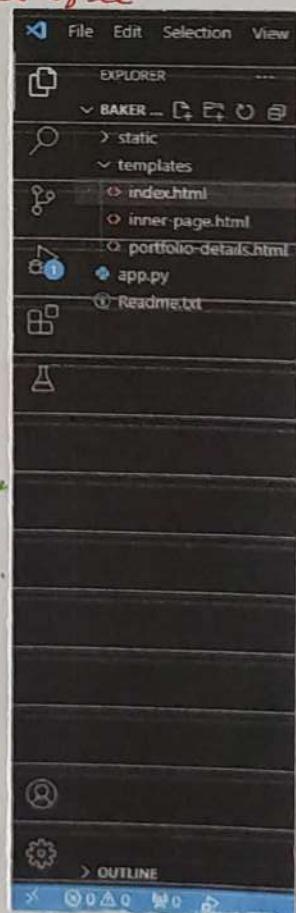
	Name	Date modified	Type	Size
Quick access	index	25-04-2024 01:31 PM	Chrome HTML Doc...	36 KB
OneDrive	inner-page	25-04-2024 12:44 AM	Chrome HTML Doc...	9 KB
This PC	portfolio-details	25-04-2024 12:44 AM	Chrome HTML Doc...	5 KB

• Create index.html, inner-page, portfolio-details inside folder inside templates folder.

- observe Readme.txt file over here.



• Download python of current version and generate all packages of it.

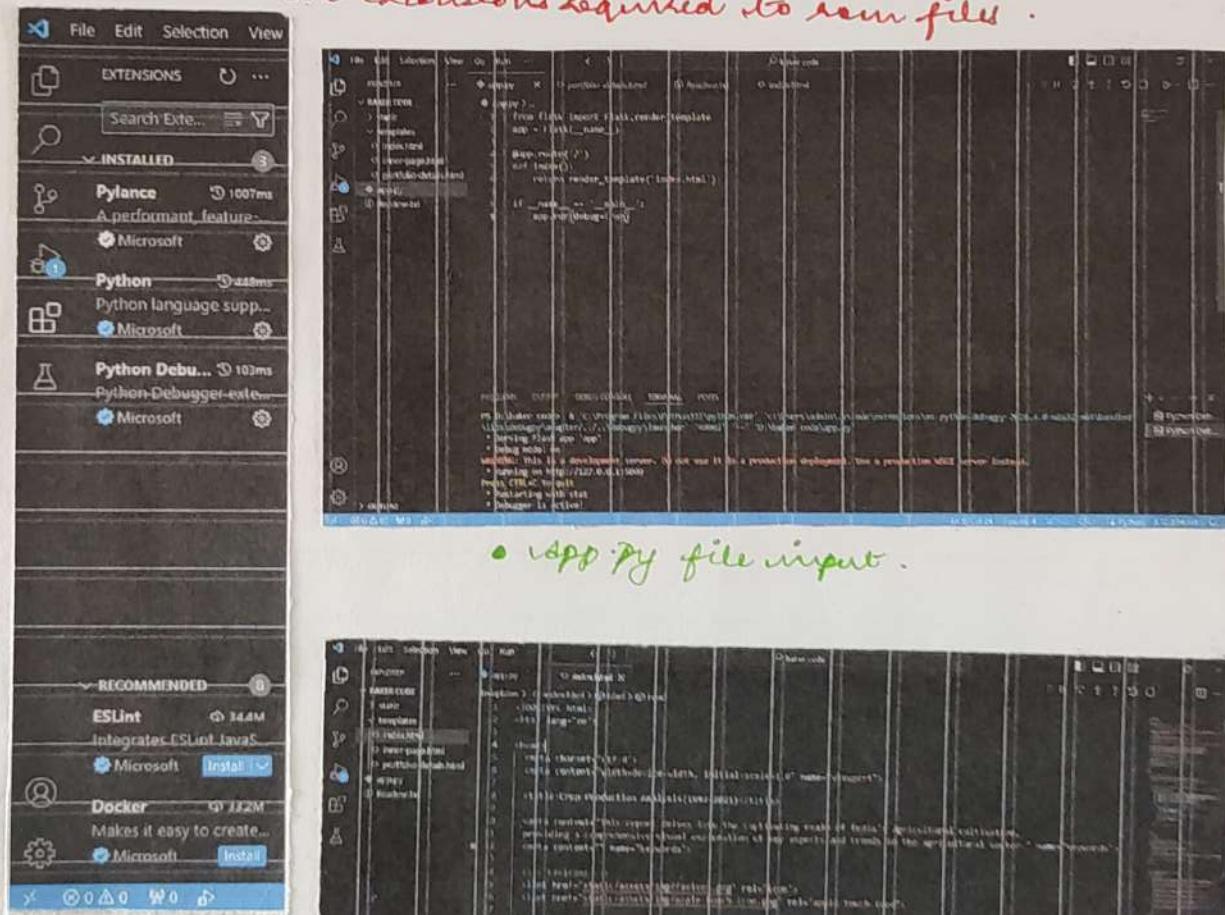


• explore files over VS code and start debugging

we will terminate code word 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 .

from this activity we have acquired data visualizations and web application development skills .

