

**ESTIMATE THE CROP YIELD USING
DATA ANALYTICS**

A PROJECT REPORT

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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 is primarily depends on weather conditions. Rainfall conditions also influences the rice cultivation. In this context, the farmers necessarily requires a 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 expect. In the past, yield prediction was performed by considering farmer's previous experience on a particular crop. The volume of data is enormous in Indian agriculture. The data when become information is highly useful for many purposes. IBM Cognos Business Intelligence is a web-based integrated business intelligence suite by IBM. It provides a toolset for reporting, analytics, score carding, and monitoring of events and metrics.

The software consists of several components designed to meet the different information requirements in a company. IBM Cognos has components such as IBM Cognos Framework Manager, IBM Cognos Cube Designer, IBM Cognos Transformer. Cognos Analysis Studio helps business users get fast answers to business-related queries. Reporting studio allows you to create pixel-perfect reports for your organization. Cognos event studio allows you to assign a specific event that sends a notification to the stakeholder in your organization. Cognos Metric Studio allows you to monitor and analyze business metrics of your organization by building a scorecard environment.

1.2 Purpose

The main purpose of the project Estimate the Crop Yield Production is to achieve the maximum crop at minimum yield is the ultimate aim of the project. Early detection of problems and management of that problems using data analytics can help the farmers for better crop yield and also analyzing the usage area along with the seasons also increase the production.

2.LITERATURE SURVEY

2.1 Existing problem

1.<https://www.agremo.com/>

2.<https://khetibuddy.com/farming>

1 .We planted the seed in 2015 and have been nourishing it ever since. As we watched our idea sprout, we've changed the name once: we called it AgriSens and as soon as our software platform entered the international market in 2017, we changed its name to Agremo, the name under which our company bloomed.The idea behind Agremo has been always the same: to help people working in agriculture analyze data and obtain the most accurate information for making informed decisions, thus improving their work results and simplifying their everyday activities.

2 .The need for improved crop production is at an all-time high, with limited resources and a rapidly growing population. The adoption of software that tracks activities in farms can help solve this problem by giving insight into how food gets from one stage to another on its journey towards our plate!With our analytics platform, you'll never have to worry about your yields again. We help decision-makers prepare before setting out on the next venture or simply looking back at past successes for guidance as they plan ahead by providing robust data and machine learning algorithms that analyze field information from all over so no detail goes unnoticed when it comes down to analyzing/estimating yield rates.

