ESTIMATE THE CROP YIELD USING DATA ANALYTICS

A PROJECT REPORT

Submitted by

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Team member 3: Sandeepvasan .S

in partial fulfilment for the award of the degree of

BACHELOR OF ENGINEERING

in

COMPUTER SCIENCE & ENGINEERING

VEL TECH HIGH TECH DR.RANGARAJAN DR.SAKUNTHALA

ENGINEERING COLLEGE

(AN AUTONOMOUS INSTITUTION)

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1.INTRODUCTION

1.1 PROJECT OVERVIEW

Agriculture is the backbone of Indian Economy in India; majority of the farmers are not getting the expected crop yield due to several reasons. The agricultural yield primarily depends on weather conditions. Rainfall conditions also influence rice cultivation. In this context, the farmers necessarily require timely advice to predict the future crop productivity and an analysis is to be made in order to help the farmers to maximize the crop production in their crops. Yield prediction is an important agricultural problem. Every farmer is interested in knowing how much yield he is about to expect. In the past, yield prediction was performed by considering a farmer's previous experience on a particular crop. The volume of data is enormous in Indian agriculture. The data when it becomes information is highly useful for many purposes.

1.2 PURPOSE

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

2.LITERATURE SURVEY

2.1 EXISTING PROBLEM

1. TITLE: Agriculture Data Analytics in Crop Yield Estimation

AUTHOR: B M Sagar, Cauvery N K.

YEAR:2018.

TECHNIQUE(S): Data Analytics.

ABSTRACT:

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. The present study gives insights on various data analytics methods applied to crop yield prediction and also signifies the important lacunae points' in the proposed area of research.

2.TITLE: Crop Yield Prediction Using Data Analytics and Hybrid Approach

AUTHOR: Ms. Shreya V. Bhosale, Mr. Prasanna G. Dhemey, Ms. Ruchita A. Thombare, Ms. Anagha N. Chaudhari
YEAR: 2018

TECHNIQUE(S): Data Analytics and Hybrid Approach

ABSTRACT:

Agricultural data is being produced constantly and enormously. As a result, agricultural data has come in the era of big data. Smart technologies contribute in data collection using electronic devices. In our project we are going to analyze and mine this agricultural data to get useful results using technologies like data analytics and machine learningand this result will be given to farmers for better crop yield in terms of efficiency and productivity.

3.TITLE: A Model for Prediction of Crop Yield

AUTHOR: E. Manjula, S. Djodiltachoumy
YEAR: 2017
ABSTRACT:

Data Mining is emerging research field in crop yield analysis. Yield prediction is a very important issue in agricultural. Any farmer is interested in knowing how much yield he is about to expect. In the past, yield prediction was performed by considering farmer's experience on particular field and crop. The yield prediction is a major issue that remains to be solved based on available data. Data mining techniques are the better choice for this purpose. Different Data Mining techniques are used and evaluated in agriculture for estimating the future year's crop production. This research proposes and implements a system to predict crop yield from previous data. This is achieved by applying association rule mining on agriculture data. This research focuses on creation of a prediction model which may be used to future prediction of crop yield. This paper presents a brief analysis of crop yield prediction using data mining technique based on association rules for the selected region i.e district of Tamil Nadu in India. The experimental results shows that the proposed work efficiently predict the crop yield production.

2.2.REFERENCES

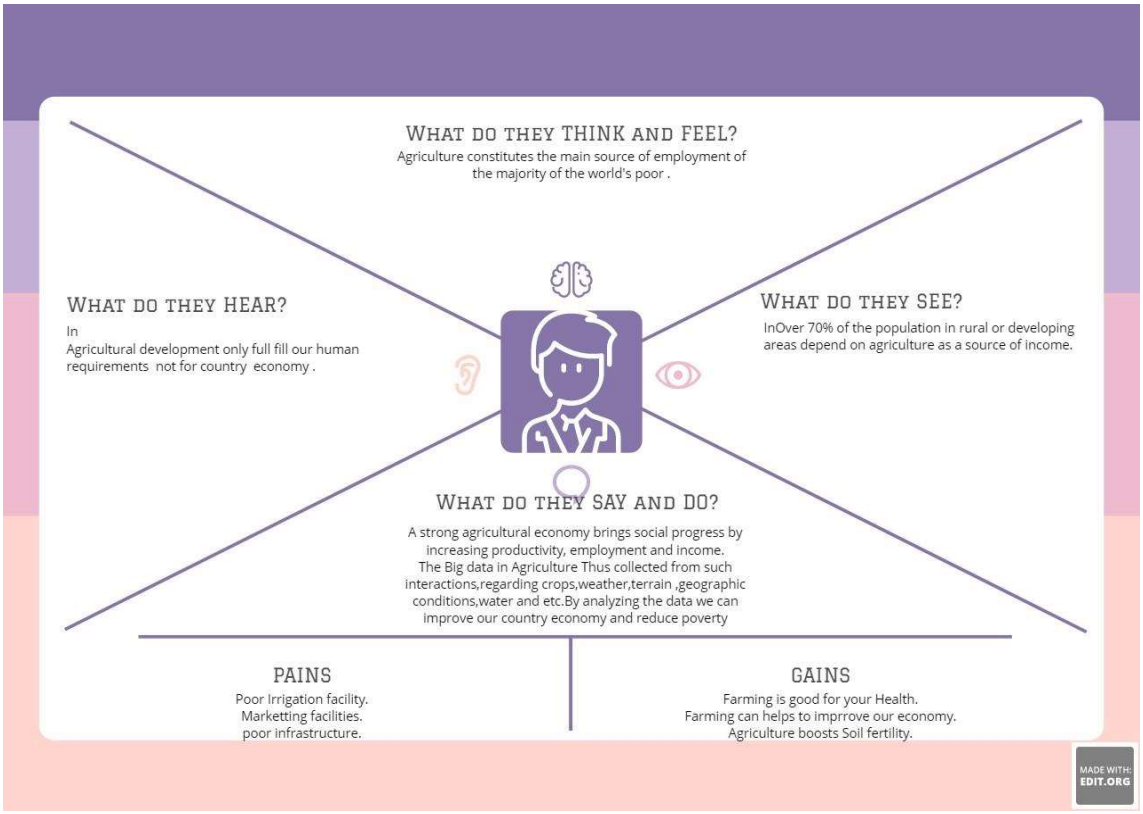
- https://ieeexplore.ieee.org/document/8697806
- https://ieeexplore.ieee.org/document/7918789
- https://www.researchgate.net/publication/329467349_Agriculture_Data_Analytics_in_Crop_Yield_Estimation_A_Critical_Review
- https://ieeexplore.ieee.org/document/8746001/references#references

2.3 PROBLEM STATEMENT DEFINITION

Problem Statement	I am (Customer)	I'm trying to	But	Because	Which makes me feel
PS-1	A Farmer	Harvest my crops	I am not sure about the best time to harvest the crops	Harvesting in a wrong season can reduce my yield	Disappointment
PS-2	A Farmer	Get more yield when harvesting	Some birds, insects and animals damages the crops they eat the crops which reduces my production	they eat the crops which reduces my production	Frustrated
PS-3	A Farmer	Get proper production	I don't know exactly which crop to plant in my field based on my locality	I got low production last year when I planted a crop that doesn't suit my locality/soil nature	Dispirited