- Install all the extensions required to run files .



• app.py file input .

The screenshot shows the Visual Studio Code editor with the file `app.py` open. The code defines a Flask application with a single route that returns a template named `index.html`. The code also includes imports for `os` and `sys`, and a main function that runs the application on port 5000. A status bar at the bottom indicates the file is 100% up-to-date and shows other project details like `__init__.py` and `requirements.txt`.

```
from flask import Flask, render_template
app = Flask(__name__)

@app.route('/')
def index():
    return render_template('index.html')

if __name__ == '__main__':
    app.run(debug=True)
```

• index.html file input .

- Debug app.py file and follow the link in output terminal.

```
INFO:root:1  
INFO:root:2  
INFO:root:3  
INFO:root:4  
INFO:root:5  
INFO:root:6  
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INFO:root:8  
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INFO:root:100
```



- desired web interface after following the link provided above.

growing processes and mitigation strategies for environmental degradation.

→ ADVANTAGES

• Historical insights :-

Studying crop production over centuries provides valuable insights into the historical evolution of Indian agriculture. It allows researchers to trace the development of agricultural practices, technological innovations, and policy interventions over time, shedding light on the factors that have shaped the sector.

• Policy implications :-

By analyzing historical trends in crop production is essential for assessing the economic performance of the agricultural sector. Policy makers can identify successful strategies and lessons learned from the past mistakes. This historical perspective can inform the design and implementation of future agricultural policies aimed at enhancing productivity, sustainability, and food security.

• Economic Perspective :-

Understanding long term trends in crop production is essential for assessing the economic performance of the agricultural sector. Analysis of production data over centuries enables researchers to evaluate the impact of economic factors, market dynamics and trade policies on agricultural output & farm incomes.

• Environmental Assessment :-

Long term analysis of crop production allows for an assessment of the environmental impacts of agricultural practices. Researchers can study changes in land use, water usage and soil health over time, facilitating the identification of sustainable farming practices and mitigation strategies for environmental degradation.

- Technological innovations :-

Studying crop production across centuries highlights the role of technological innovation in driving agricultural productivity. Researchers can examine the adoption of new farming techniques, machinery & crop varieties over time providing insights into the factors that have contributed to increase yield and efficiency.

- Social impact :-

Crop production analysis offers insights into the societal impacts of agriculture and on rural communities, livelihoods and food security. By understanding historical trends, researchers can assess the resilience of farming communities to social, economic, and environmental challenges and identify strategies for improving rural development outcome.

⇒ DISADVANTAGES.

- Data limitations :-

One of the primary disadvantage is the scarcity & reliability of historical data, especially for ancient and medieval periods. Historical agricultural records may be incomplete, inconsistent or biased, making it challenging to accurately assess long-term trends in crop production.

- Data quality issue :-

Historical agricultural data may suffer from quality issues such as inaccuracies, errors and inconsistencies. These data quality issues can undermine the reliability and validity of analyses affecting the credibility of research findings and policy recommendations.

- Bias and interpretation :-

Historical agricultural records may be biased towards certain regions, crops, or socio-economic groups, leading to skewed representation of agricultural dynamics. Biases in data collection, recording & preservation can influence the analysis and interpretations.

of historical crop production trends.

• Complexity of factors :-

Agricultural production is influenced by a complex interplay of socio-economic, environmental, technological and political factors. Analyzing crop production over centuries requires careful consideration of these multifaceted dynamics, which can be challenging to capture comprehensively.

→ APPLICATIONS

• Policy formulation :-

The analysis provides valuable insights for policy makers in formulating agricultural policies and strategies. Historical trends and patterns in crop production inform evidence-based decisions making to address current challenges and promote sustainable agricultural development.

• Agricultural Developments :-

By understanding historical agricultural dynamics, policymakers and development practitioners can identify opportunities for enhancing agricultural productivity, improving rural livelihoods and promoting inclusive growth in the agricultural sector.

• Environmental Management :-

The analysis helps assess the environmental impacts of agricultural practices over centuries, guiding efforts to mitigate environmental degradation, conserve natural resources & promote sustainable land management.

• Food Security & Nutrition :-

Understanding long-term trends in crop production is essential for ensuring food security and nutrition.

The analysis helps identify vulnerabilities in the food system and design interventions to enhance food availability, access and utilization for vulnerable populations.

• Climate change adaptation:-

Historical analysis of crop production provides insights into the resilience of agricultural systems to climate variability and change. This information is valuable for designing adaptation strategies to mitigate the impacts of climate change on agriculture.

⇒ CONCLUSION.

In conclusion, the analysis of India's agricultural crop production from 1997 to 2021 unveils a rich tapestry of historical, economic and environmental dynamics that have shaped the nation's agricultural landscape over centuries. From ancient agrarian societies to the modern era of technological advancements, India's agriculture has undergone remarkable transformations influenced by a myriad of factors.

⇒ FUTURE SCOPES

The future scope of analyzing India's agricultural crop production from 1997-2021 lies in embracing technological innovations, promoting sustainable practices, adapting to climate change, strengthening policy frameworks, and forecasting future research and innovation. These efforts are essential for ensuring food security, environmental sustainability and economic prosperity in India's agricultural sector in the years to come.