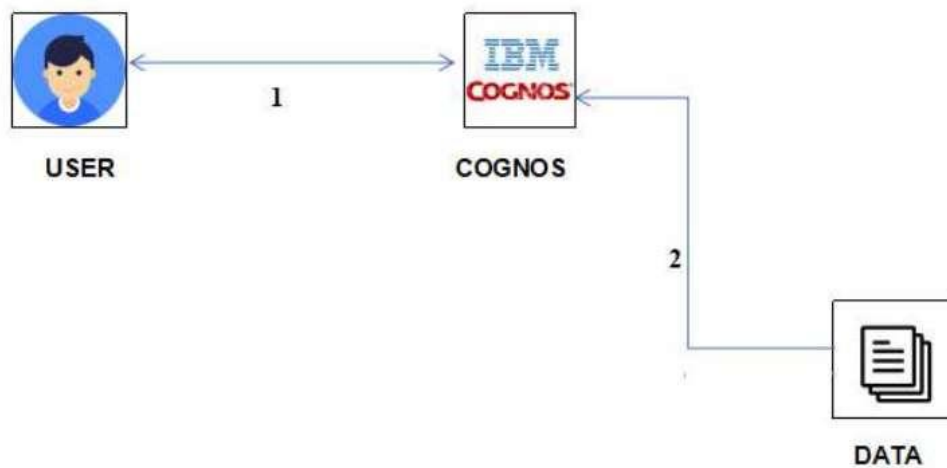
2.2 References

- <https://intellias.com/how-to-encourage-farmers-to-use-big-data-analytics-in -agriculture>
- David B. Lobell, The use of satellite data for crop yield gap analysis, Field Crops Research- 143, 2013; 56–64.
- <https://www.toolbox.com/hr/hr-analytics/articles/what-is-hr-analytics/>
- Krisnawijaya, N. N. K., Tekinerdogan, B., Catal, C., & van der Tol, R. (2022).
- Data analytics platforms for agricultural systems: A systematic literature review. Computers and Electronics in Agriculture, 195, 106813.
- Mauttone, A., & Plà-Aragonés, L. M. (2022). Preface: Contributions of OR to solve agricultural problems. Annals of Operations Research, 314(2), 317-318.

2.3 Problem Statement Definition

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:



Mr.T Ranjith kumar is a 40 years old man. He had a own farming land and do Agriculture for past 20 Years , In this 20 Years he Faced a problems in crop yield . He wants to know when he will obtain more yield also choosing right crop that can be grown in particular region on a particular season.

- * He has faced huge losses for a long time.
- * This problem is usually faced by most farmers.
- * Mr.T.Ranjith Kumar needs to know the result immediately

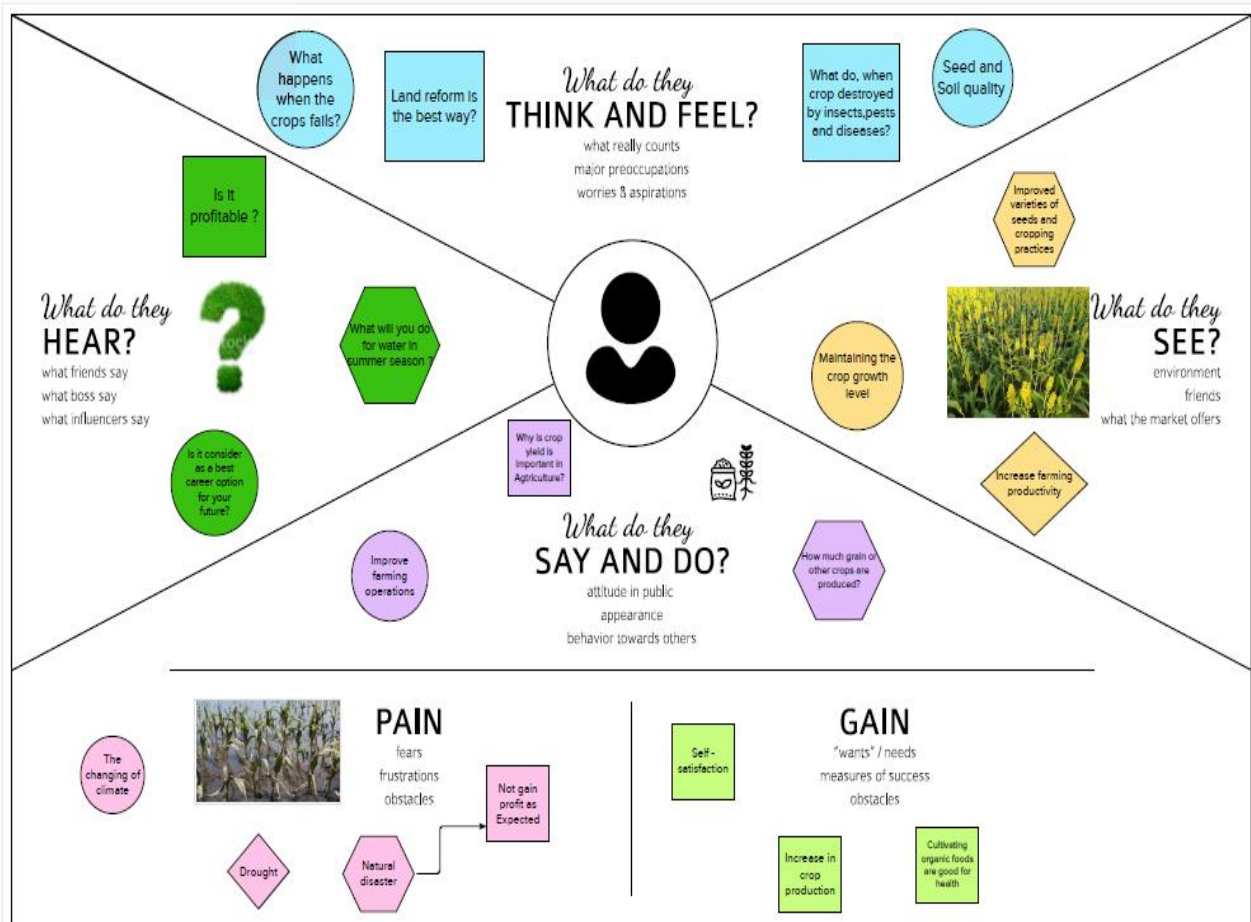
Who does the problem affect?	If the crop yield is low, The farmers who have cultivated the crop People who are dependent on the crop yield as the food Indian Economy because Crop production is one of the most important sources of the income. They will be affected if there is a problem in low yield
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What are the boundaries of the problem?	The harvest should be good,so that the profit will get Improved. Future prediction – What will happen if we make that decision. Do all the possible ways to change moving forward. Location matters for a good crop yield. Data Analytics require Critical Thinking. Want reliable data for analysis
What is the issue?	If we do wrong prediction,the crop yield will be affected.
When does the issue occur?	The crop yield will be affected,if <ul style="list-style-type: none"> • There is an extreme weather • Bugs and Insects • Soil Erosion • Low quality of data for analysis • Lack of commitment and patience
Where does the issue occur?	Due to lack of research on data for analysis <ul style="list-style-type: none"> • If we work without the evidence base • If the location is not considered during analysis
Why is it important that we fix the problem?	If we fix the problem, <ul style="list-style-type: none"> • Good Harvest • Insight of Crop production in India • Visible progress in the yield Predictive Analysis of crop in real time
What solution to solve this issue?	A system is introduced to analyze and estimate the crop yield on a particular area and on a particular season.
What methodology used to solve the issue?	Data analytics techniques can be used . Using the previous data right crop for right season and soil can be identified. Hence more yield can be obtained.

