PROFESSIONAL READINESS FOR INNOVATION, EMPLOYABILITY ANDENTREPRENEURSHIP

ESTIMATE THE CROP YIELD USING DATA ANALYTICS

DOMAIN: DATA ANALYTICS

PROJECT REPORT

Submitted by

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1. INTRODUCTION

1.1. PROJECT OVERVIEW:

Agriculture is important for human survival because it serves the basic need. A well-known fact that the majority of population (≥55%) in India is into agriculture. Due to variations in climatic conditions, there exist bottlenecks for increasing the crop production in India. It has become challenging task to achieve desired targets in Agri based crop yield. Various factors are to be considered which have direct impact on the production, productivity of the crops. Crop yield prediction is one of the important factors in agriculture practices. Farmers need information regarding crop yield before sowing seeds in their fields to achieve enhanced crop yield. The use of technology in agriculture has increased in recent year and data analytics is one such trend that has penetrated into the agriculture field.

The main challenge in using big data in agriculture is identification of effectiveness of big data analytics. Efforts are going on to understand how big data analytics can agriculture productivity. Thus our project helps in finding the best crop suitable for specific climate.

1.2. PURPOSE:

At present we are at the immense need of another Green revolution to supply the food demand of growing population. With the decrease of available cultivable land globally and the decreased cultivable water resources, it is almost impossible to report higher crop yield. Agricultural based big data analytics is one approach, believed to have a significant role and positive impact on the increase of crop yield by providing the optimum condition for the plant growth and decreasing the yield gaps and the crop damage and wastage.

Thus in this project we will be analyzing some important visualization, creating a dashboard and by going through these we will get most of the insights of Crop production in India.

2.LITERATURE SURVEY

2.1. EXISTING PROBLEM :

Agriculture is having more trouble as a result of extreme weather events that significantly reduce food yields as a result of climate change. Crop plants are typically delicate.

since they were frequently chosen for high yield rather than for stress tolerance. The soil fertility, water availability, climate, and diseases or pests are the four main variables that affect crop output.Without the aid of technology, it is quite challenging to comprehend or estimate the patterns with such a wide range of factors. Therefore, a technological solution that can adapt to the changes and offer the anticipated solution in a way that end users can easily understand is crucial.

2.2. REFERENCES:

i. Fan, Q., and N. Ansari. "Crop Yield Prediction Using Data Analytics and Hybrid Approach." *IEEE transaction* (2019).

ii. Nagini, S., TV Rajini Kanth, and B. V. Kiranmayee. "Agriculture yield prediction using predictive analytic techniques." *2016 2nd International Conference on Contemporary Computing and Informatics (IC3I)*. IEEE, 2016.

iii. Sharma, Shivi, Geetanjali Rathee, and Hemraj Saini. "Big data analytics for crop prediction mode using optimization technique." *2018 Fifth International Conference on Parallel, Distributed and Grid Computing (PDGC)*. IEEE, 2018.

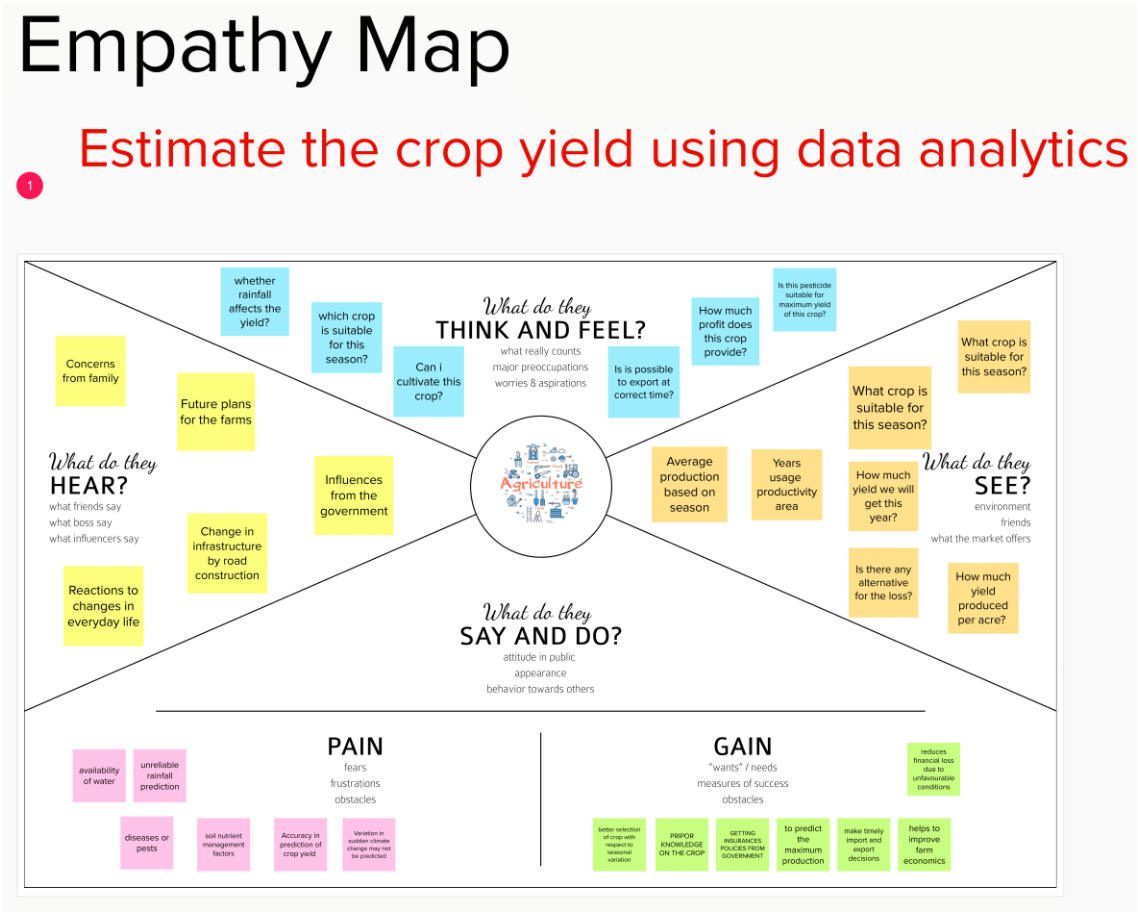
iv. Sagar, B. M., and N. K. Cauvery. "Agriculture data analytics in crop yield estimation: a critical review." *Indonesian Journal of Electrical Engineering and Computer Science* 12.3 (2018): 1087-1093.

2.3. PROBLEM STATEMENT DEFINITION:

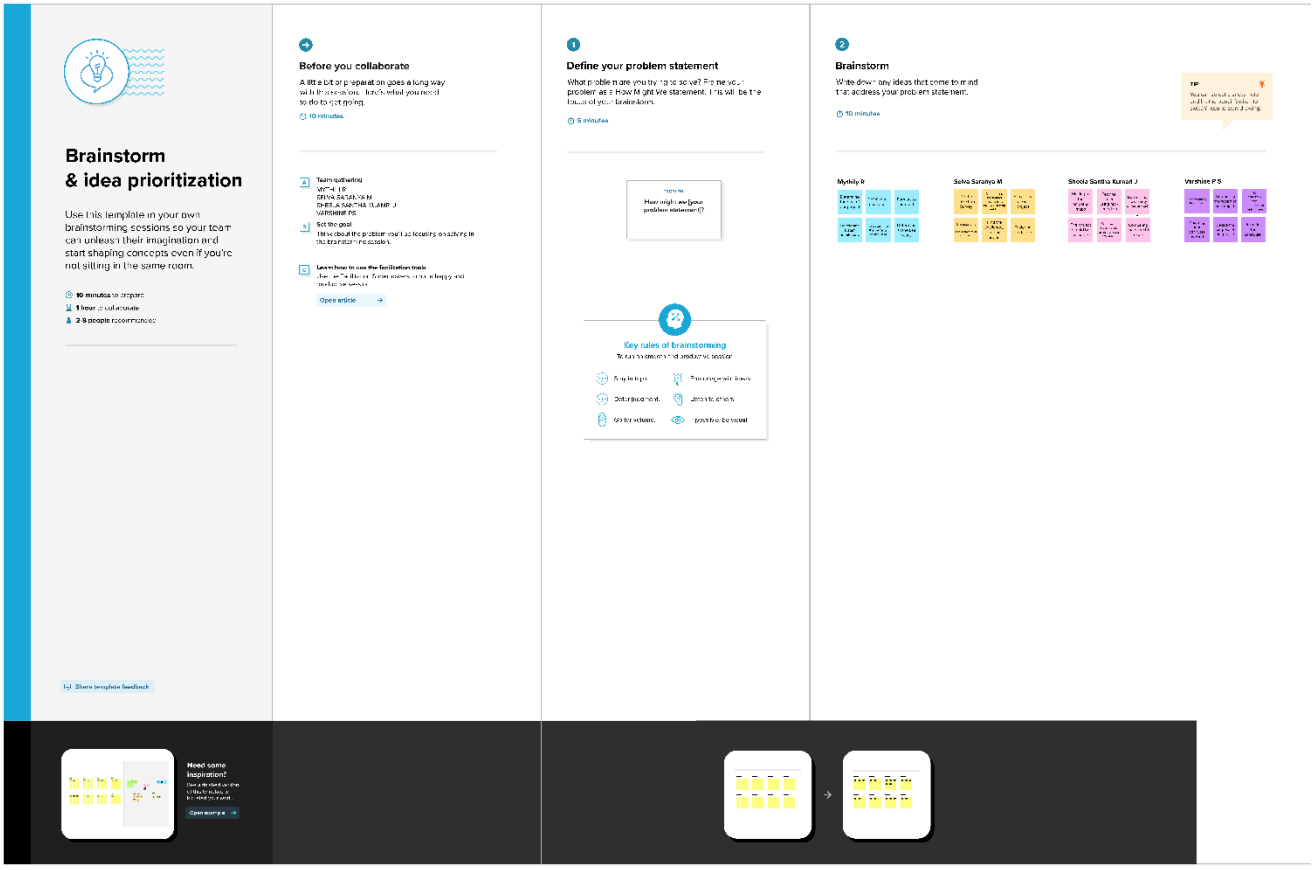
Crop production in India is one of the most important sources of income and India is one of the top countries to produce crops. As per this project we will be analyzing some important visualization, creating a dashboard and by going through these we will get most of the insights of Crop production in India. Our project predicts the crop yield according to the climatic conditions and area of different states in India. It helps the farmers to yield maximum by cultivating right crop at right time.