3.IDEATION & PROPOSED SOLUTION

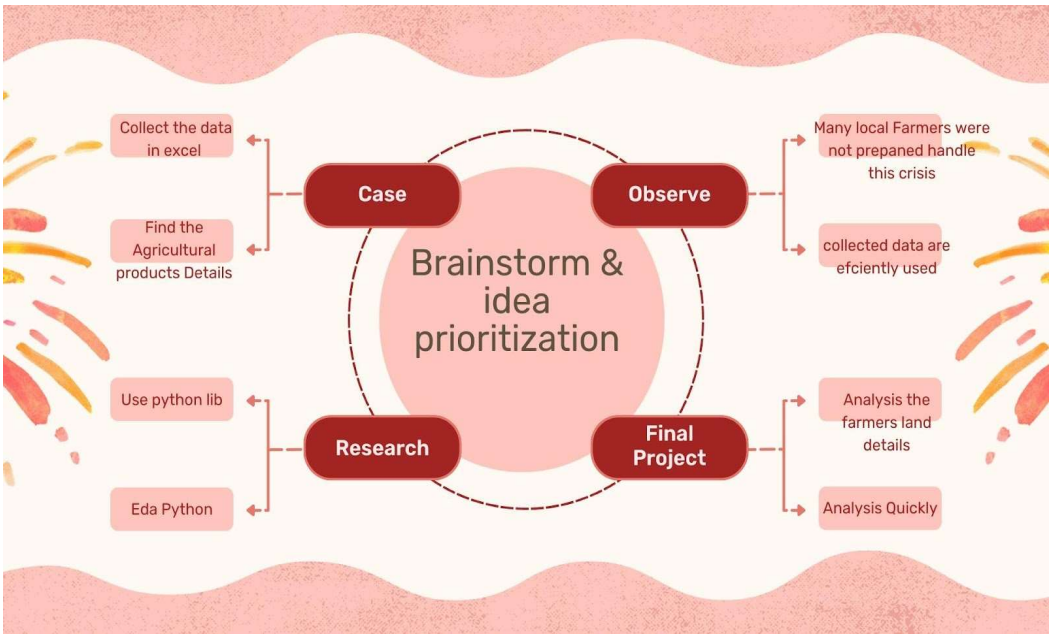
3.1 Empathy Map Canvas



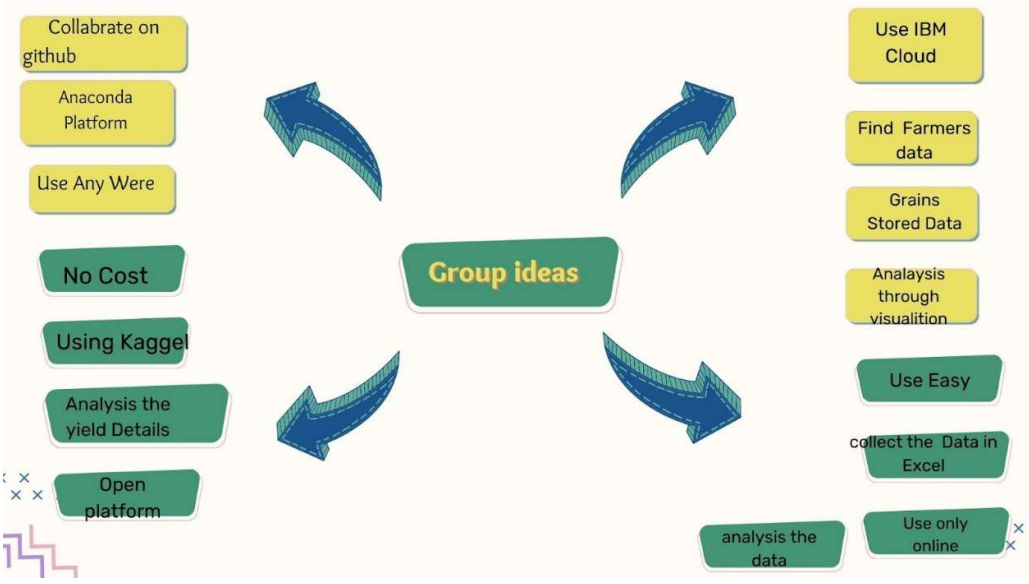
3.2 Ideation & Brainstorming

Brainstorming provides a free and open environment that encourages everyone within a team to participate in the creative thinking process that leads to problem solving. Prioritizing volume over value, out-of-the-box ideas are welcome and built upon, and all participants are encouraged to collaborate, helping each other develop a rich amount of creative solutions.

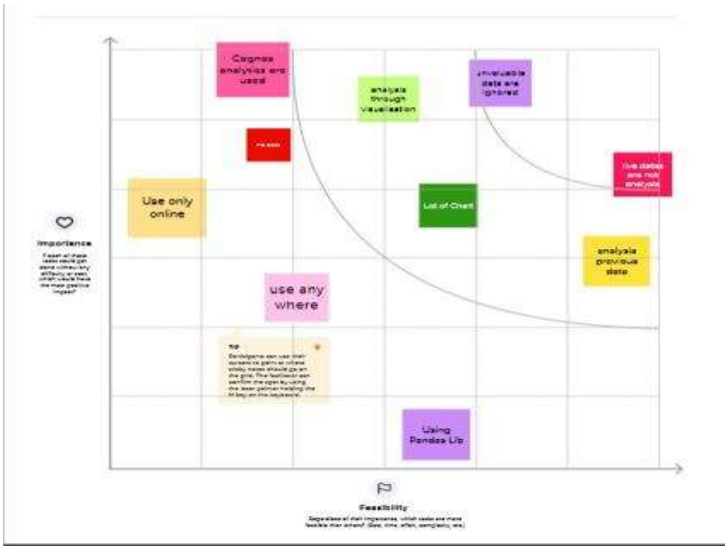
Step-1: Team Gathering, Collaboration and Select the Problem Statement



Step-2: Brainstorm, Idea Listing and Grouping



3.Prioritize



Agriculture is important for human survival because it serves the basic need. A well known fact is 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 a challenging task to achieve desired targets in Agri based crop yield. Various factors are to be considered which have a 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 years 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 increase agricultural productivity. The present study gives insights on various data analytics methods applied to crop yield prediction and also signifies the important lacunae points in the proposed area of research

Due to the changing climatic conditions accurate results cannot be predicted by this system. Agriculture sector is struggling to increase crop production and in some of the areas being explored the problem of yield prediction is a major concern.

TOP IDEAS:

● Understand how the data analytics platform will support the overall business strategy of the organization.

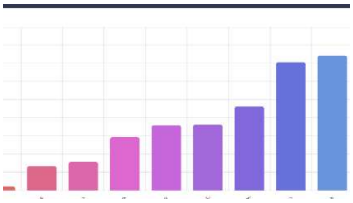
● Develop an analytics vision and set target maturity levels for core processes.

● Increasing Innovation, Productivity & Reduce wastage.

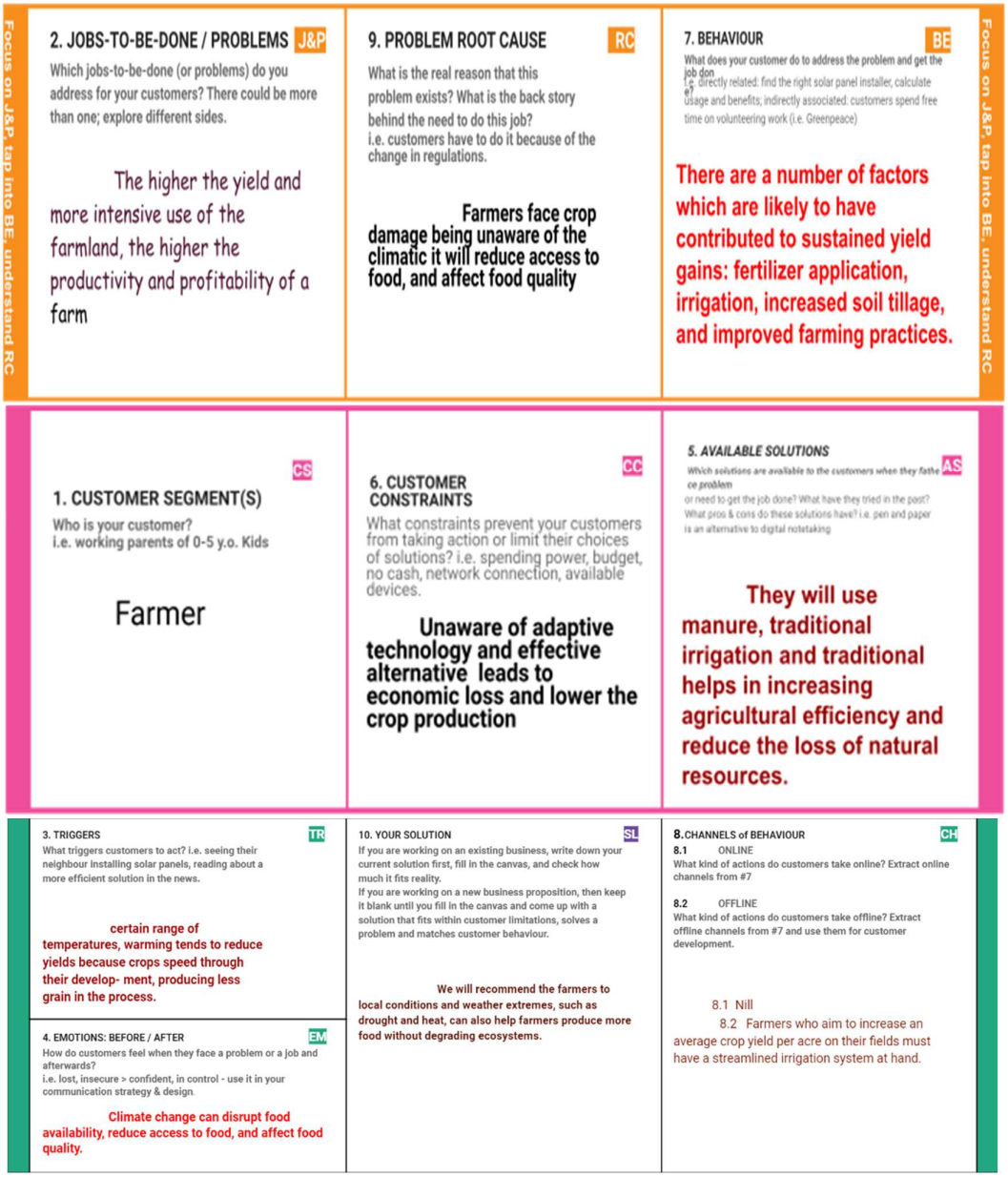
- Market demand drives production. Knowledge of seeds, crops, mechanism, soil, climate & agriculture science. Right use of resources like soil and water
- This system will provide a complete technical solution using the internet of things to the frames to prevent their crops from wild animals and provide information to the farmers to prevent their crops from wild animals and provide information to the farmers to maximize their production.