3 .IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas


An empathy map is a simple, easy-to-digest visual that captures knowledge about a user's behaviours and attitudes. It is a useful tool to help teams better understand their users. Creating an effective solution requires understanding the true problem and the person who is experiencing it. The exercise of creating the map helps participants consider things from the user's perspective along with his or her goals and challenges.



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. participants are encouraged to collaborate, helping each other develop a rich amount of creative solutions. Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

Template




Brainstorm & idea prioritization

Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

- 10 minutes to prepare
- 1 hour to collaborate
- 3-8 people recommended


Show template feedback




Before you collaborate

A little bit of preparation goes a long way with this session. Here's what you need to do to get going.


10 minutes

**Team gathering**

Define who should participate in the session and send an invite. Share relevant information or pre-work ahead.


**Set the goal**

Think about the problem you'll be focusing on solving in the brainstorming session.

**Learn how to use the facilitation tools**

Use the Facilitation Superpowers to run a happy and productive session.

Open article →




Define your problem statement

What problem are you trying to solve? Frame your problem as a How Might We statement. This will be the focus of your brainstorm.

5 minutes


PROBLEM


TO ESTIMATE THE CROP YIELD USING DATA ANALYTICS AND HELP THE FARMERS TO PREDICT THE MAIN CONDITIONS AND OTHER VARIABLES EVEN BEFORE SOWING SEEDS





Key rules of brainstorming


To run an smooth and productive session


**Stay in topic.**

**Encourage all ideas.**

**Deferr judgement.**

**Listen to others.**

**Go for volume.**

**If possible, be visual.**

2

Brainstorm

Write down any ideas that came to mind that address your problem statement.

10 minutes

1*

You can select a sticky note and edit it (just click on it) or delete it (just click on the trash icon).