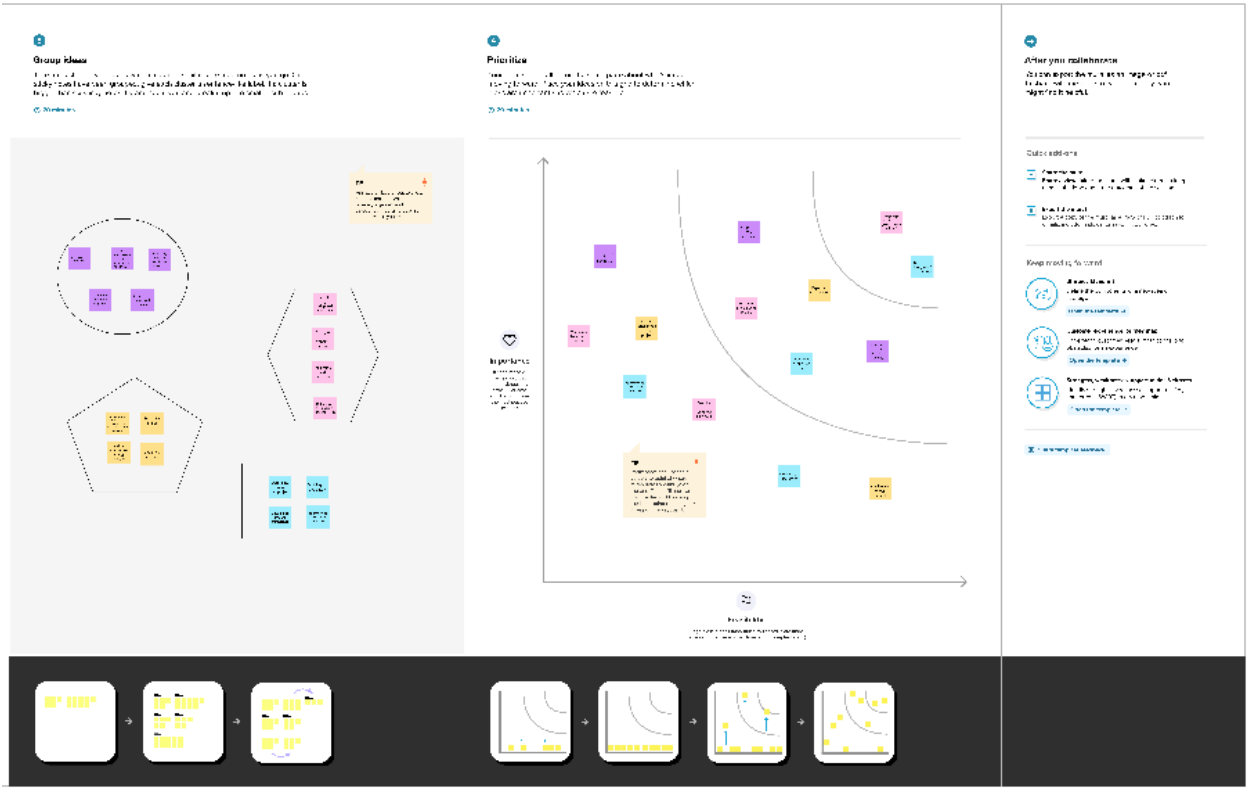
3. IDEATION & PROPOSED SOLUTION

3.1. EMPATHY MAP CANVAS:



3.2. IDEATION & BRAINSTORMING:

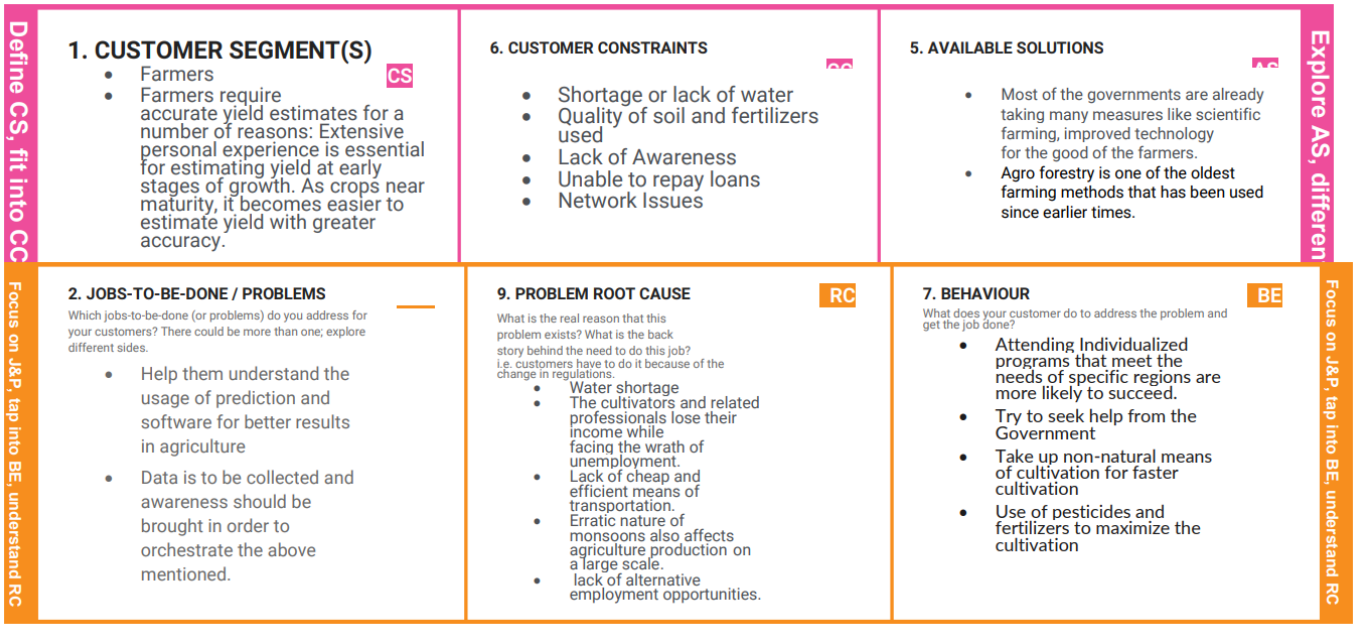


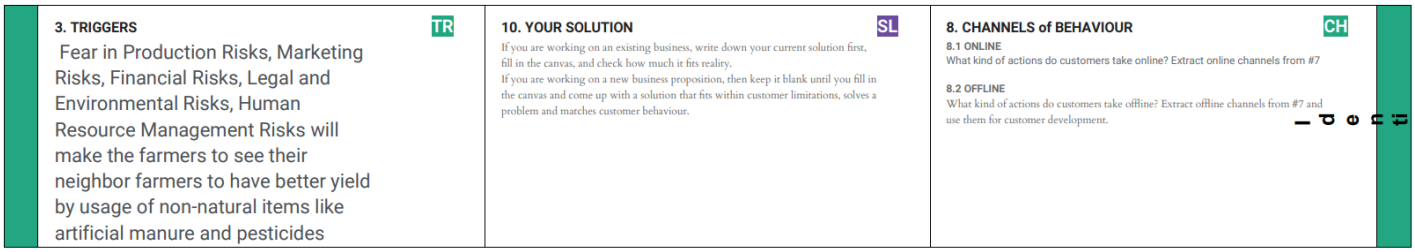


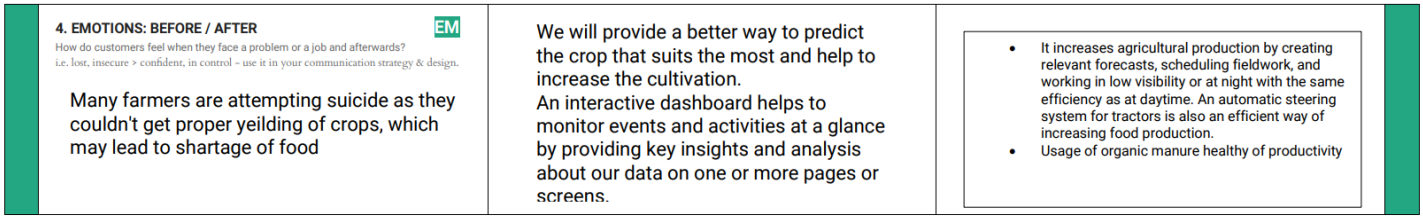
3.3. PROPOSED SOLUTION:

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	With the changing of climate, agriculture faces increasing problems leads to losses of crops, our project is to predict crop-yield which can be extremely useful to farmers in planning for harvest and to get a maximum harvest.
2.	Idea / Solution description	Analysing the previous data we prepare dashboard which provides accurate result which helps the farmers to prevent the crop lost and to increase the productivity.
3.	Novelty / Uniqueness	The report is based on the area, state, climate, soil which will give suggestion to the farmers about the crop to be cultivated to help them to get more vegetation.
4.	Social Impact / Customer Satisfaction	By this visualization information will ultimately lead to better production forecasts and greater crop yield.
5.	Business Model (Revenue Model)	Data's are collected and models can be implemented easily and can be widely used by farmers.
6.	Scalability of the Solution	More accurate result can be obtained for different climate, soil, state and district, as enough details are present in dataset.

3.4 PROBLEM SOLUTION FIT:







4. REQUIREMENT ANALYSIS

4.1 FUNCTIONAL REQUIREMENTS:

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	**User Signup**	Registration through Gmail Registration through IBM
FR-2	**User Confirmation**	Confirmation via Email Confirmation via OTP
FR-3	**Data Collection**	Dataset is a benchmark dataset.
FR-4	**Data Processing**	Data cleaning, removal of noise and obsolete data
FR-5	**Visualization Tool**	Graphical visualization choices

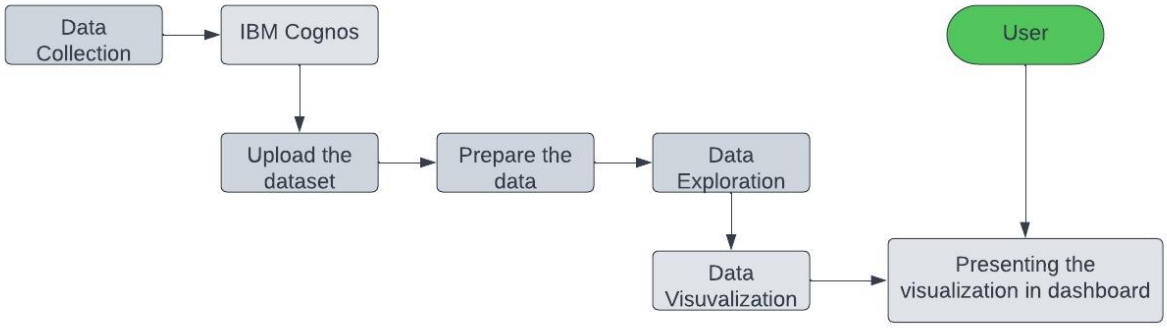
4.2 NON - FUNCTIONAL REQUIREMENTS:

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Ease of usage along with ease in-access of tools and features
NFR-2	**Security**	Access to resources through two factor authentication and credentials
NFR-3	**Reliability**	There should be no crashes or loss of data or processes
NFR-4	**Performance**	High speed rendering of visualization and other readily available features

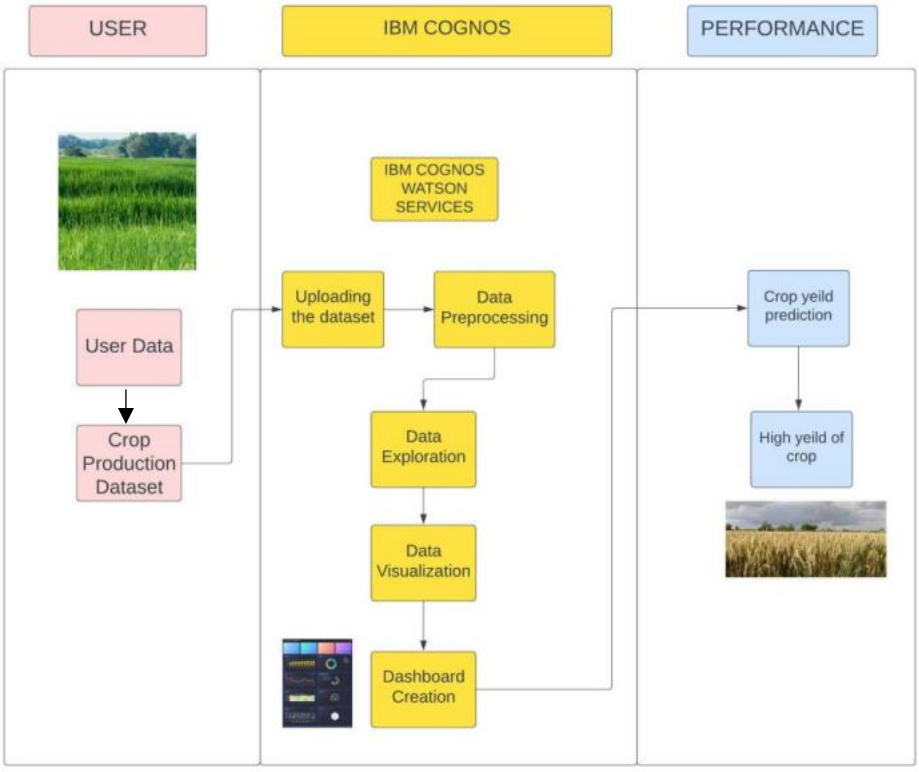
NFR-5	**Availability**	Should be available on demand
NFR-6	**Scalability**	Should be able to incorporate as many visualizations and datasets as possible

5. PROJECT DESIGN

5.1 DATA FLOW DIAGRAMS:



5.2 SOLUTION & TECHNICAL ARCHITECTURE:



5.3 USER STORIES:

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account /dashboard	High	Sprint-1
		USN-2	As a user, I will receive confirmation emailonce I have registered for the application	I can receive confirmationemail & click confirm	High	Sprint-1
		USN-3	As a user, I can register for the application through Facebook	I can register & access thedashboard with Facebook Login	Low	Sprint-2
		USN-4	As a user, I can register for the application through Gmail	I can register and loginwith my email	Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application byentering email & password	I can use my mail id if Iforget my password o reset it.	High	Sprint-1
	Dashboard	USN-6	As a user I can access the dashboard to view the required information	I can edit my profile	High	Sprint 2
Customer (Web user)		USN-7	As a user I can Register/login the applicationand access it	I can access my accountand dashboard	Medium	Sprint 1
Customer Care Executive		USN-8	Provide support system for the application owner and able to communicate with the users	Authentication is provided to access the account so no one can access without permission	High	Sprint 2
Administrator		USN-9	As a user I can take decision to improve the company	I am able to modify thedataset.	High	Sprint 1

6. PROJECT PLANNING & SCHEDULING

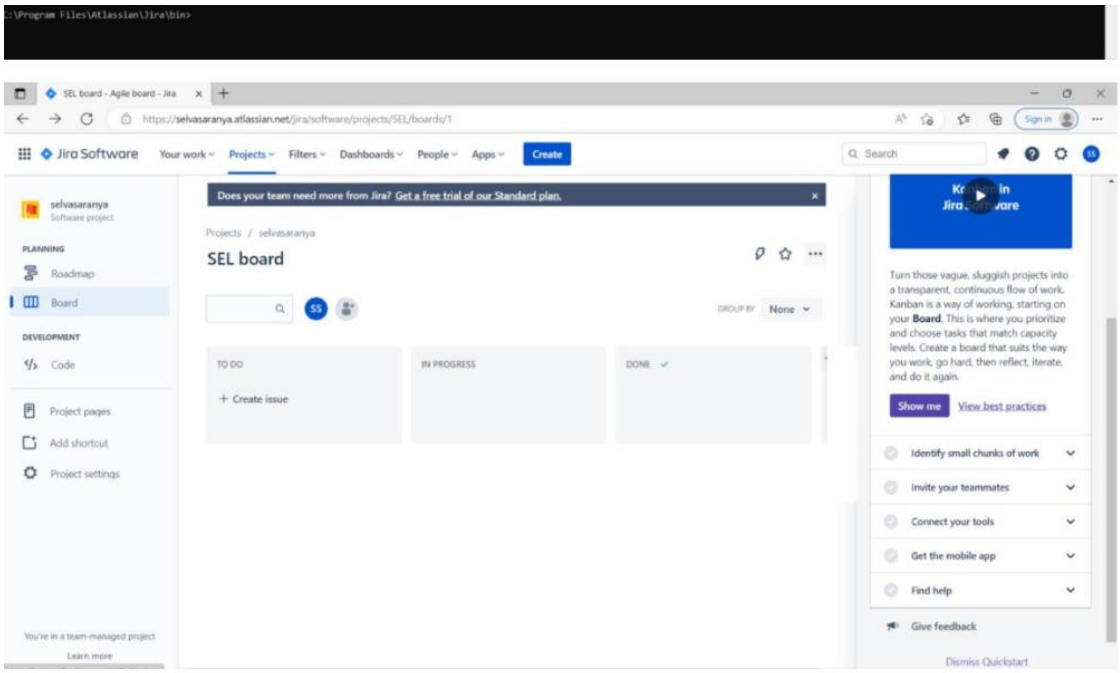
6.1 SPRINT PLANNING & ESTIMATION:

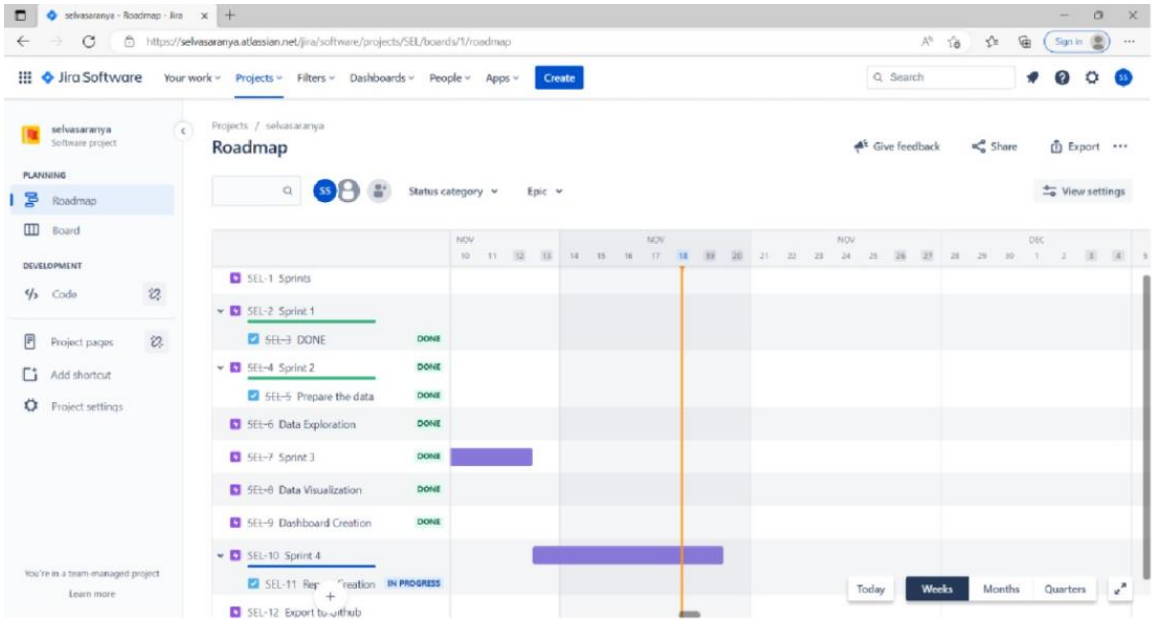
Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	2	High	Selva Saranya Varshine
		USN-2	As a user, I can register through Google.	2	Medium	Mythily Sheela
	Login	USN-3	The user can login through their login credentials.	2	High	Selva Saranya Varshine
	Working with Dataset	USN-4	Understanding the dataset.	2	High	Sheela Mythily
		USN-5	Loading the dataset into IBM Cognos	10	High	Mythily Sheela

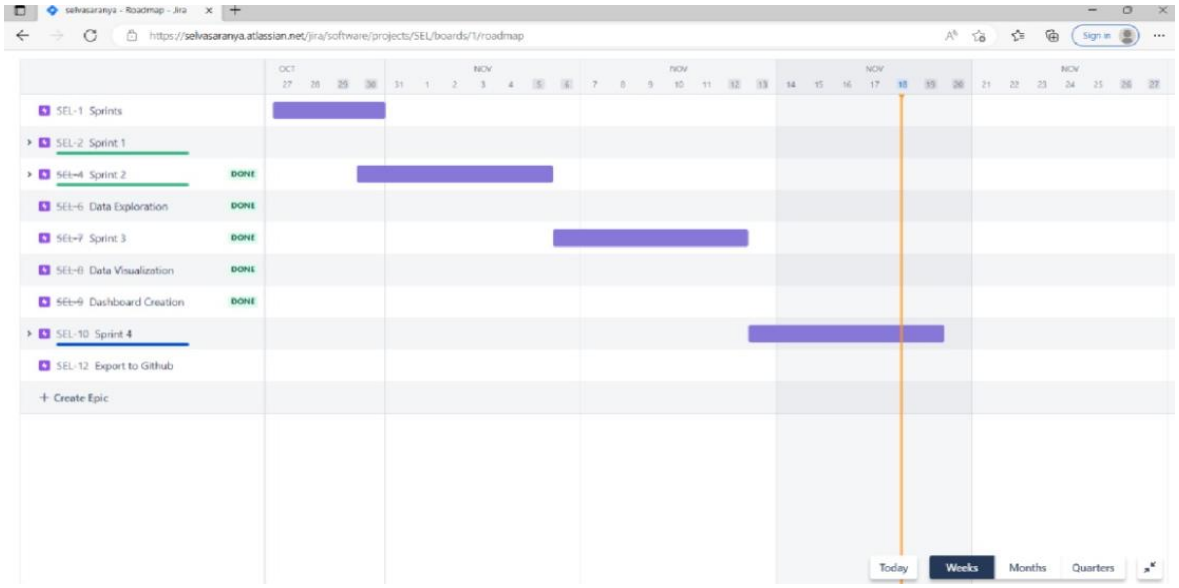
6.2 SPRINT DELIVERY SCHEDULE:

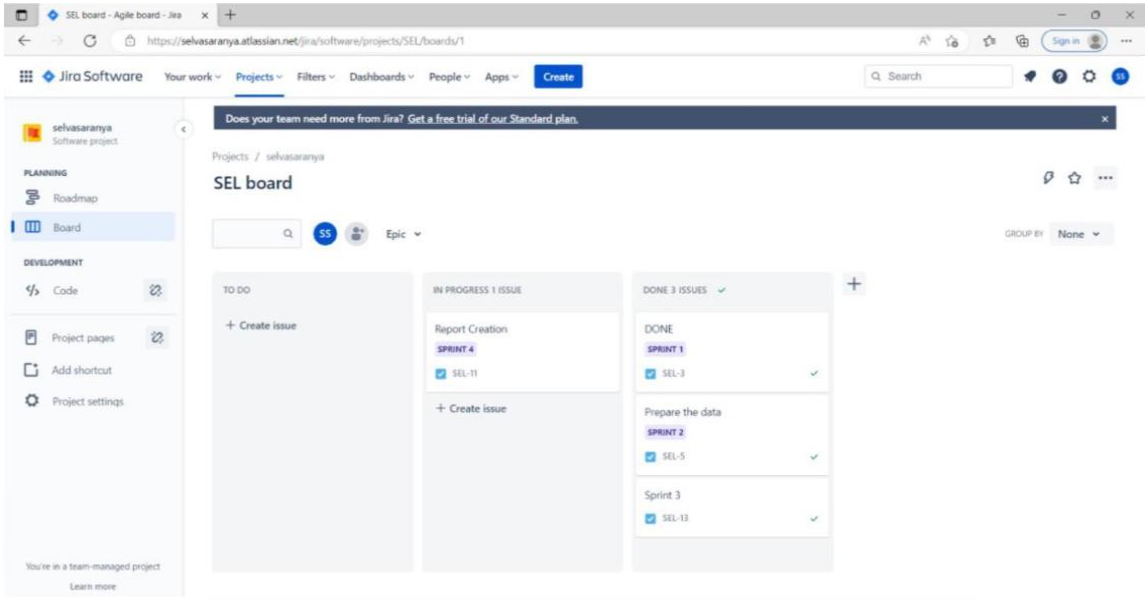
Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

6.3 REPORT FROM JIRA:

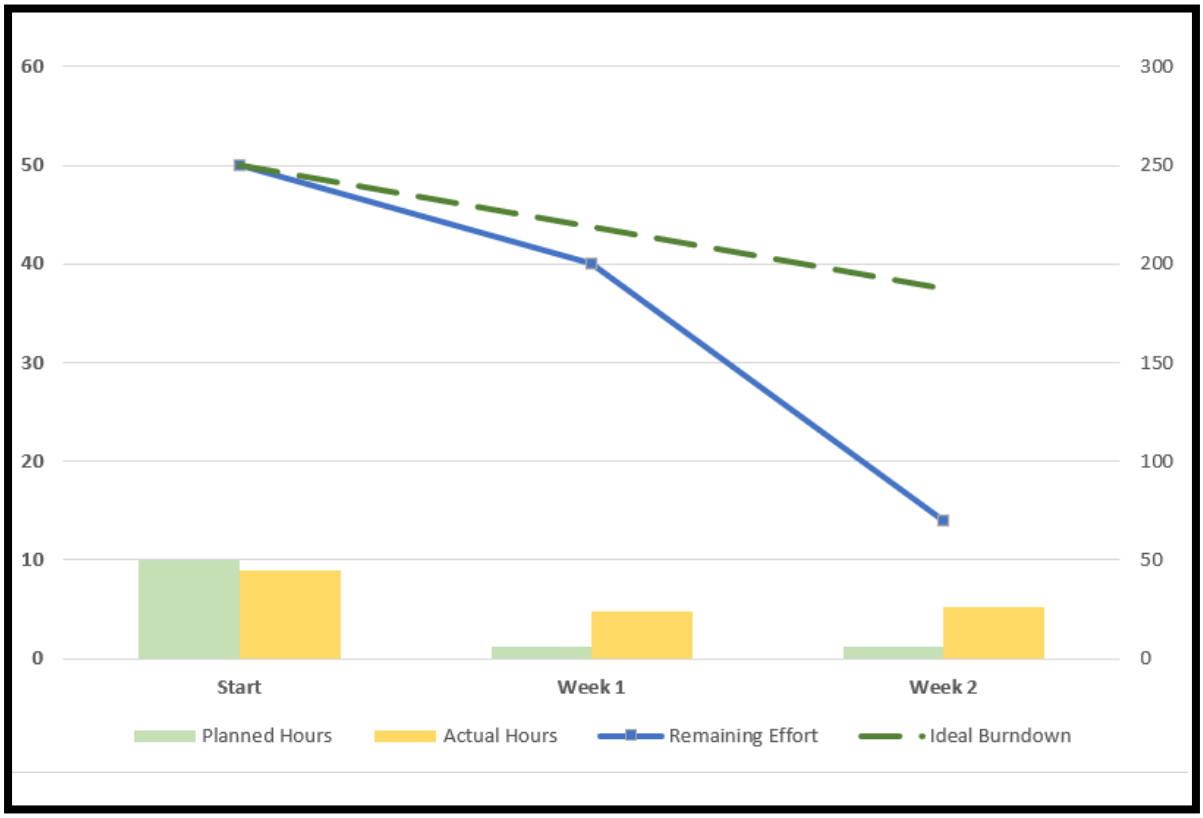





selvasaranya - Roadmap - Jira
https://selvasaranya.atlassian.net/jira/software/projects/SEL/boards/1/roadmap
Sign in
OCT
NOV
SEL-1 Sprints
SEL-2 Sprint 1
SEL-4 Sprint 2
DONE
SEL-6 Data Exploration
DONE
SEL-7 Sprint 3
DONE
SEL-8 Data Visualization
DONE
SEL-9 Dashboard Creation
DONE
SEL-10 Sprint 4
SEL-12 Export to Github
+ Create Epic
Today
Weeks
Months
Quarters


SEL board - Agile board - Jira
https://selvasaranya.atlassian.net/jira/software/projects/SEL/boards/1
Sign in
Jira Software
Your work
Projects
Filters
Dashboards
People
Apps
Create
Search
selvasaranya
Software project
PLANNING
Roadmap
Board
DEVELOPMENT
Code
Project pages
Add shortcut
Project settings
You're in a team-managed project
Learn more
Does your team need more from Jira? Get a free trial of our Standard plan.
Projects / selvasaranya
SEL board
SS
Epic
GROUP BY
None
TO DO
+ Create issue
IN PROGRESS 1 ISSUE
Report Creation
SPRINT 4
SEL-11
+ Create issue
DONE 3 ISSUES
DONE
SPRINT 1
SEL-3
Prepare the data
SPRINT 2
SEL-5
Sprint 3
SEL-13

BURN DOWN CHART:



7. CODING & SOLUTIONING

7.1 CODING:

Login.html

```
<!DOCTYPE html>
<html lang="en-us">
<head>
<meta charset="utf-8">
<link rel="stylesheet" href="style.css">
<style>
body{
margin:0px;
padding:30px;
background:url(crop2.jpg);
background-size:cover;
}
.contact-form{
width:85%;
max-width:600px;
background:#f1f1f1;
position:absolute;
top:50%;
left:50%;
transform:translate(-50%,-50%);
padding:30px 40px;
box-sizing:border-box;
border-radius:8px;
text-align:center;
box-shadow: 0 0 20px #000000b3;
```

```
}
.contact-form h1{
margin-top:0;
font-weight:200;
}
.txtb{
border:1px solid gray;
margin:8px 0;
padding:12px 18px;
border-radius:8px;
}
.txtb label{
display:block;
text-align:left;
color:#333;
text-transform:uppercase;
font-size:14px;
}
.txtb input,.txtb textarea{
width:100%;
border:none;
background:none;
outline:none;
font-size:18px;
margin-top:6px;
}
.btn{
display:inline-block;
background:#9b59b6;
```

```
padding:14px 0px;
color:white;
text-transform:uppercase;
cursor:pointer;
margin-top:8px;
width:100%;
}

</style>
</head>
<body>
<form>
<div class="contact-form">
<h1> LOGIN FORM </h1>
<div class="txtb">
<label>User Name:</label>
<input type="text" name="name" placeholder="Enter Your Name">
</div>
<div class="txtb">
<label>Email:</label>
<input type="text" name="email" placeholder="Enter Your Email">
</div>
<div class="txtb">
<label>Password:</label>
<input type="password" name="password" placeholder="Enter Your password">
</div>
<div class="txtb">
<label>Phone Number:</label>
<input type="text" name="phoneno." placeholder="Enter Your Number">
```

```
</div>

        <input type="checkbox" checked="checked"> Remember me
        <button type="button" class="cancelbtn"> Cancel</button>
        <a href="#"> Forgot password? </a><br>
                                                                    <a href="dashboard.html">
Login </a> <br>


</form>
</body>
</html>
```

Dashboard.html

```
<!DOCTYPE html>
<html lang="en">
<head>
<title>Estimate The Crop Yield Using Data Analytics</title><br>
<br><br> <br><br><br><br>
<p> Crop yield is a standard measurement of the amount of agricultural production harvested—yield of a crop—per unit of land area. Crop yield is the measure most often used for cereal, grain, or legumes; and typically is measured in bushels, tons, or pounds per acre in the U.S.Crop yields refer to how much grain or other crops are produced, and by extension how efficient land is used to produce food or agricultural commodities.The U.S. Department of Agriculture takes samples and estimates crop yields for nearly two-dozen crops in the United States.Crop yields and farm efficiency have increased dramatically over the past decades as technology has advanced in farm automation, crop genetics, fertilizers, and pesticides.The U.S. government also monitors crop yields of foreign countries to help track their economic health. Several governments also publish their crop yield reports to the public.</p>
<br><br>
<meta charset="utf-8">
<meta name="viewport" content="width=device-width, initial-scale=1">
<link href="https://cdn.jsdelivr.net/npm/bootstrap@5.2.2/dist/css/bootstrap.min.css" rel="stylesheet">
<script src="https://cdn.jsdelivr.net/npm/bootstrap@5.2.2/dist/js/bootstrap.bundle.min.js"></script>
```

```
<link rel="stylesheet" type="text/css"  href="style.css">

<link href="https://fonts.googleapis.com/css2?family=Merienda:wght@700&display=swap" rel="stylesheet">

<link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/font-awesome/4.7.0/css/font-awesome.min.css">


<style>

body{

background-image:url("crop6.jpg");

background-align:center;

background-size: cover;

}

a:link, a:visited {

background-color: #004d26;

color: white;

padding: 15px 25px;

text-align: center;

text-decoration: none;

display: inline-block;

border: white;

border-width:4px;

border-style:dashed;

}

a:hover, a:active {

background-color: DarkBlue;

font-size: 140%;

}

h2{

font-size:35px;

color: white;
```

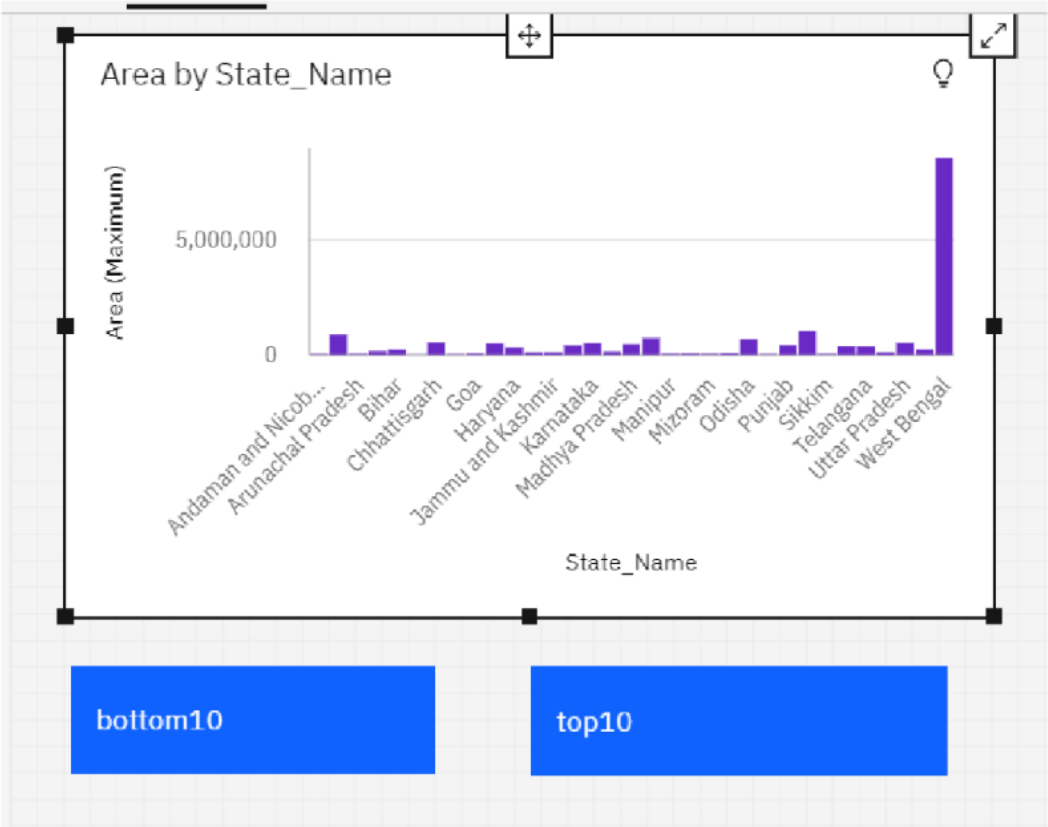
```
position: absolute;
top:20px;
right: 300px;
}
h4{
font-size:30px;
color: white;
}
p{
font-size:25px;
color: white;
}

</style>
</head> <br>


<div class="container-md">
<div class='p-5'>
<div class="p-5">
<br>
<h2>ESTIMATE THE CROP YIELD USING DATA ANALYTICS</h2><br><br>
<center>
<a href="https://us1.ca.analytics.ibm.com/bi/?perspective=dashboard&pathRef=.my_folders%2Fproject&action=view&mode=dashboard&subView=model0000018490382c24_00000000" target="_self">View Dashboard</a><br><br>

<a href="https://drive.google.com/file/d/131pRvDpiii9Kp6aOd3oby7dxW7dSOFnn/view?usp=sharing" target="_self">Data visualization</a>
```

</body>

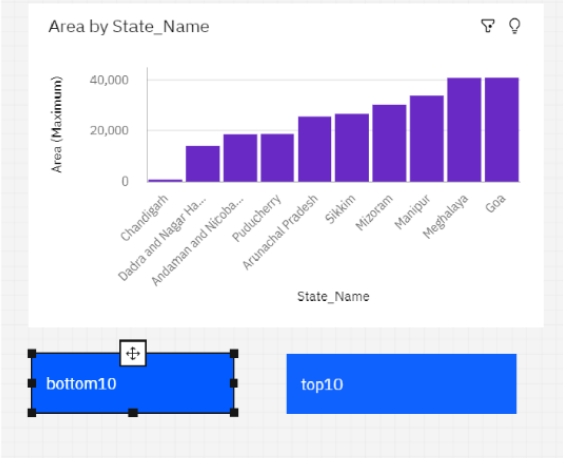
</html>

7.2 DASHBOARD CREATION:

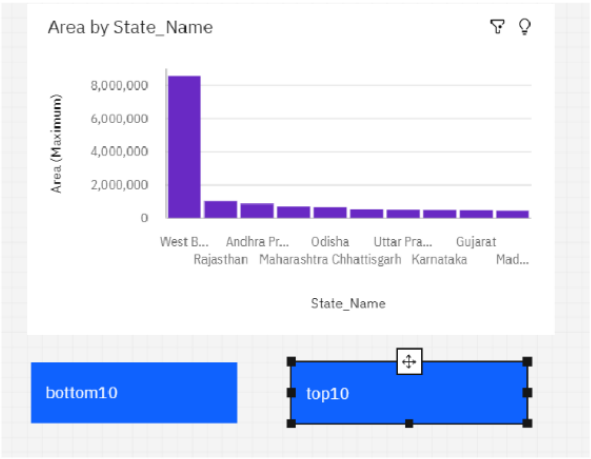
Action Buttons:

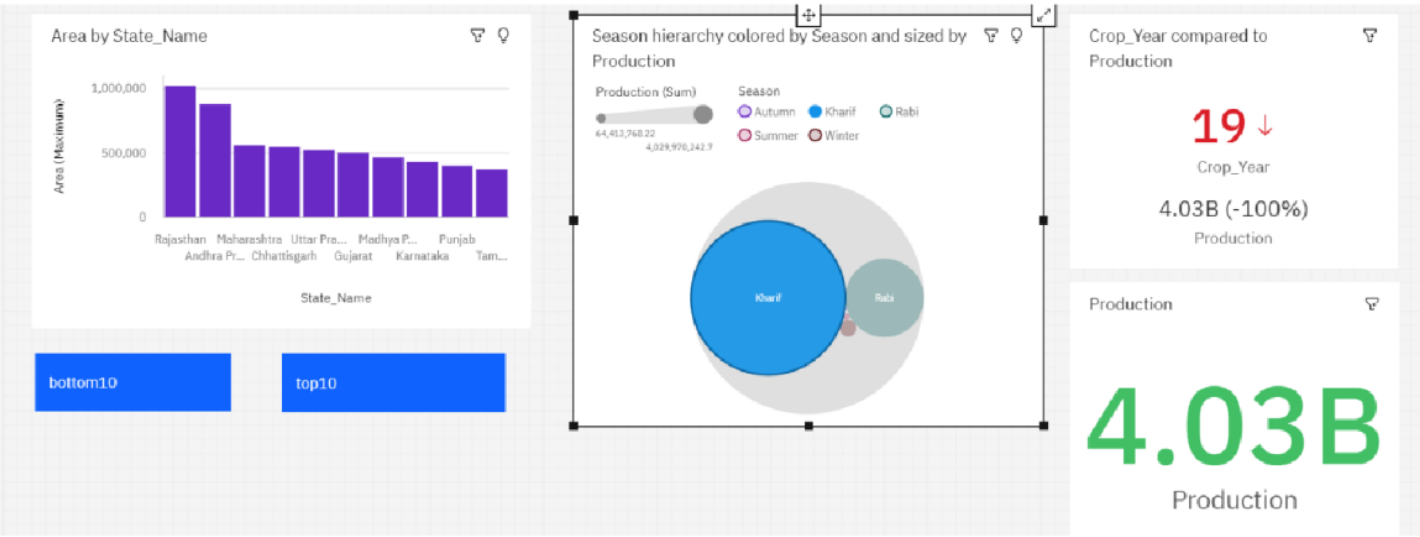


After pressing bottom 10:

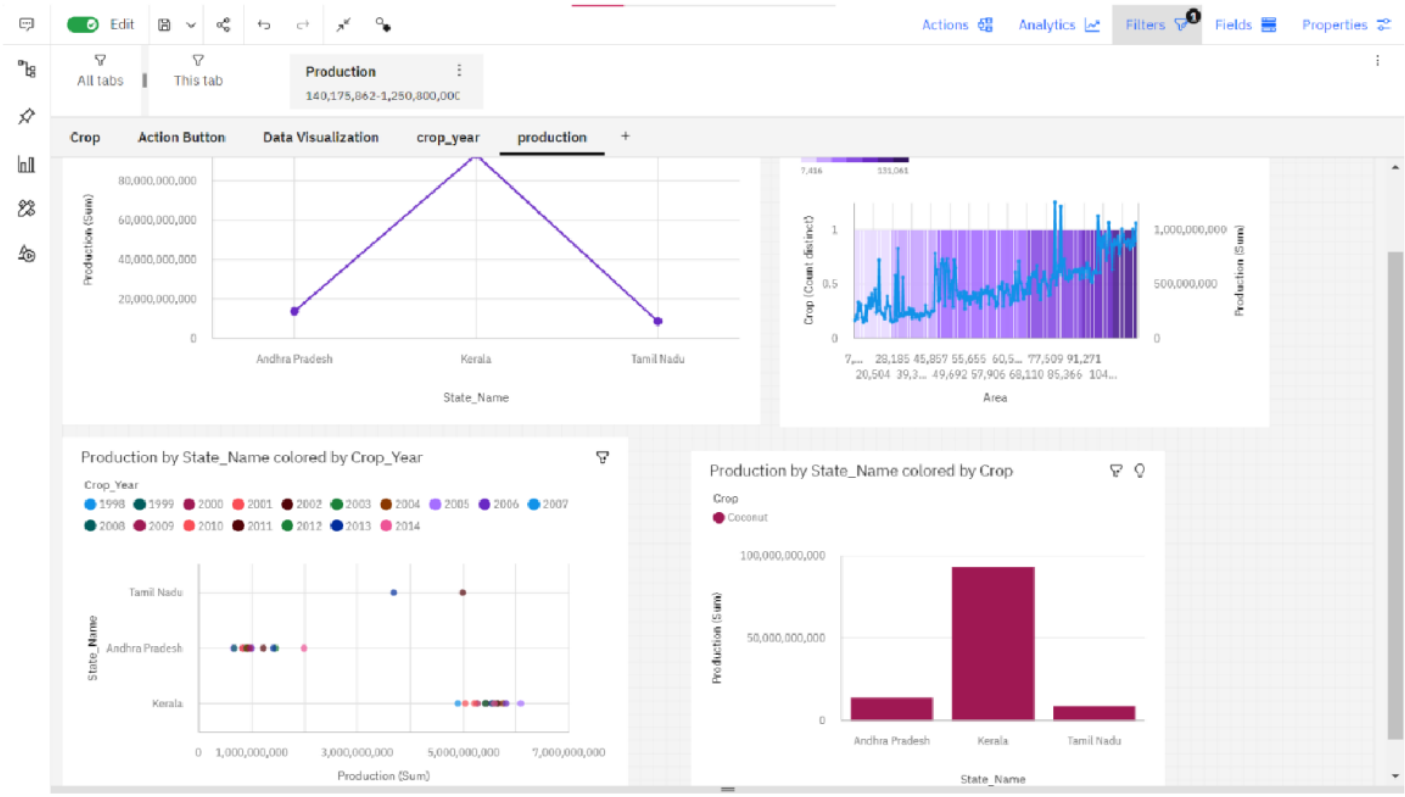


After pressing top 10:



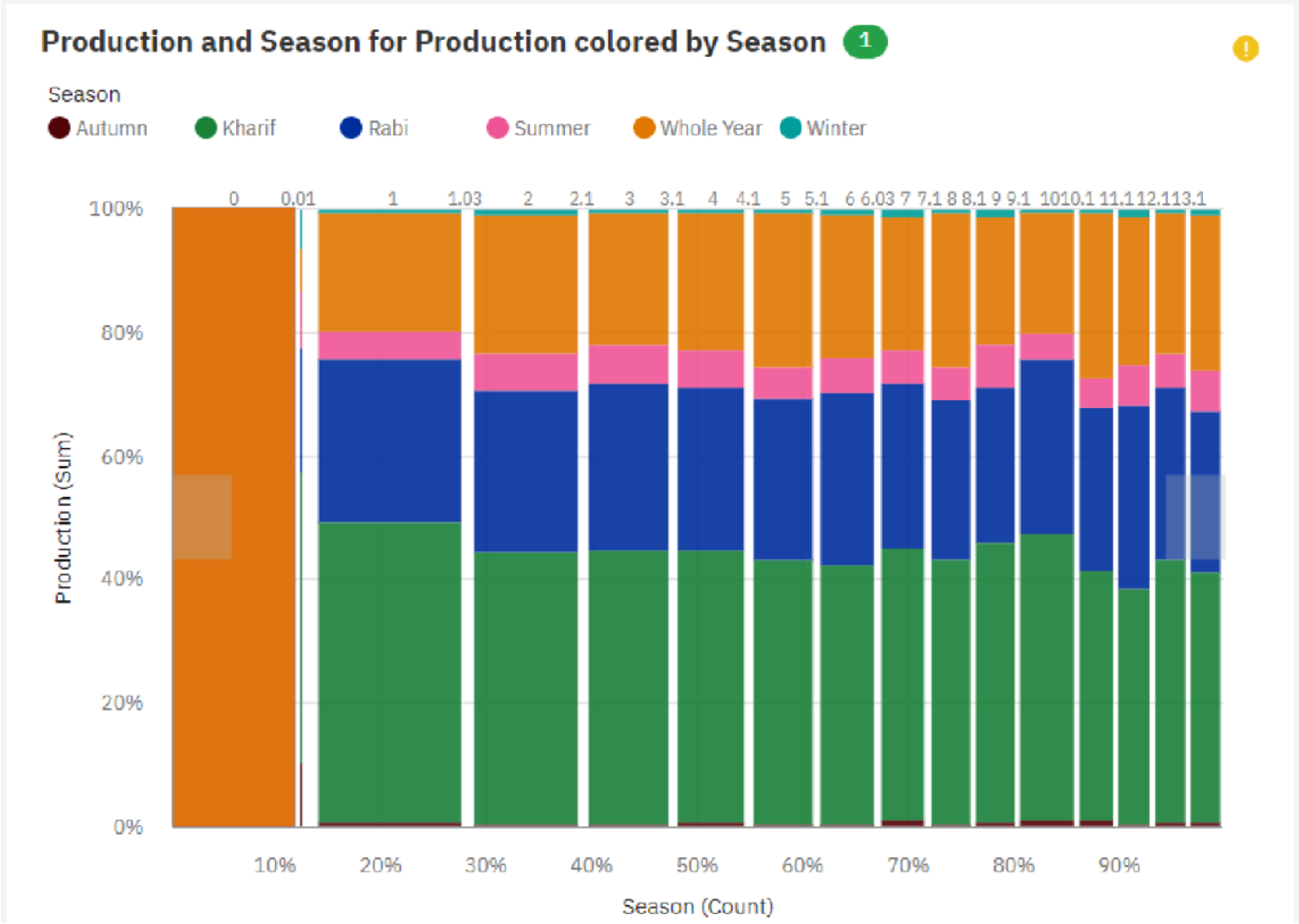


Dashboard with respect to production:

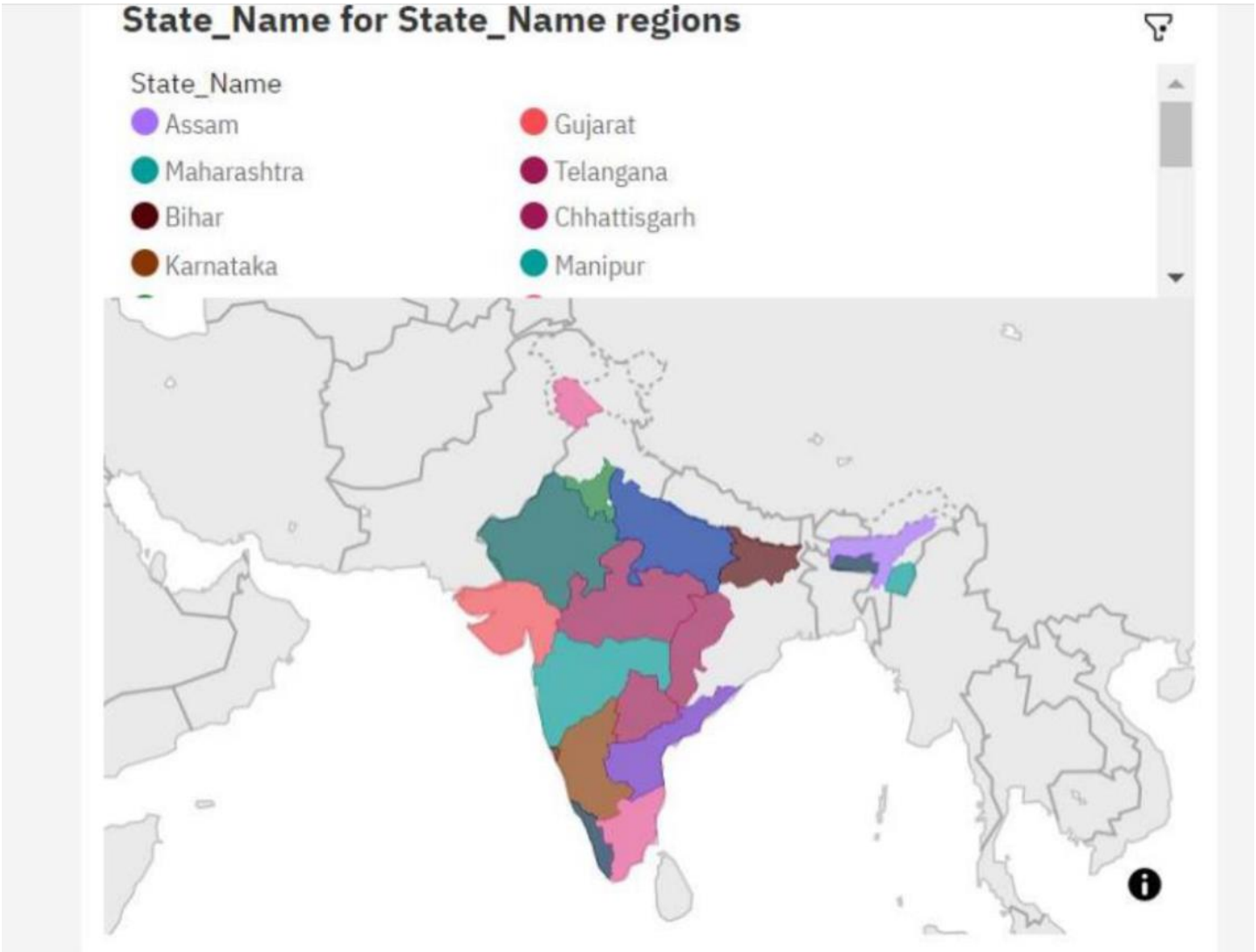


7.3 REPORT CREATION:

SEASONS WITH AVERAGE PRODUCTION



STATE WITH CROP PRODUCTION



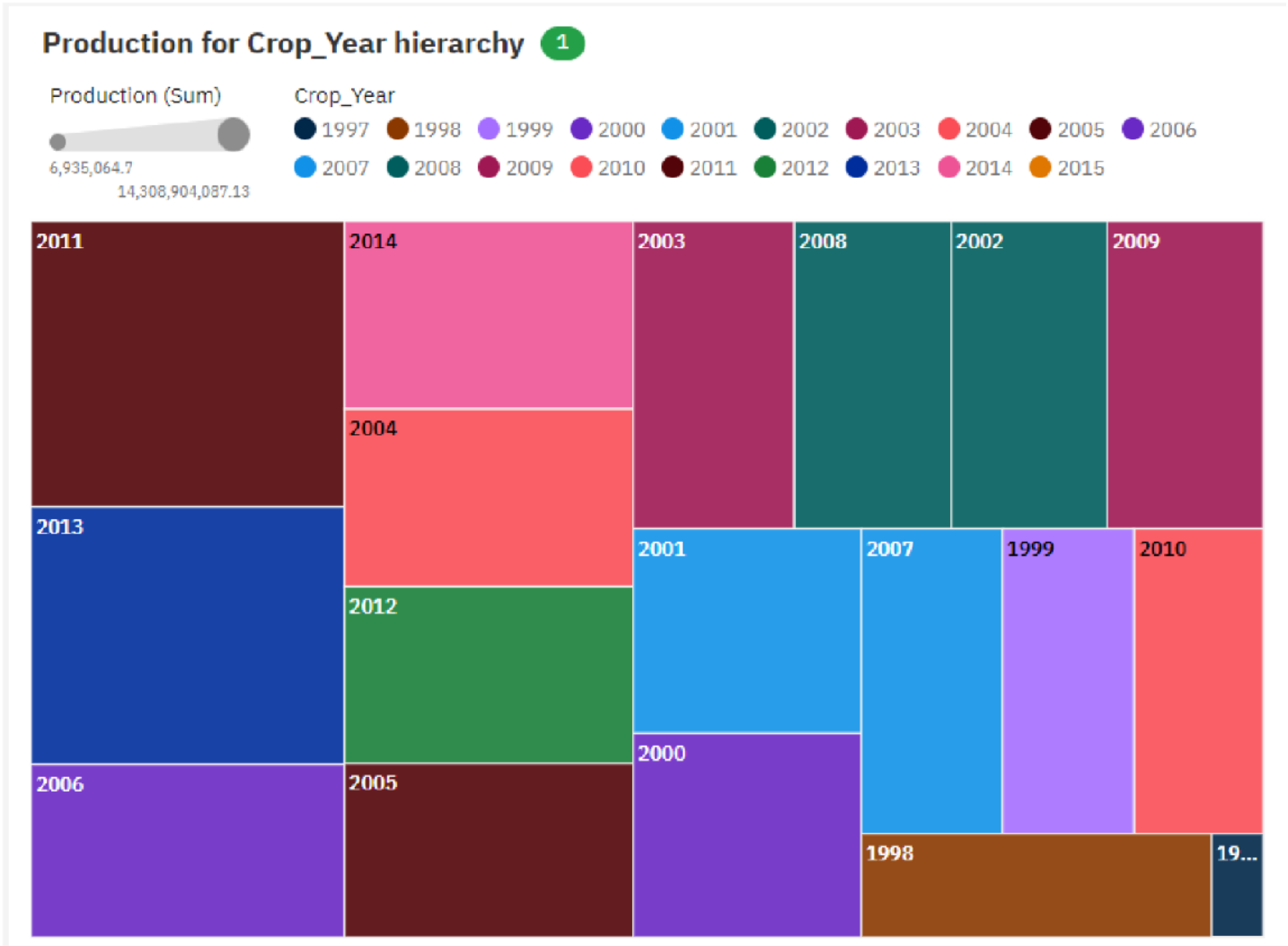
STATE WITH CROP PRODUCTION ALONG WITH SEASON

State_Name	Crop
Kerala	Banana
Madhya Pradesh	Banana
Maharashtra	Banana
Manipur	Banana
Meghalaya	Banana
Puducherry	Banana
Rajasthan	Banana
Tamil Nadu	Apple
	Banana
Telangana	Banana
Uttar Pradesh	Banana