3.3 Proposed Solution

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	• Crop production in India is one of the most important sources of income and India is one of the top countries to produce crops. • Big data provides farmers granular data on rainfall patterns, water cycles, fertilizer requirements, and more. This enables them to make smart decisions, such as what crops to plant for better profitability and when to harvest. The right decisions ultimately improve farm yields.
2.	Idea / Solution description	• Data analytics can help farmers monitor the health of crops in real-time, create predictive analytics related to future yields and help farmers make resource management decisions based on proven trends. Reducing waste and improving profits
3.	Novelty / Uniqueness	• To increase quality and yields, it is crucial to understand the current nutrient levels of the soil to be able to ascertain which areas require improvement.
4.	Social Impact / Customer Satisfaction	• Farmers are always looking for innovations and information to help them boost production and maximize returns on their products.

		• The rise of digital technology has offered access to a wide range of opportunities for more informed and accurate actions in the field. • As a result, big data analytics are proving to be a real game-changer in the industry. • With the increased availability of data, farmers have more tools than ever at their disposal, offering numerous benefits. Knowledge is not only powerful, but it can make or break an agricultural producer's success.
5.	Business Model (Revenue Model)	• the agricultural entrepreneur to make easier and better decisions based on information. This work aims to sensitize farmers to the importance of adopting data-driven solutions to address the needs of this sector.
6.	Scalability of the Solution	• Increases in agricultural productivity lead also to agricultural growth and can help to alleviate poverty in poor and developing countrie**s**, where agriculture often employs the greatest portion of the population. As farms become more productive, the wages earned by those who work in agriculture increase. 

3.4 Problem Solution fit



4 REQUIREMENT ANALYSIS

4.1 Functional Requirement

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Requirements	Knowledge of seeds,crops,mechanism,soil,climate & agriculture.Right use of resources like soil and water.Time management.Market demand drive production.
FR-2	User Business roles	Three laws-the farmers produce trade and commerce(promotion and facilitation)act,the farmers agreement of price assurance and farm services act and the essential commodities act
FR-3	User factors	Crop yield is influenced by climate and temperature,plant and water management,and soil nutrient management factors.Good genetics and the ability to manipulate and optimize the plants environment results in the highest yields
FR-4	User importance	Crop yield is referred to as agricultural output.Crop yield data is vital to measure if crops that are produced can adequately provide enough food for nation's food supply,livestock feed and energy sources.
FR-5	User Objectives	Formulation and implementation of policies and programmes aimed at achieving rapid agricultural growth .In modern agriculture,maximizing and sustaining crop yields are the main objectives.
FR-6	User improvement	The crop variety can be improved through cross breeding and hybridization.It is necessary to increase the crop variety to produce disease resistance offsprings of the crops.

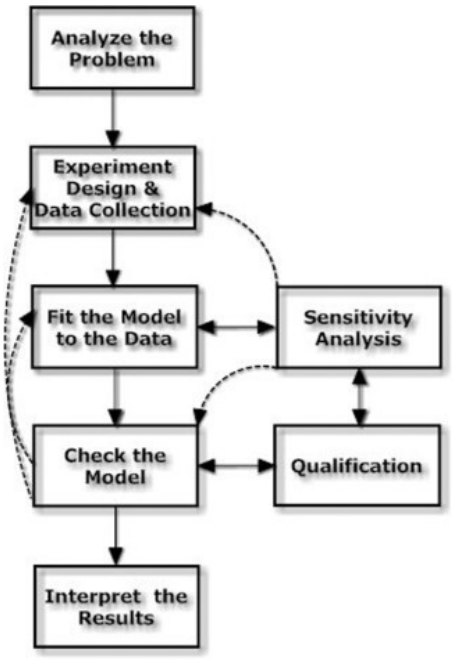
4.2 Non-functional Requirements:

Following are the non-functional requirements of the proposed solution.

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	To empower farmers and to increase the productivity there is need to provide the best dissemination tool for their farming activities.
NFR-2	**Security**	The developed ICT agriculture focus on important agricultural service such as crop.
NFR-3	**Reliability**	It removes the issues and acts as a bridge between farmers and technology.
NFR-4	**Performance**	Crop performance analytics quantify the yield potential and environmental impact of food production at field,farm and catchment scales.Multiple technologies and services that will improve the usability in agricultural activities.
NFR-5	**Availability**	Both website and mobile application developed in local language and the content is available in localized language.
NFR-6	**Scalability**	i)Increased productivity from warm temperature ii)Decreased moisture stress i. Possibility of growing new crops i. Productivity of soil and water

5.Product Design

5.1 Data Flow Diagrams

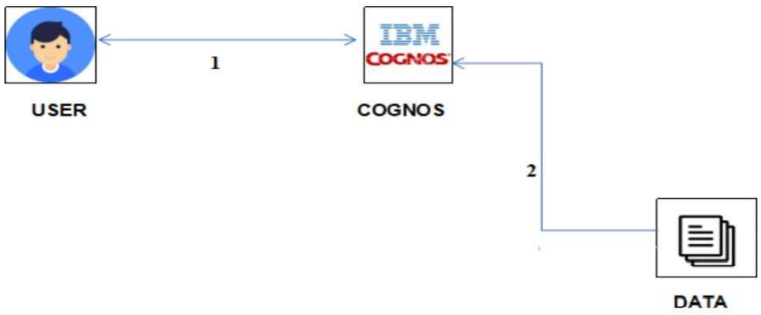


5.2 Solution & Technical Architecture

Estimate The Crop Yield Using Data Analytics:

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.

Technical Architecture:



5.3 User Stories

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task
Sprint-1	Registration	USN-1	As a user, I can register by entering my Agri - id card and request.
		USN-3	As a user, I can register for the application through Gmail
	Login	USN-4	As a user, I can Call and request or Approach for dataset
	Working with the Dataset	USN-5	To work on the given dataset, Understand the Dataset.
		USN-6	Load the dataset to the Cloud platform then Build the required Visualizations.
Sprint-2	Data Visualization Chart	USN-7	Using the Crop production in Indian dataset, create various graphs and charts to highlight the insights and visualizations. showcase Average Crop Production by Seasons.
			*Showcase the Yearly usage of Area in Crop Production.
			Build a visualization to show the top 10 States in Crop Yield Production by Area.
			Build the required Visualization to showcase the Crop Production by State.
			Build Visual analytics to represent the States with Seasonal Crop Production using a Text representation.
Sprint-3	Creating The dashboard	USN-8	Create the Dashboard by using the created visualizations.
Sprint-4	Export The Analytics	USN-9	Export the created Dashboard

6. PROJECT PLANNING & SCHEDULING

6.1 SPRINT PLANNING AND ESTIMATION

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

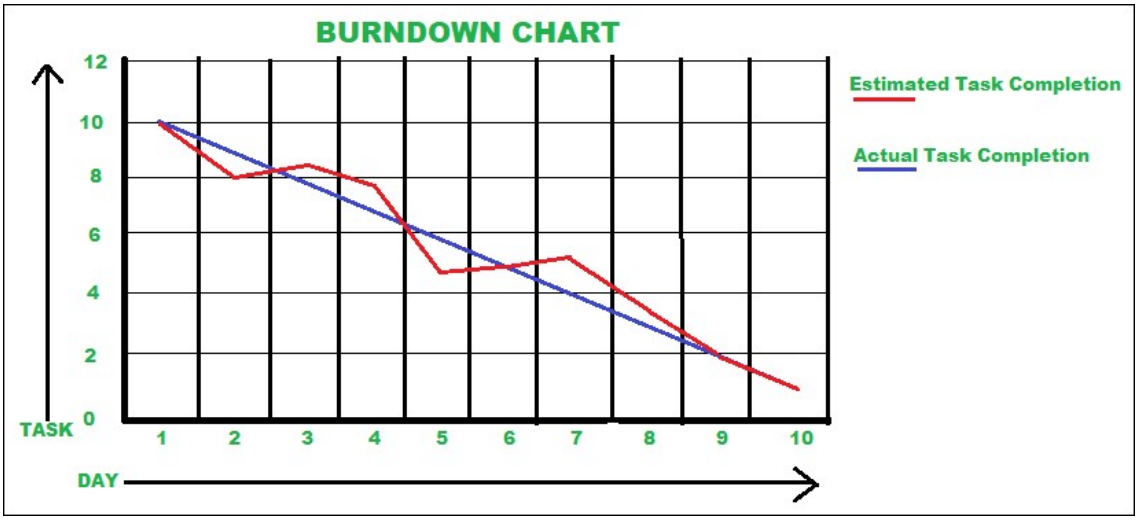
Velocity

We have a 24-day sprint duration, and the velocity of the team is 20 (points per sprint). Let's calculate the team's average velocity (AV) per iteration unit (story points per day)

AV = Sprint Duration / Velocity = 24 / 20 = 1.2

Burndown Chart

A burn down chart is a graphical representation of work left to do versus time. It is often used in agile software development methodologies. A burn down chart is a graphical representation of work left to do versus time. It is often used in agile software development methodologies such as Scrum. However, burn down charts can be applied to any project containing measurable progress over time.