ABITHA



NANDHU



INDHUMATHI



CHARAN RAJ



3

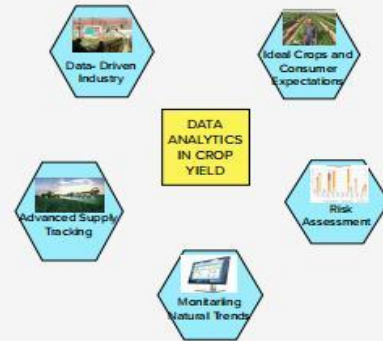
Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you can break it up into smaller sub-groups.

20 minutes

1*

Abstract sticky notes help to easily move, combine, and delete sticky notes, rearrange, and rearrange sticky notes as you go.

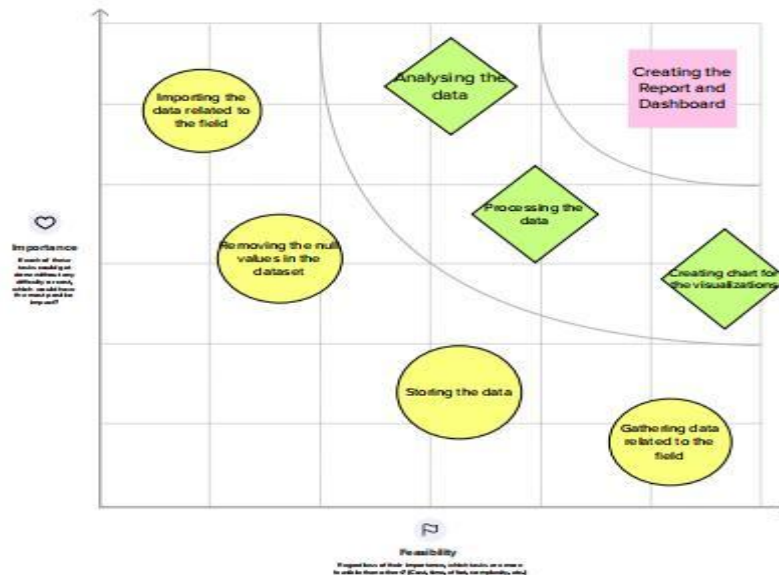


4

Prioritize

Your team should agree on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

30 minutes



5

After you collaborate

You can export the mural as an image or pdf to share with members of your company who might find it helpful.

Quick add-ons

- ☐ Share the mural: Share a view link to the mural with the link to help them in the map about the content of the mural.
- ☐ Export the mural: Export a copy of the mural as a PDF or PNG to attach to emails, include in slides, or save to your drive.

Keep moving forward

- ☐ Strategic Blueprint: Define the components of a new idea or strategy. Open the template.
- ☐ Customer experience journey map: Understand customer needs, motivations, and obstacles for an experience. Open the template.
- ☐ Strategic roadmap: Identify strengths, weaknesses, opportunities, and threats (SWOT) to develop a plan. Open the template.

Share template feedback

3.3 Proposed Solution

In this activity you are expected to prepare the proposed solution document, which includes the novelty, feasibility of idea, business model, social impact, scalability of solution, etc

S.No.	Parameter	Description
1	Problem Statement (Problem to be solved)	Increase of Poverty, increase in farmers Suicide, Increase the profit in yield, Loss of appetite.
2	Idea / Solution description	Provide perfect data report after deep analyse of past data. Helping them out to overcome loss in farming and business.
3	Novelty / Uniqueness	With this solution we can Analysis, visualize the data and gives the farmers to choose which plant/crop to cultivate at which period of time or season to gain more profit from the crop yield.
4	Social Impact / Customer Satisfaction	By providing the perfect data visuals it creates a large impact in crop yield. And gain more profit to the farmers
5	Business Model (Revenue Model)	We can create large number of crop production and other raw materials. Increase in natural products and organic foods from this we can increase the Revenue for the farmers
6	Scalability of the Solution	With the data visual reports, we can cultivate crop according to the Crop, State, district, climate, soil can change the estimation of Crop yield

3.4 Problem Solution fit

The Problem-Solution Fit canvas is based on the principles of Lean Startup, LUM (Lazy User Model) and User Experience design. It helps entrepreneurs, marketers and corporate innovators identify behavioral patterns and recognize what would work and why. It is a template to help identify solutions

with higher chances of solution adoption, reduce time spent on testing and get a better overview of the current situation.