Crop	Season
Apple	Whole Year
Banana	Autumn
	Kharif
	Rabi
	Summer
	Whole Year
	Winter

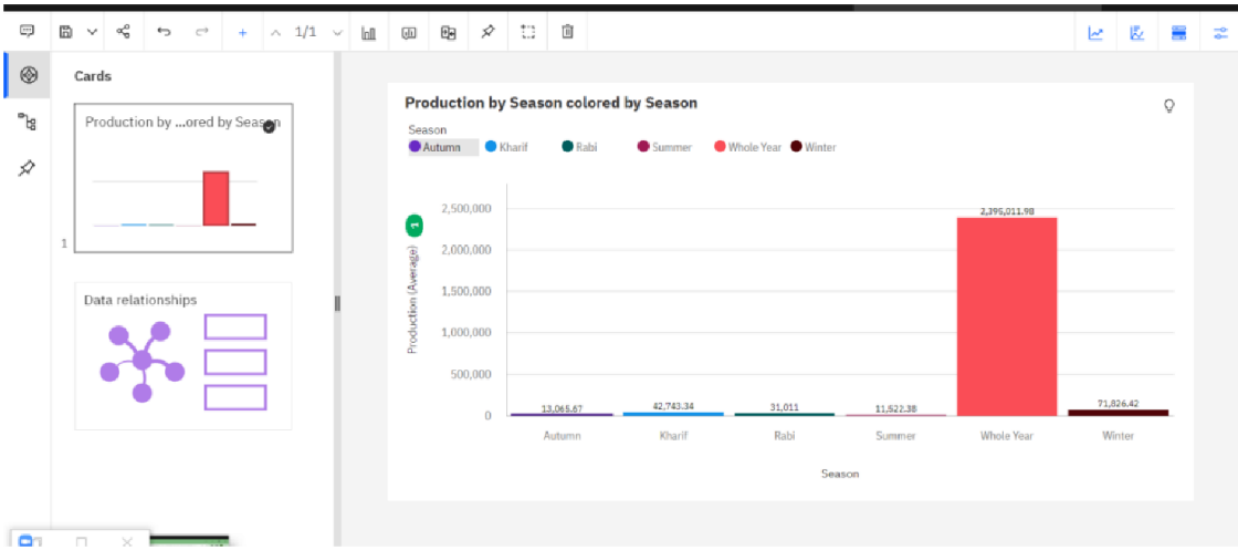
TOP 10 STATES WITH MOST AREA

WITH YEARS USAGE OF AREA AND PRODUCTION

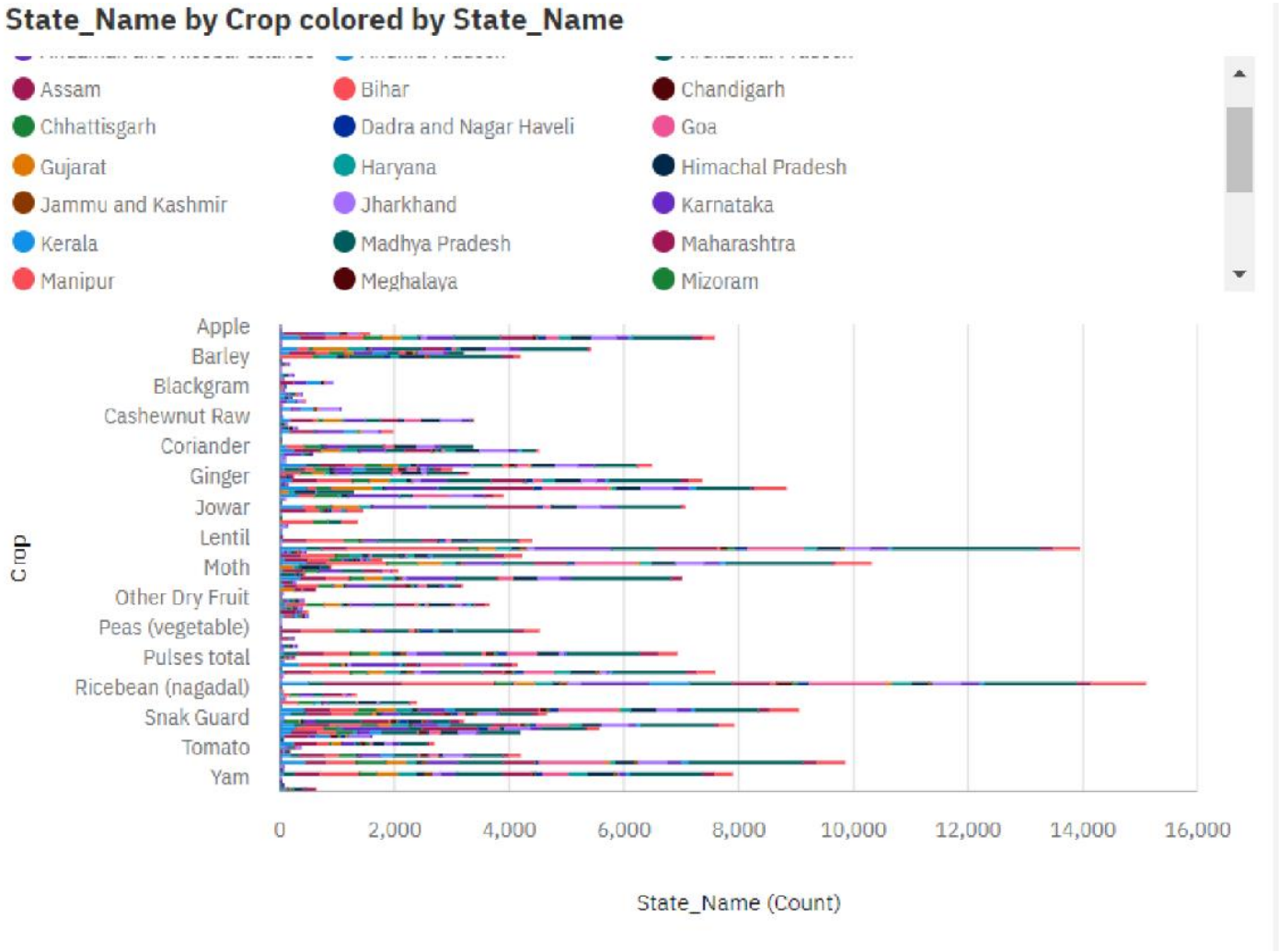


7.4 STORY CREATION:

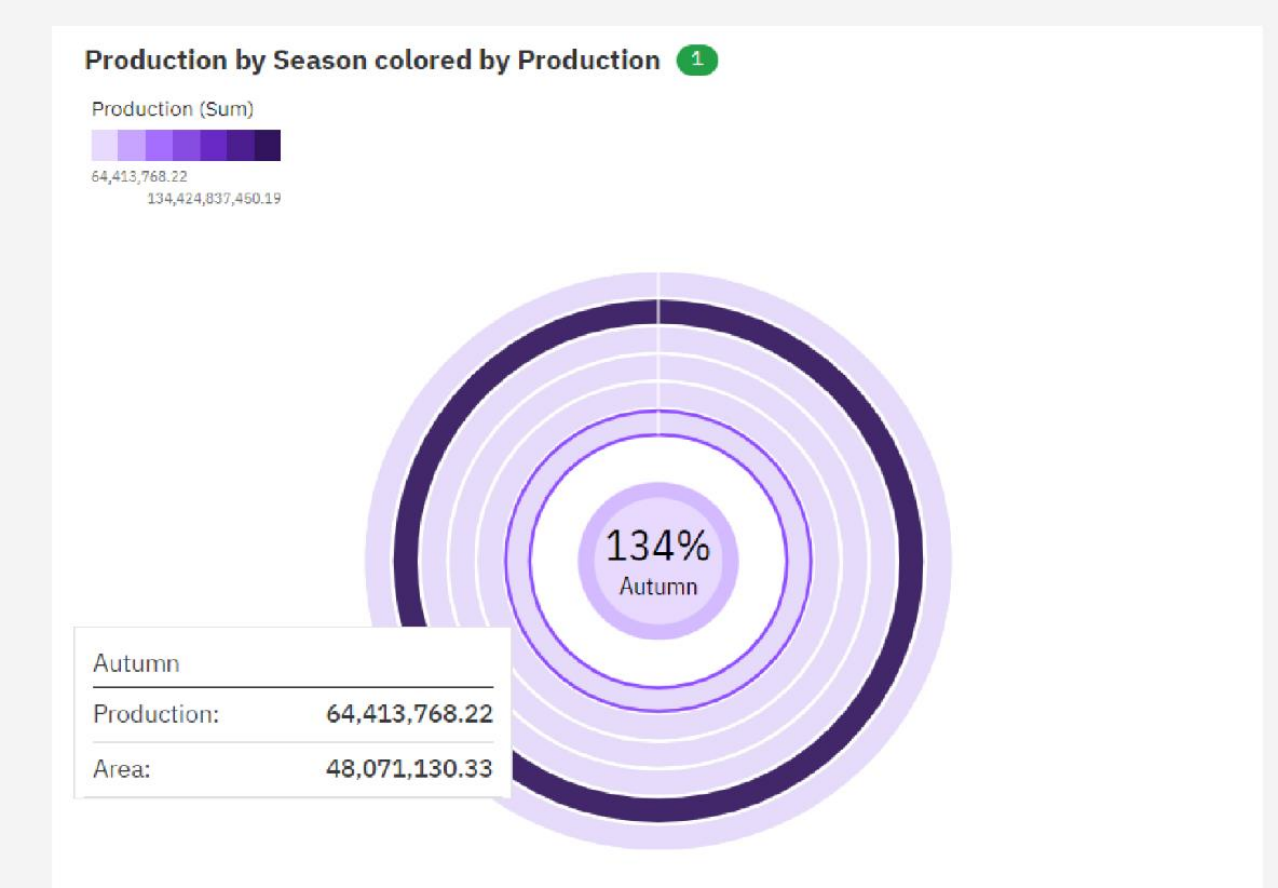
SEASONS WITH AVERAGE PRODUCTI



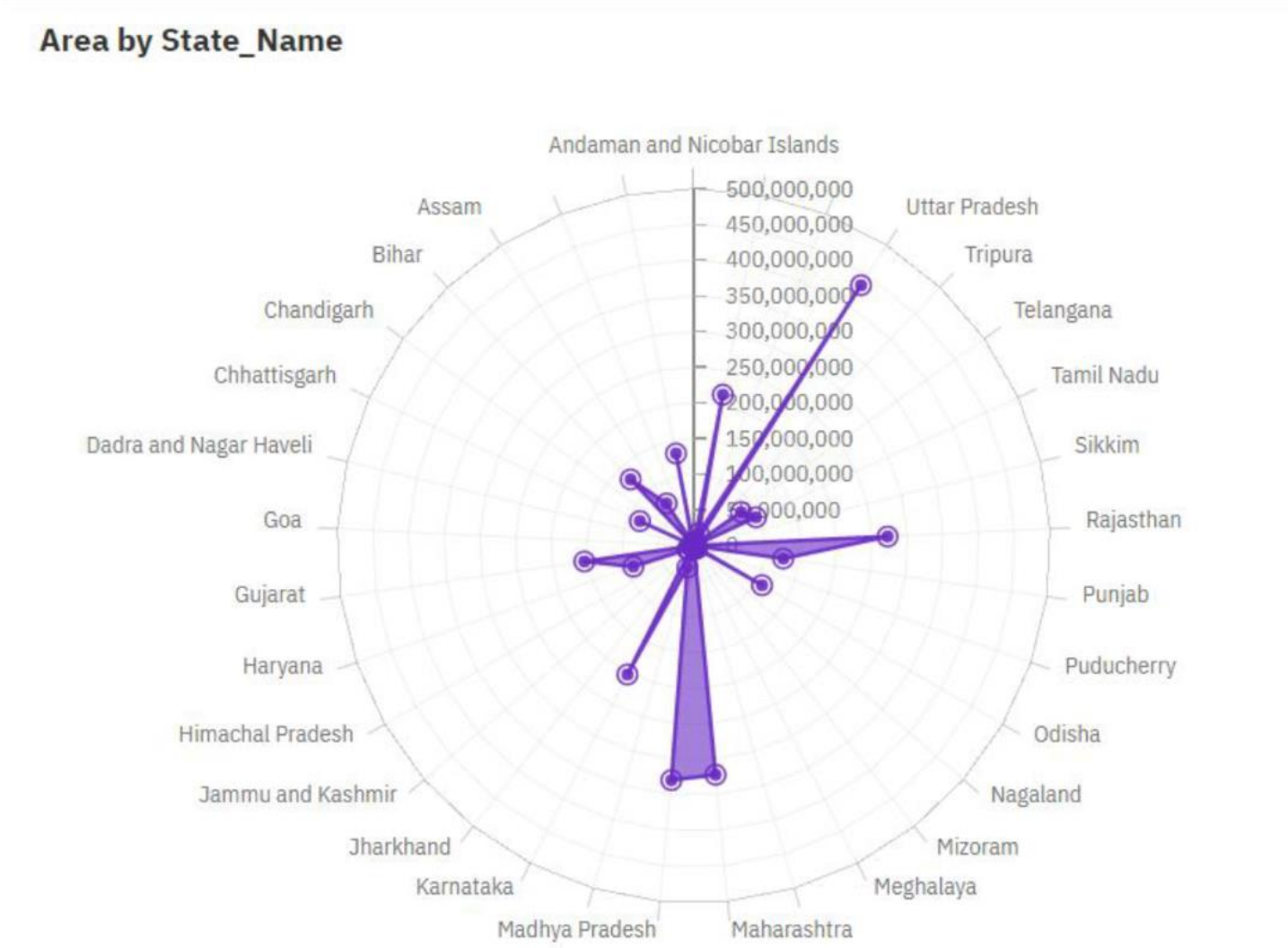
STATE WITH CROP PRODUCTION



STATE WITH CROP PRODUCTION ALONG WITH SEASON



TOP 10 STATES WITH MOST AREA



WITH YEARS USAGE OF AREA AND PRODUCTION

Chart A

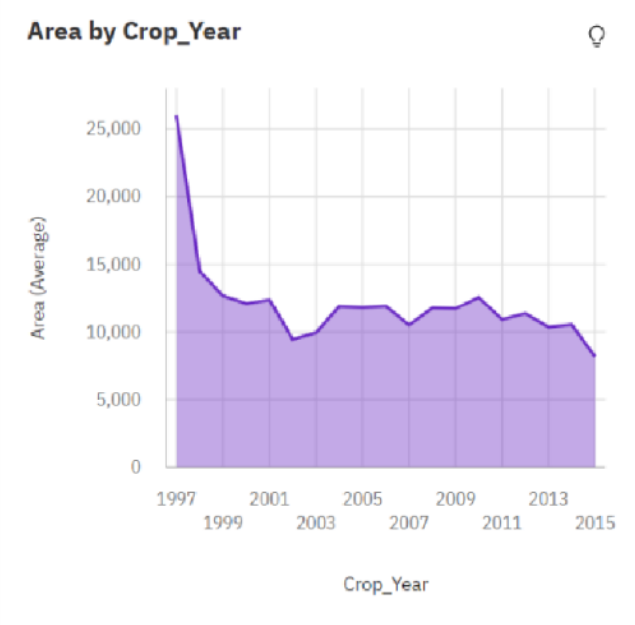
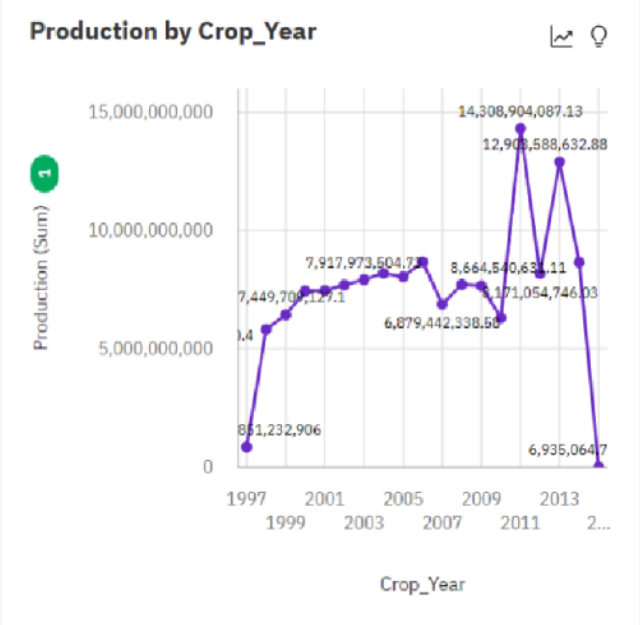


Chart B



8. TESTING

8.1 TEST CASES:

Test case ID	Feature Type	Component	Test Scenario	Steps To Execute	Result	Status
HomePage_ TC_OO1		Functional	Home Page	Verify user is able to see the Login/Signup popup when user clicked on Login Button in the Homepage	1.Enter URL and click go 2.Click on Login Button 3.Verify login/Singup popup displayed or not	Login page should pop up as soon as the Login button is clicked clicked	Pass
LoginPage_ TC_OO2		UI	Login Page	Verify the U elements in Login/Signup popup	1.Enter URL and click go 2.Click on Login Button 3.Verify login/Singup popup with below UI elements: a.email text box b.password text box c.Login button d.New customer? Create account link e.Last password? Recovery password link	Application should show below UI elements: a.login with twitter & facebook b.password text box c.Login button with orange colour d.Last password? Recovery password link	Fail