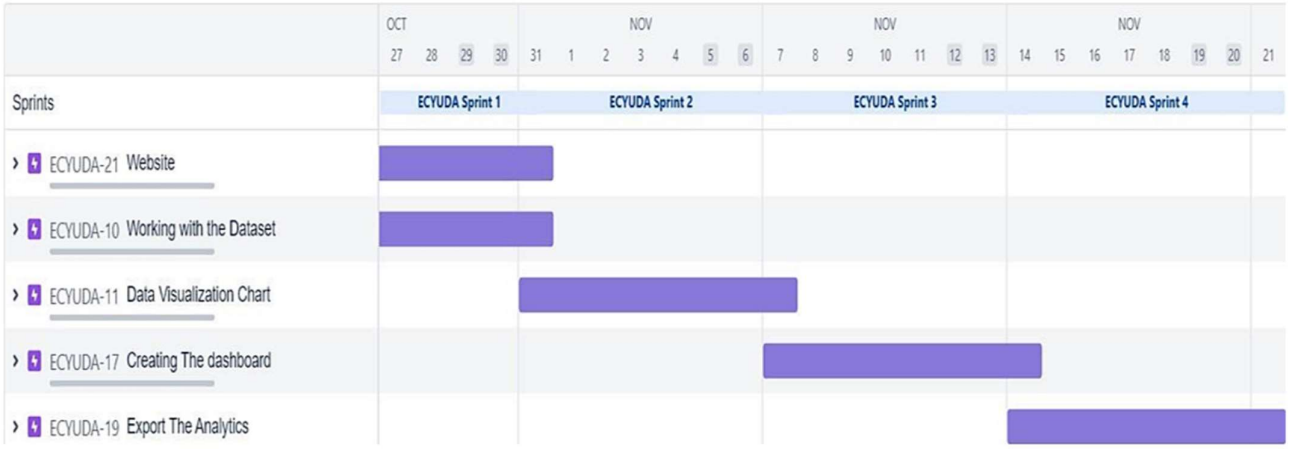


6.2 SPRINT DELIVERY SCHEDULE

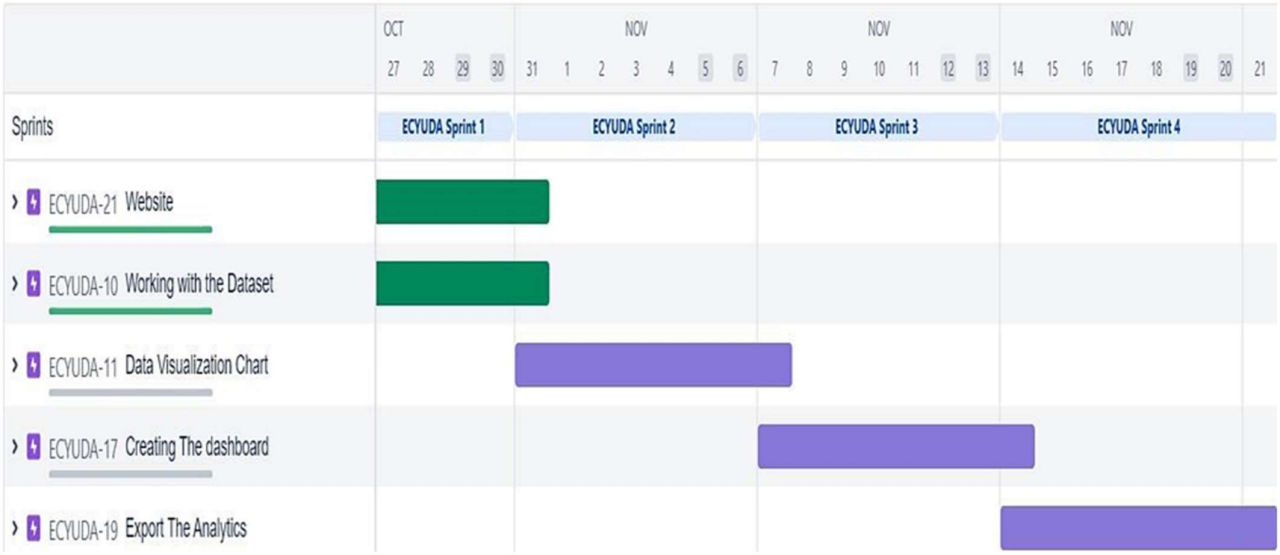
Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register by entering my Agri - id card and request..	2	High	Paranthaman .P Shakthy Balan .D Sandeepvasan .S Pragadeesh .S
		USN-3	As a user, I can register for the application through Gmail	2	Medium	Sandeepvasan .S Paranthaman .P
	Login	USN-4	As a user, I can Call and request or Approach for dataset	4	High	Shakthy Balan .D Pragadeesh .S
	Working with the Dataset	USN-5	To work on the given dataset, Understand the Dataset.	2	High	Pragadeesh .S Shakthy Balan .D Paranthaman ..P Sandeepvasan .S
		USN-6	Load the dataset to the Cloud platform then Build the required Visualizations.	10	High	Paranthaman .P Shakthy Balan .D
Sprint-2	Data Visualization Chart	USN-7	Using the Crop production in Indian dataset, create various graphs and charts to highlight the insights and visualizations. *Build a Visualization to showcase Average Crop Production by Seasons.	4	Medium	Shakthy Balan .D
			*Showcase the Yearly usage of Area in Crop Production.	4	Medium	Sandeepvasan .S
			Build a visualization to showcase case top 10 States in Crop Yield Production by Area.	4	Medium	Paranthaman .P
			Build the required Visualization to showcase the Crop Production by State.	4	Medium	Pragadeesh .S
			Build Visual analytics to represent the States with Seasonal Crop Production using a Text representation.	4	Medium	Paranthaman .P Shakthy Balan .D
Sprint-3	Creating The dashboard	USN-8	Create the Dashboard by using the created visualizations.	20	High	Sandeepvasan .S Paranthaman .P
Sprint-4	Export The Analytics	USN-9	Export the created Dashboard	20	High	Pragadeesh .S Shakthy Balan .D

6.3 REPORTS FROM JIRA

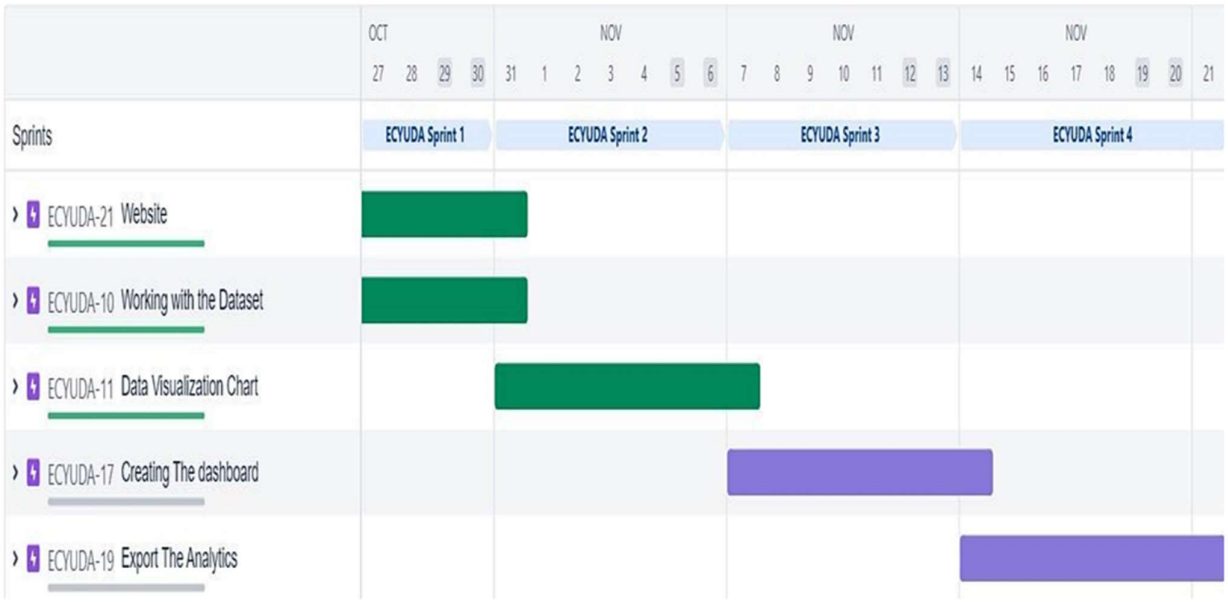
(I) BEFORE START OF THE SPRINT:



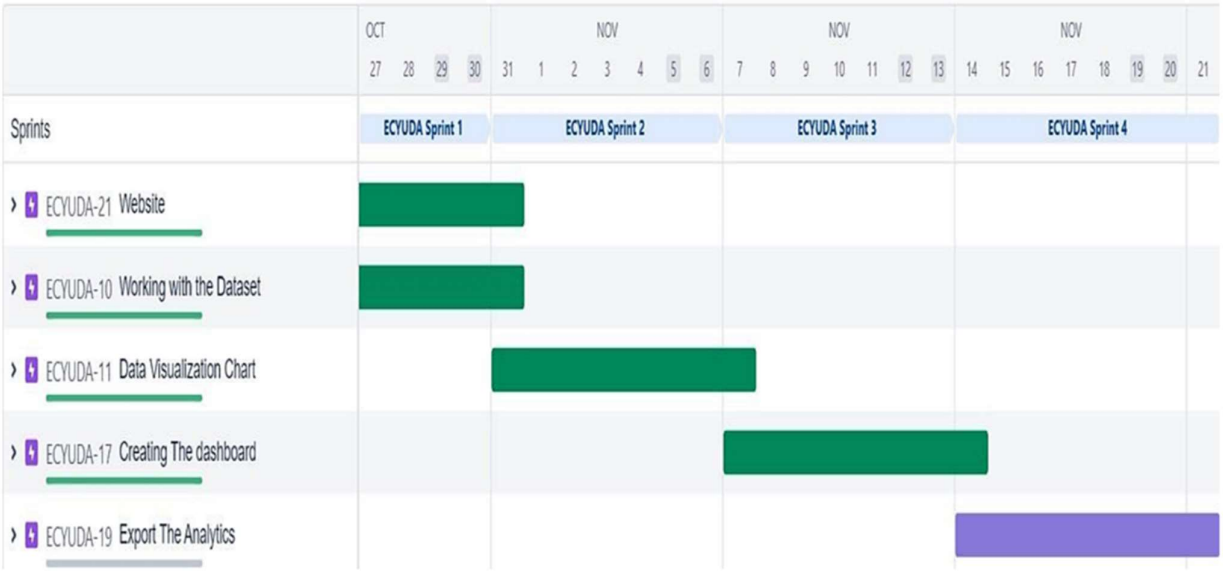
(II) SPRINT 1:



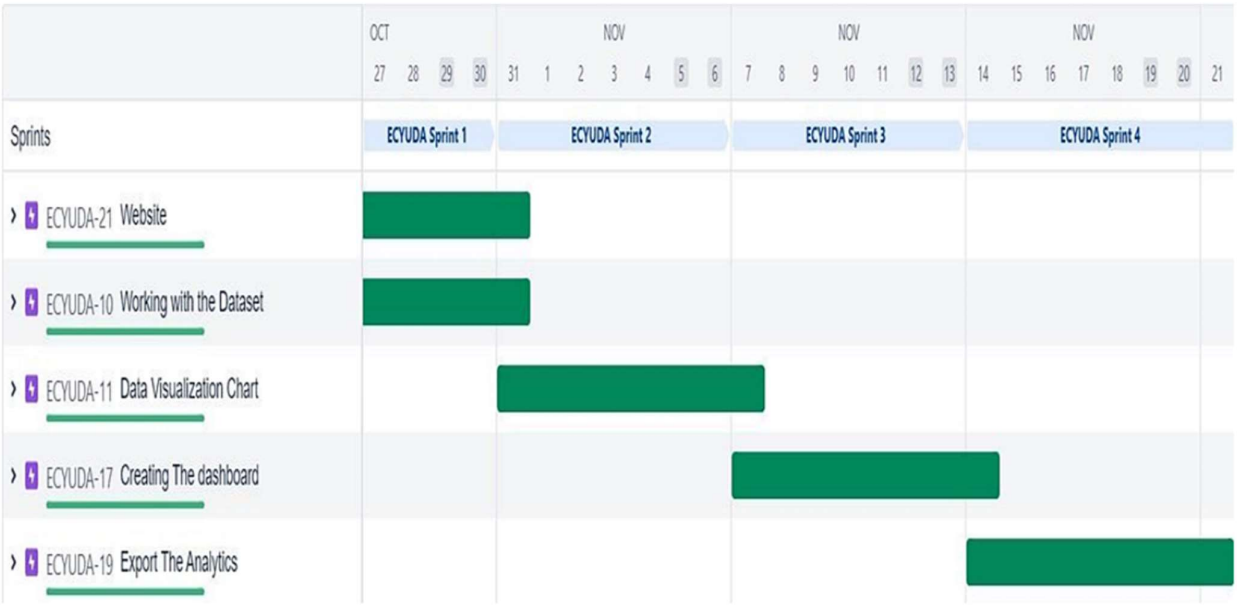
(III) SPRINT 2:



(IV) SPRINT 3:



(V) SPRINT 4:



7.CODING & SOLUTIONING

7.1 FEATURE 1

DASHBOARD DESIGN

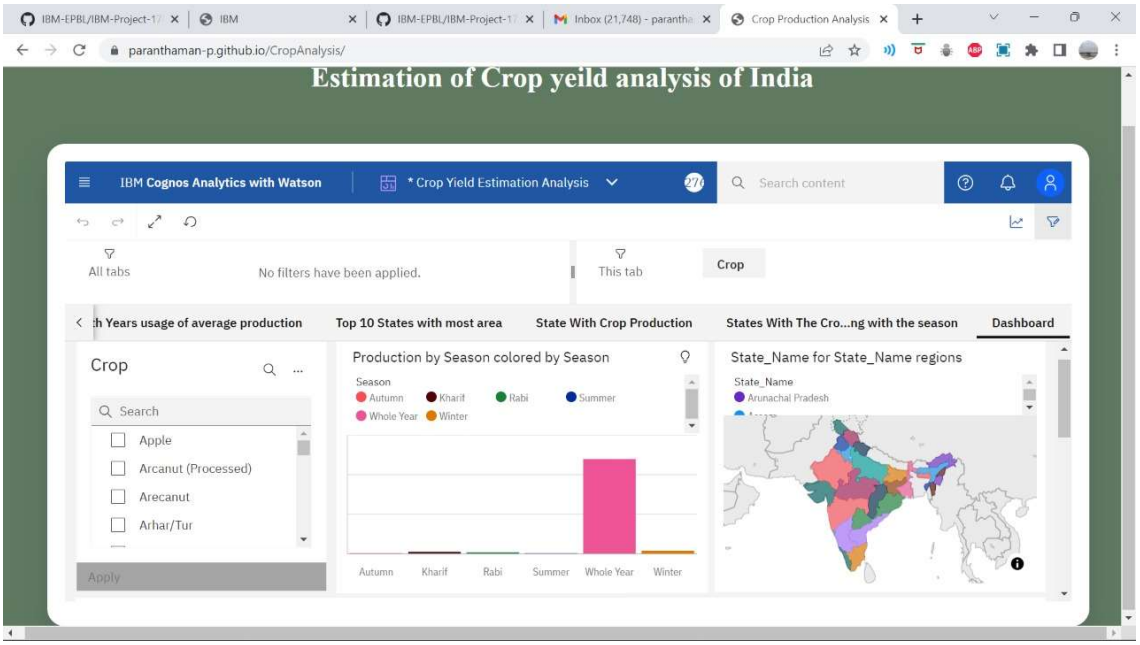
The dashboard is created using IBM Cognos tool which efficiently visualises a given data. The design is incorporated along with page and provides excellent insights on various data regarding crops.

Dashboard.html :

```
<!DOCTYPE html>
<html lang="en" dir="ltr">
<head>
  <meta charset="utf-8">
  <link rel="stylesheet" href="style.css">
  <title>Crop Production Analysis</title>
</head>
<body>
  <h1>Estimation of Crop yeild analysis of India</h1>
  <br /><br />
<div class=fr>
<iframe
src="https://us3.ca.analytics.ibm.com/bi/?perspective=dashboard&amp;pathRef=.my_folders%2FCrop%2BYield%2BEstimation%2BAnalysis&amp;closeWindowOnLastView=true&amp;ui_appbar=false&amp;ui_navbar=false&amp;shareMode=embedded&amp;action=view&amp;mode=dashboard&amp;subView=model000001828a4a94d0_00000002" width="320" height="200" frameborder="0" gesture="media" allow="encrypted-media" allowfullscreen=""></iframe>
</div>
<br />
</body>
</html>
```

styles.css:

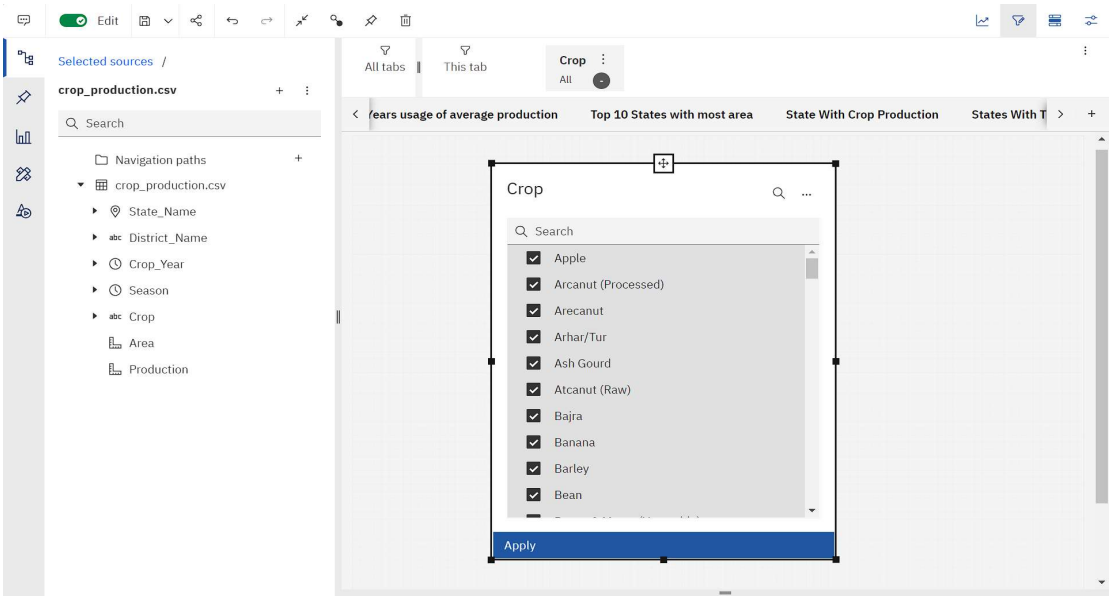
```
@import
url('https://fonts.googleapis.com/css2?family=Poppins:wght@400;500;600;700&display=swap');
body{
  background-color:#5F7A61;
  width: 100%;
  height: 100%
}
h1{
  color: white;
  align-items: center;
  align-content: center;
  text-align: center;
  padding-top: 30px;
  font-family: 'Cinzel';
}
.fr{
  background-color: #ffffff;
   width: 90%;
   height: 80%;
   position: absolute;
 margin-left: 50px;
 margin-right: 50px;
 margin-bottom:50px;
   padding: 20px 20px 20px 20px;
   border-radius: 20px;
   box-shadow: 0 20px 40px rgba(38, 33, 61, 0.2);
}
#f1{
  width: 100%;
  height: 100%;
position: relative;
 }
```



7.2 FEATURE 2:

DATA FILTERS:

The filters used for classifying different parameters of the dataset can be efficiently done using the Cognos tool. The particular state with the specific crop can be visualized.



8.TESTING

8.1 TEST CASES

Test case ID	Feature Type	Component	Test Scenario	Steps To Execute	Result	status
Home Page _ TC_OO1	Functional	Homepage	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
Login page_ TC_OO2	U1	Login page	Verify the UI 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
Login Page_ TC_OO3	Funtional	Dashboard page	Verify user is 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
Login page_ TC_ OO4	Functional	Dashboard page	Verify user is able to view the dashboard and see the charts	1.Enter URL 2.Click on the different charts that the user wants 3.The embedded link will be able to display the charts from cognos	Application should show the expected charts from cognos	Pass

8.2 USER ACCEPTANCE TESTING

(I) PURPOSE OF DOCUMENT

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

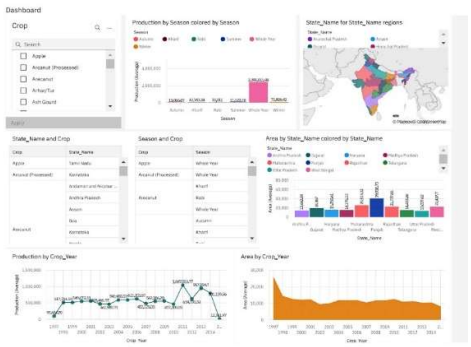
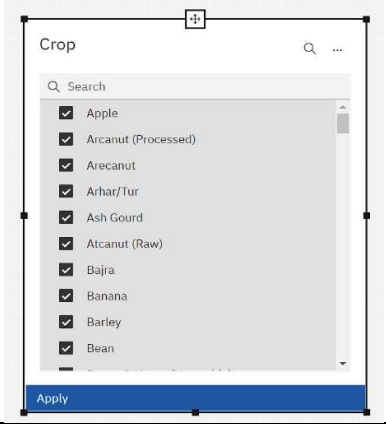
(II) TEST CASE ANALYSIS

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

9.1 PERFORMANCE MATRICS

S.No.	Parameter	Screenshot / Values
1.	Dashboard design	No of Visulizations - 8 
2.	Data Responsiveness	Faster
3.	Amount Data to Rendered (DB2 Metrics)	Data's Rendered: • 2,46,091 – Records • 7 - Fields
4.	Utilization of Data Filters	Yes,Utilized 

5.	Effective User Story	No. of Scene Added - 9
6.	Descriptive Reports	No. of Visulizations / Graphs - 7

10.ADVANTAGES & DISADVANTAGES

ADVANTAGES

The advantage of this Crop yield estimation it is relatively less time-consuming and inexpensive. We can able to know the average productions of the crop, the amount of crop produced in different year and in different districts and in different area. And it is also used by farmers to make decisions about when to plant and harvest crops based on soil moisture content and weather conditions.

It allows us to predict which crops would be opportunity for a given climate. Using the weather and disease related data sets the crop quality can also be improved prediction algorithms help us to classify the data based on the disease and data extracted from the classifier is used to predict soil and crop

DISADVANTAGES

The disadvantage of the system is number of data used for the estimation are less. This method is highly subjective, as the information are collected from the farmers' knowledge and experience.

Due to the changing climatic conditions accurate results cannot be predicted by this condition

11.CONCLUSION

The proposed “ESTIMATE THE CROP YIELD USING DATA ANALYTICS” is used to predict the crop yield using the attributes such State_Name, District_Name, Crop_Year,Season,Crop,Area and Production. The proposed model is build with IBM Cognos Watson. As a result of penetration of technology into agricultural field,there is a marginal improvement in the productivity.The innovation have led to new concepts like digital agriculture, smart farming, precision agriculture etc.It has been observed that analysis has been done on crop, hidden pattern discovery using dataset related to season, area, production data.The activities of agriculture field are numerous like weather forecasting, soil quality assessment, seeds selection, crop yield prediction etc. In this survey, the specific activity, crop yield prediction has been surveyed and the major trends have been identified. It can be concluded that the research in the field of agriculture with reference to using IT trends like data analytics is in its infancy. As the food is the basic need of humans, the requirement of getting the maximum yields using optimal resource will become the necessity in near future as a result of growing population. The survey outcomes indicate the need for improved techniques in crop yield analytics. There exists a lot of research scope in this research area.

12.FUTURE SCOPE

The dashboard creation,visualization have taken lots of procedures and steps.The aim of the future work is to analyze the target attribute by reducing the number of procedures and steps.To improve the accuracy of the analysis algorithm selection procedure need to be optimized. As a future work, the results of the analysis can be improved, using the large number of crop datasets and more weather parameters. This can be also implemented in machine learning model to build in a strong yield prediction model and analysis of all the crops with different climatic conditions and different areas.

13.APPENDIX

Source Code:

Dashboard.html:

```
<!DOCTYPE html>
<html lang="en" dir="ltr">
<head>
  <meta charset="utf-8">
  <link rel="stylesheet" href="style.css">
  <title>Crop Production Analysis</title>
</head>
<body>
  <h1>Estimation of Crop yeild analysis of India</h1>
  <br /><br />
<div class=fr>
<iframe
src="https://us3.ca.analytics.ibm.com/bi/?perspective=dashboard&amp;pathRef=.my_folders%2FCrop%2BYield%2BEstimation%2BAnalysis&amp;closeWindowOnLastView=true&amp;ui_appbar=false&amp;ui_navbar=false&amp;shareMode=embedded&amp;action=view&amp;mode=dashboard&amp;subView=model000001828a4a94d0_00000002" width="320" height="200" frameborder="0" gesture="media" allow="encrypted-media" allowfullscreen=""></iframe>
</div>
<br />
</body>
</html>
```

styles.css:

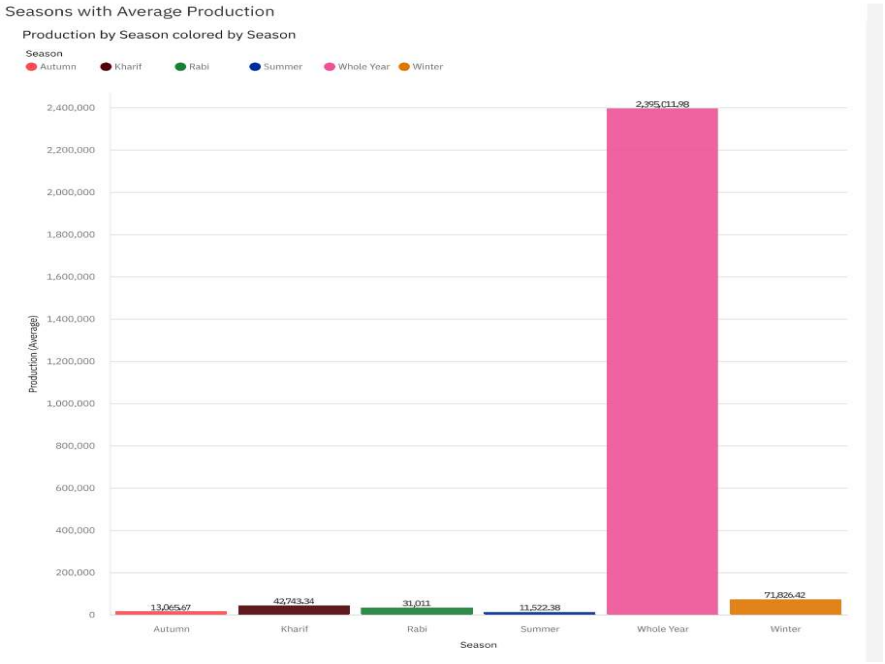
```
@import
url('https://fonts.googleapis.com/css2?family=Poppins:wght@400;500;600;700&display=swap');

body{
```

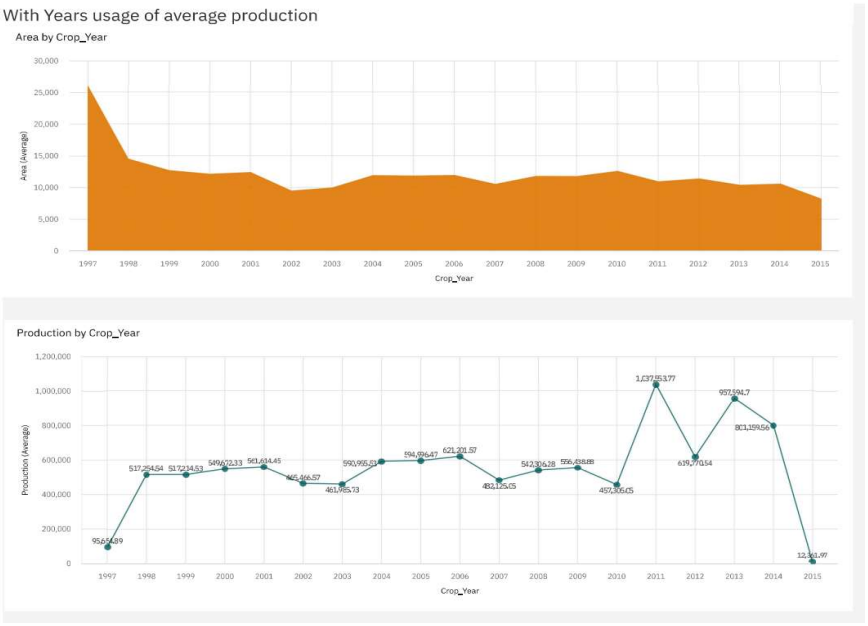
```
  background-color:#5F7A61;
  width: 100%;
  height: 100%
}
h1{
  color: white;
  align-items: center;
  align-content: center;
  text-align: center;
  padding-top: 30px;
  font-family: 'Cinzel';
}
.fr{
  background-color: #ffffff;
   width: 90%;
   height: 80%;
   position: absolute;
 margin-left: 50px;
 margin-right: 50px;
 margin-bottom:50px;
   padding: 20px 20px 20px 20px;
   border-radius: 20px;
   box-shadow: 0 20px 40px rgba(38, 33, 61, 0.2);
}
#f1{
  width: 100%;
  height: 100%;
position: relative;
 }
```

Data Visualization Charts:

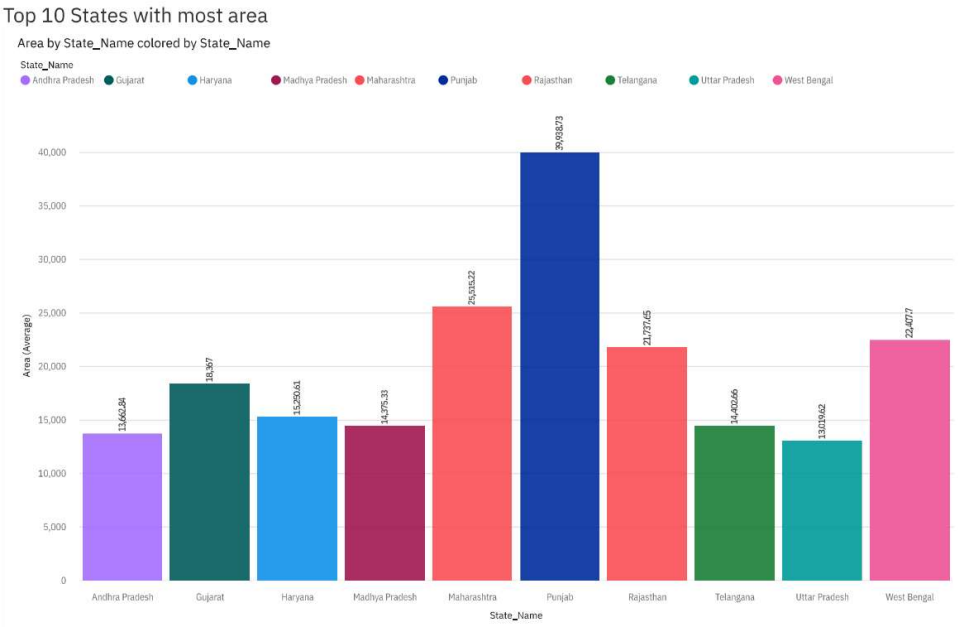
1. Seasons with Average Productions:



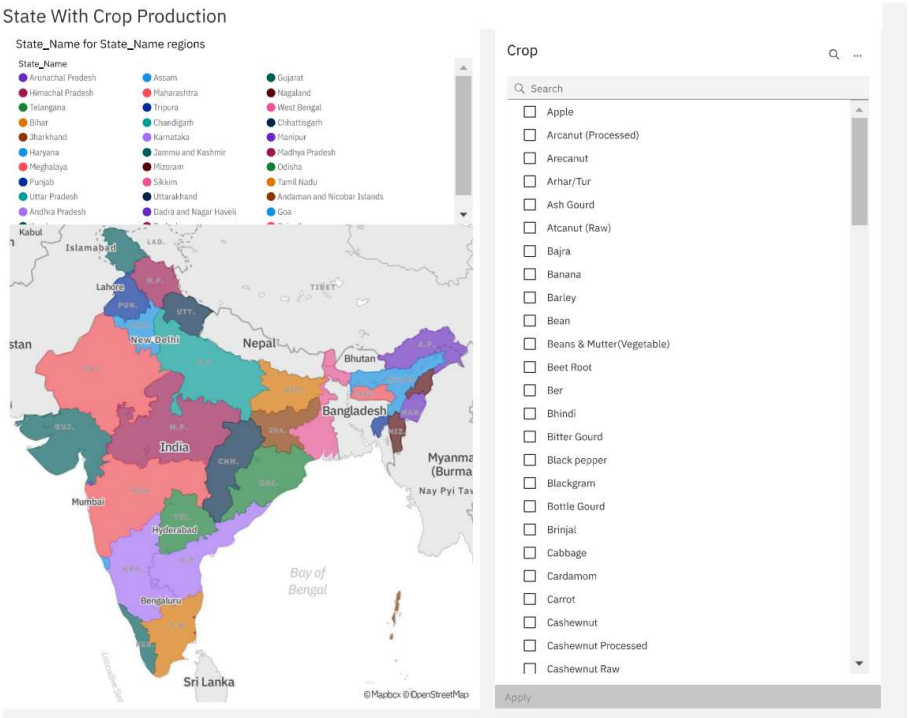
2. Yearly usage of Area in Crop Production.