My goal was to create a tool that translates a problem into a solution, taking into account customer behavior and the context around it. None of the existing canvases or frameworks were giving me an overview and insight into the real customer situation during his/her decision-making process. With this template you will be able to take important information into consideration at an earlier stage and look at problem solving in depth. It increases your chances of finding problem-solution and product-market fit.

Define CS, fit into CC	1. CUSTOMER SEGMENT(S) CS Farmer, Agricultural economist, Agricultural Engineer	6. CUSTOMER CONSTRAINTS CC <ul style="list-style-type: none"> Clear understanding of analysis due to visualization technique Any kind of customers can understand the analysis and interpretation Less time consumption 	5. AVAILABLE SOLUTIONS AS Provide perfect data report after deep analyse of past data. Helping them out to overcome loss in farming and business.	Explore AS, differential
	2. JOBS-TO-BE-DONE / PROBLEMS <ul style="list-style-type: none"> Seasons with average productions With years usage of area and production Top 10 states with most area State with crop production States with the crop production along with season Dashboard creation. 	9. PROBLEM ROOT CAUSE RC In order to estimate the crop yield to increase the quality and reduce the risk management.	7. BEHAVIOUR BE <ul style="list-style-type: none"> User should provide correct input for analysis Dashboard should be provided with best algorithm to give feasible solution. 	

Identify strong TR & EM	3. TRIGGERS TR Climate and temperature, Soil fertility, Availability of water, Light intensity, oxygen and CO2, Crop diseases or pests.	10. YOUR SOLUTION SL With the data visual reports, we can cultivate crop according to the Crop, State, District, Climate, Soil can change the estimation of crop yield.	8.CHANNELS of BEHAVIOUR CH ONLINE Visualising the crop yield analysis. OFFLINE Based on the analysis user gets the expected outcome.	Identify strong TR & EM
	4. EMOTIONS: BEFORE / AFTER EM Before: Stress of the farmer about the crop yield. Depression of the farmer due to less production of the crop growth. After: Feel joy, Happiness, and peace.			

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 Registration	➤ Registers a new user through registration form or mail
FR-2	User Confirmation	➤ Confirmation through Email or OTP.
FR-3	Data collection	➤ Data collection. Relevant data is gathered from operational systems, data warehouses, data lakes and other data sources. <ul style="list-style-type: none">• Data discovery and profiling.• Data cleansing.• Data structuring.• Data transformation and enrichment.• Data validation and publishing
FR-4	Data Preprocessing	➤ Data preprocessing a component of data preparation, describes any type of processing performed on raw data to prepare it for another data processing procedure. It has traditionally been an important preliminary step for the data mining process.
FR-5	Model Evaluation	➤ Model evaluation is the process of using different evaluation metrics to understand a machine learning model's performance, as well as its strengths and weaknesses. Model evaluation is important to assess the efficacy of a model during initial research phases, and it also plays a role in model monitoring
FR-6	Prediction Output	➤ Predictive analytics is the process of using data analytics to make predictions based on data. This process uses data along with analysis, statistics, and machine learning techniques to create a predictive model for forecasting future events.