LoginPage_ TC_OO3	Functional	Login Page	Verify able to log into application with Valid credentials	1.Enter URL(login.html) and click go 2.ClicK on My Account dropdown button 3.Enter Valid username/email in Email text box 4.Enter valid password in password text box 5.Click on login button	User should navigate to user account homepage	Pass
Dashboard_ TC_OO4	Functional	Dashboard rd page	Verify user is able to dashboard and see the charts	1.Enter URL(dashboard.html) 2.Click on the different charts that the user wants.	Application should show the expected charts from cognos	Pass
				3.The embedded link will be able to display the charts from cognos		

8.2 USER ACCEPTANCE TESTING:

PURPOSE OF TESTING:

The purpose of this document is to briefly explain the test coverage and open issues of the [Estimate The Crop Yield Using Data Analytics] project at the time of the release to User Acceptance Testing (UAT).

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	7	0	0	7
Client Application	51	0	0	51
Security	3	0	0	3

This report shows the number of resolved or closed bugs at each severity level, and how they were resolved

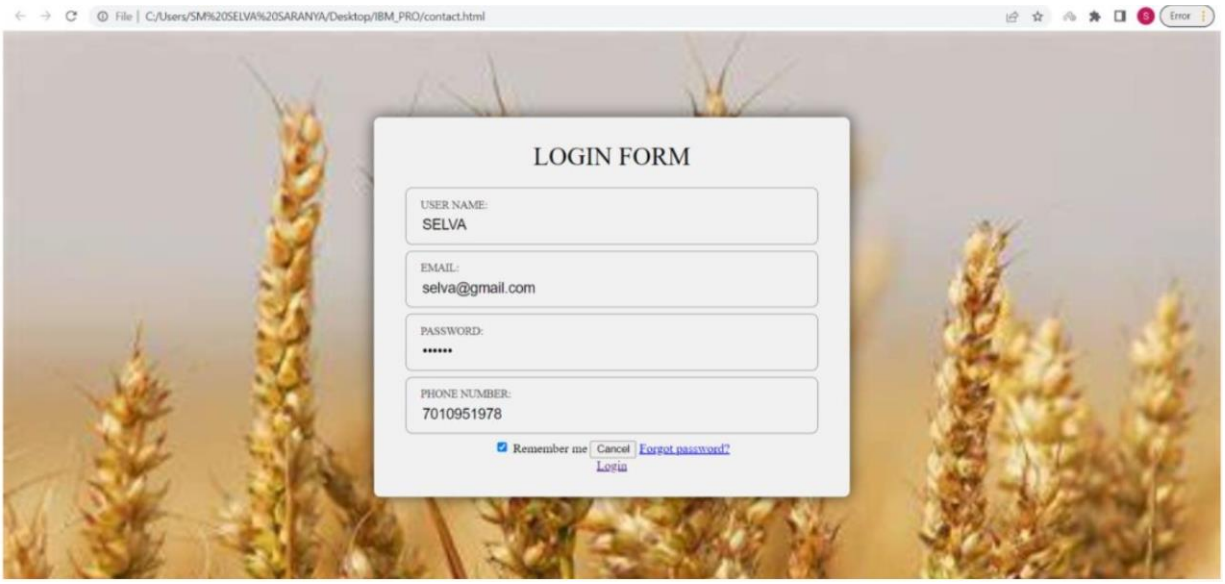
Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	10	4	2	3	19
Duplicate	1	0	3	0	4
External	2	3	0	1	6
Fixed	11	2	4	18	35
Not Reproduced	1	0	0	0	1
Skipped	0	0	1	1	2
Won't Fix	0	0	2	1	3
Totals	25	9	12	24	70

(II) TEST CASE ANALYSIS:

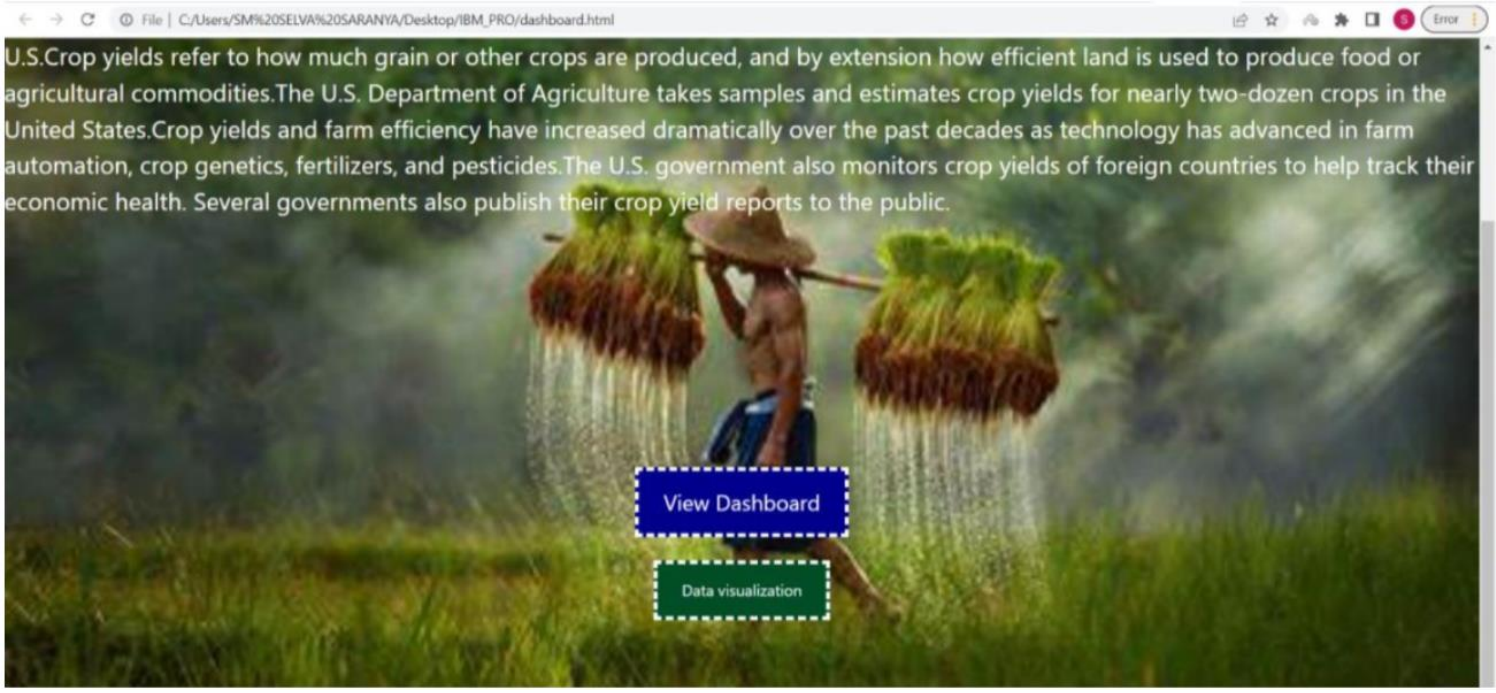
This report shows the number of test cases that have passed, failed, and untested

Outsource Shipping	3	0	0	3
Exception Reporting	9	0	0	9
Final Report Output	5	0	0	4
Version Control	2	0	0	2