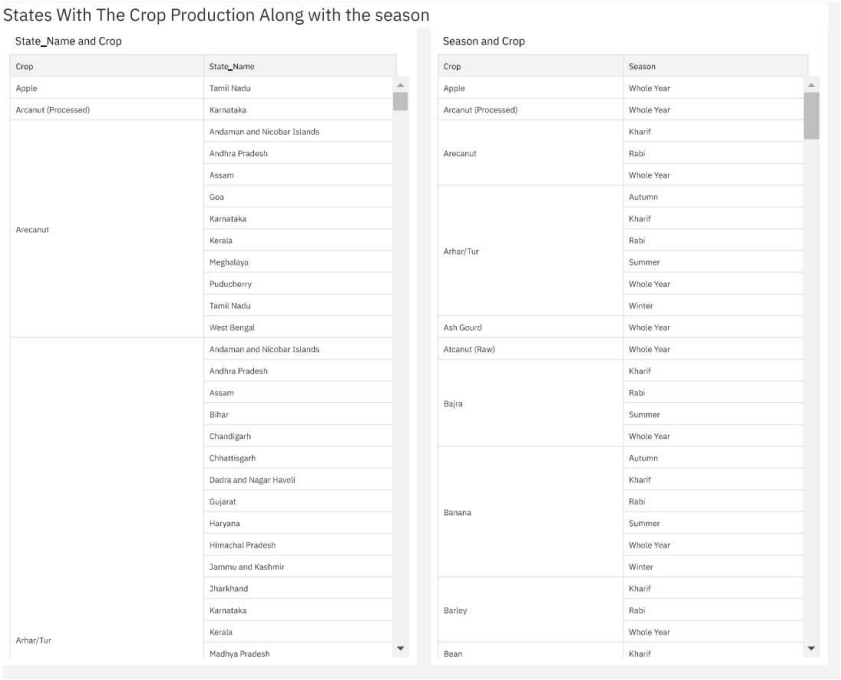
3.Show case top 10 States in Crop Yield Production



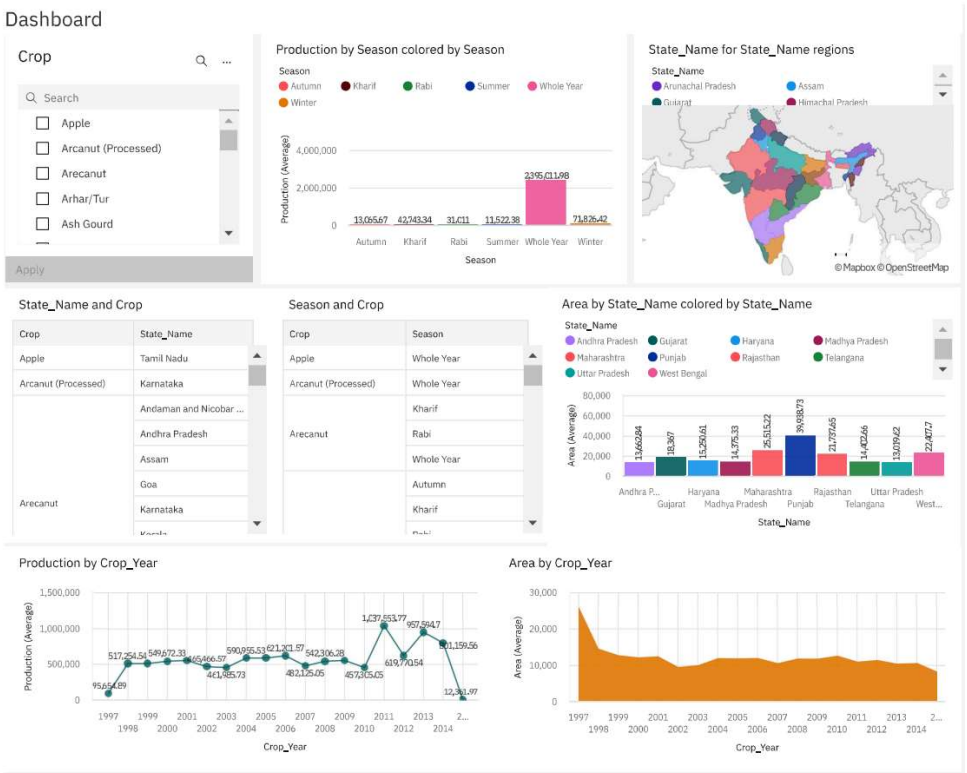
4.Visualization to showcase the Crop Production by State.



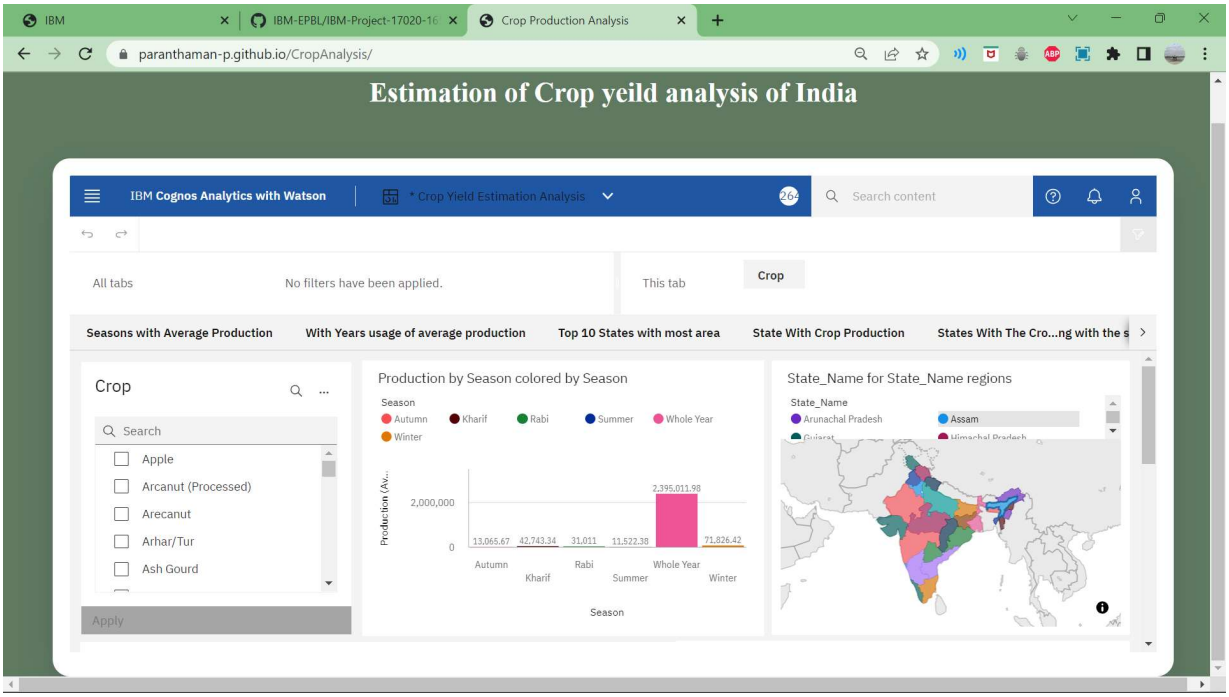
5.Visual analytics to represent the States with Seasonal Crop Production using a Text representation

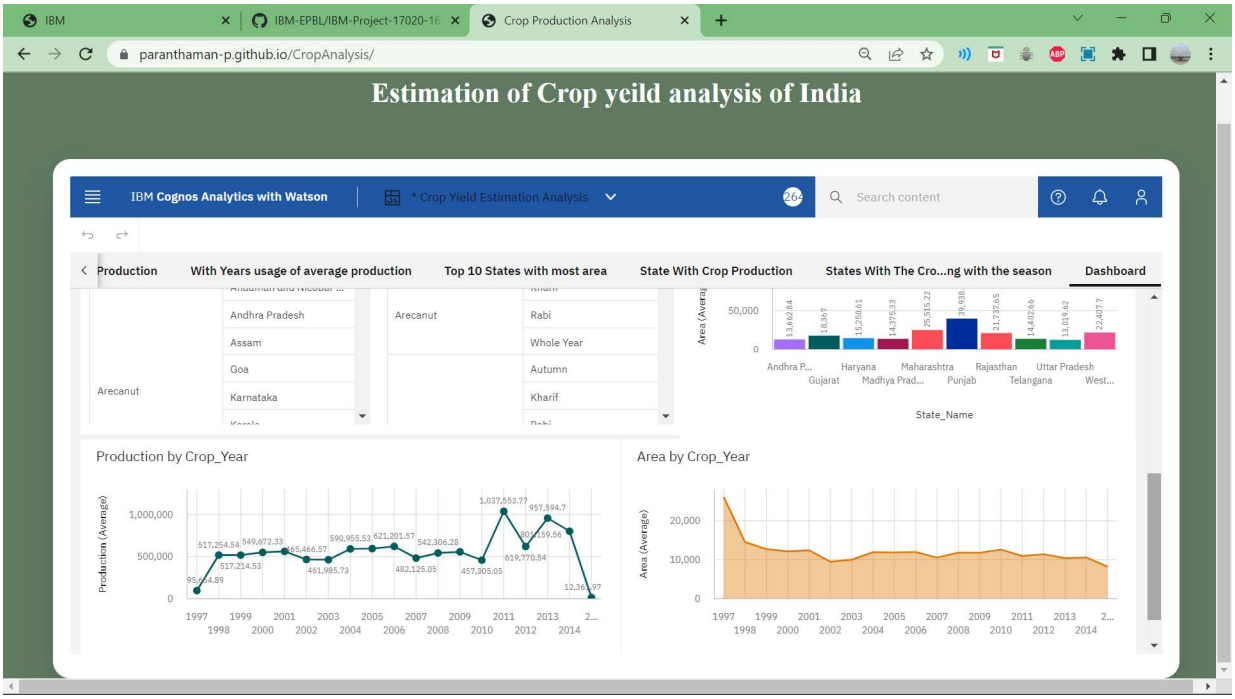


Final Dashboard:



Dashboard Website:





Github & Project Demo Link:

Github Link: https://github.com/IBM-EPBL/IBM-Project-17020-1659626839

Demo Link: https://youtu.be/siiqDouG2zw