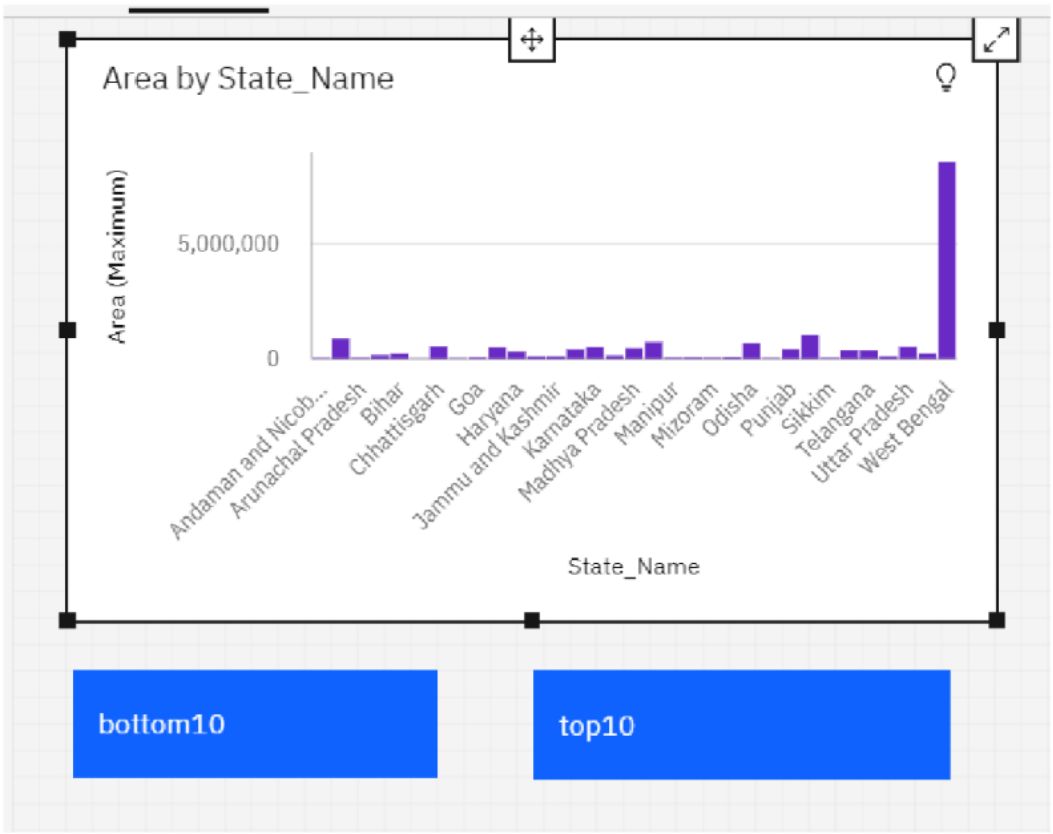
9. RESULTS


File | C:/Users/SM%20SELVA%20SARANYA/Desktop/IBM_PRO/contact.html
Error
LOGIN FORM
USER NAME:
SELVA
EMAIL:
selva@gmail.com
PASSWORD:
••••••
PHONE NUMBER:
7010951978
Remember me
Cancel
Forgot password?
Login

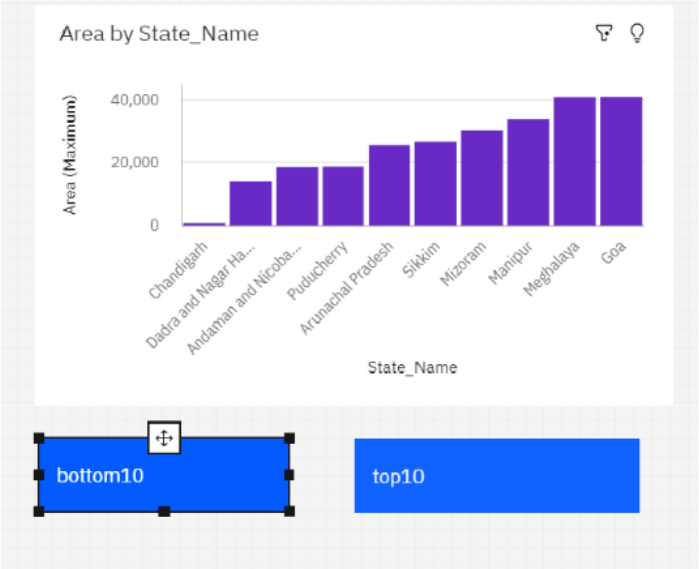

File | C:/Users/SM%20SELVA%20SARANYA/Desktop/IBM_PRO/dashboard.html
Error
ESTIMATE THE CROP YIELD USING DATA ANALYTICS
Crop yield is a standard measurement of the amount of agricultural production harvested—yield of a crop—per unit of land area. Crop yield is the measure most often used for cereal, grain, or legumes; and typically is measured in bushels, tons, or pounds per acre in the U.S.Crop yields refer to how much grain or other crops are produced, and by extension how efficient land is used to produce food or agricultural commodities.The U.S. Department of Agriculture takes samples and estimates crop yields for nearly two-dozen crops in the United States.Crop yields and farm efficiency have increased dramatically over the past decades as technology has advanced in farm automation, crop genetics, fertilizers, and pesticides.The U.S. government also monitors crop yields of foreign countries to help track their economic health. Several governments also publish their crop yield reports to the public.



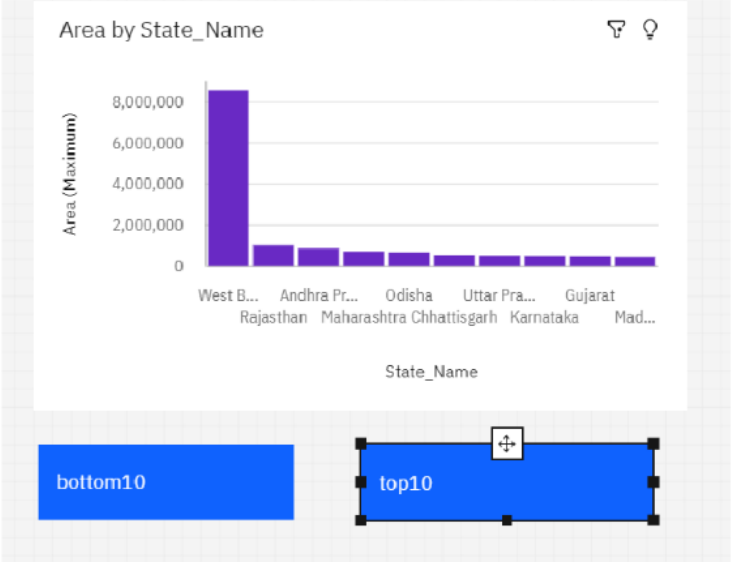
Action Buttons:

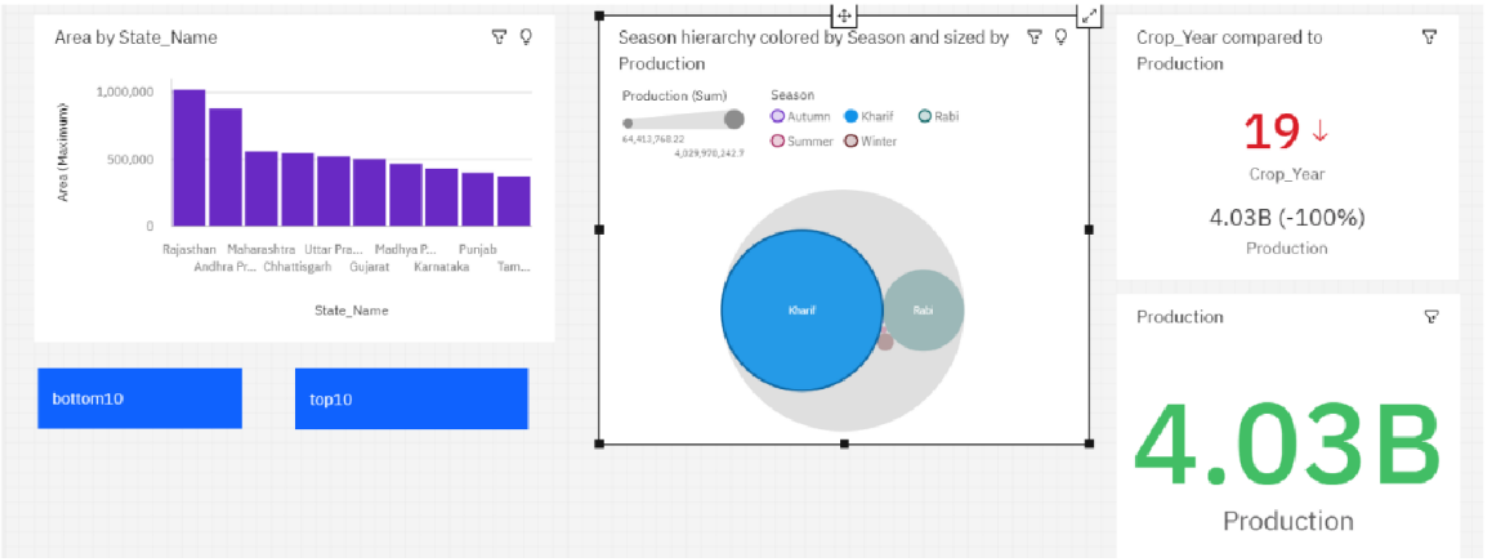


After pressing bottom 10:

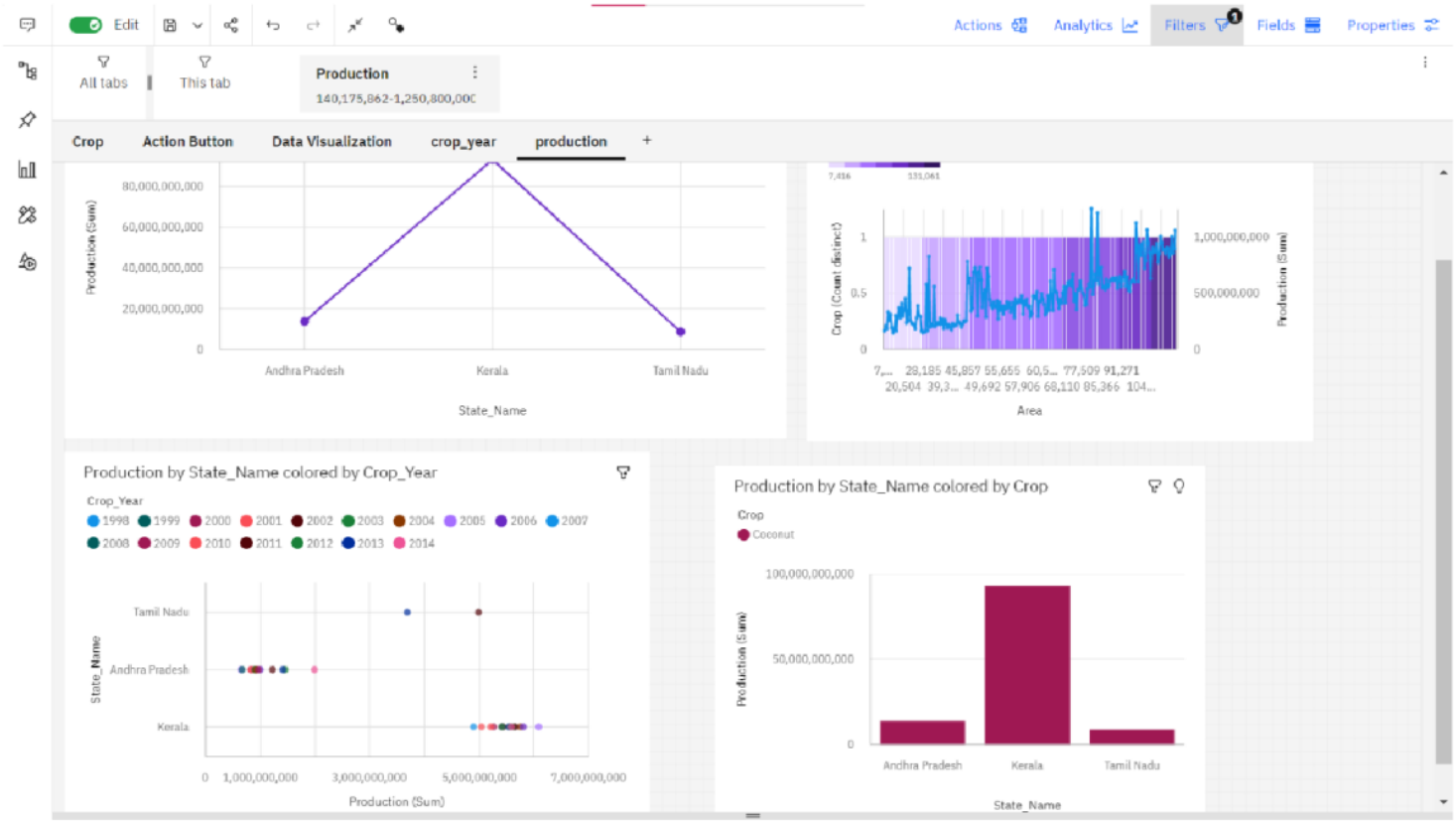


After pressing top 10:





Dashboard with respect to production:



10. ADVANTAGES & DISADVANTAGES

ADVANTAGES:

- Technology increases productivity. Technology has significantly increased productivity in agriculture, allowing farmers to complete more tasks quickly and with less effort.
- Technology reduces costs. The use of modern agricultural technologies can aid in cost savings for farmers. Farmers may labour more effectively, with less effort, and in less time with the aid of contemporary technologies.
- Work that previously needed a large number of people and a long amount of time can now be completed quickly thanks to current technology.

DISADVANTAGES:

- High maintenance costs. The high maintenance expenses of farm technology are one of its drawbacks. For farmers and small businesses, the technology's high maintenance costs are a challenge.
- Farmers struggle to stay current with technology because they cannot afford the high maintenance costs of modern technological equipment. Farmers with low levels of education are illiterate, and it is difficult for them to understand how to use modern farming technologies.

11. CONCLUSION

Through the application of data visualisation techniques, agricultural yield data is utilised to analyse and increase crop productivity.

The data users can dive down and concentrate on more in-depth views of these data displays thanks to the interactive charts that are included in the visualisation techniques that are offered.

12. FUTURE SCOPE

We anticipate expanding the same in the future as an even more user-friendly mobile application with other user experience improvements planned.

13. APPENDIX

Link to the GitHub Repository:

https://github.com/IBM-EPBL/IBM-Project-6770-1658836866

Project Demo Video Link:

https://drive.google.com/file/d/1bMI7tYtbuk1mkEzpZRn9RL3m_Dhmaoq8/view?usp=sharing