4.2 Non-functional Requirements:

Following are the non-functional requirements of the proposed solution

NFR No.	Non-Functional Requirement	Description
NFR-1	Usability	➤ It helps the farmers to monitor the health of the crops in real time, create predictive analysis related to future yield.
NFR-2	Security	➤ Data security functions to prevent data breaches, reduce risk of data exposure and ensure the ongoing safe and secure use of private data by minimizing exposure risk.
NFR-3	Reliability	➤ The reliability of the data determines whether businesses can make good decisions or not. If the data is unreliable it is useless to the organizations
NFR-4	Performance	➤ Regularly evaluating the performance of the organization can help us to understand how much progress we're making towards our goal. A performance analysis is a tool you can use to check important metrics of crop yield for very month or year and make plans for adjustment and improvement.
NFR-5	Availability	➤ Data should be available for access at anytime from anywhere.

5.PROJECT DESIGN

System design thought as the application of theory of the systems for the development of the project. System design defines the architecture, data flow, use case, class, sequence and activity diagrams of the project development.

IBM Cognos Analytics

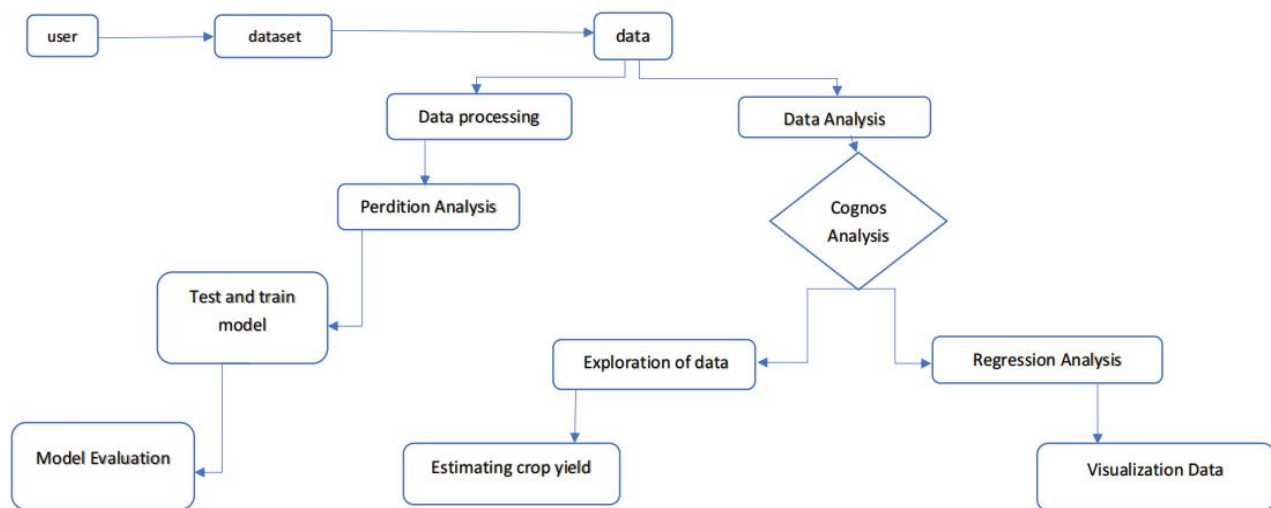
IBM Cognos Analytics is a set of business intelligence tools available on cloud or on- premise. The primary focus is in the area of Descriptive Analytics, to help users see the information in your data through dashboards, professional reporting and self-service data exploration. In this work, we used the IBM cognos data analytics for analysing the crop yield data.

Following are important features of IBM Cognos:

- 1) **Get Connected** - Connect your data effortlessly Import data from CSV files and spreadsheets. Connect to cloud or on-premises data sources, including SQL databases, Google BigQuery, Amazon, Redshift, and more.
- 2) **Prepare your data** – Prepare and connect data automatically Save time cleaning your data with AI-assisted data preparation. Clean and prep data from multiple sources, add calculated fields, join data, and create new tables.
- 3) **Build visualizations** - Create dynamic dashboards easily Quickly create compelling, interactive dashboards. Drag and drop data to create auto- generated visualizations, drill down for more detail, and share using email or Slack.
- 4) **Identify Patterns** – Uncover hidden patterns Ask the AI assistant a question in plain language, and see the answer in visualization. Use time series modelling to predict seasonal trends.
- 5) **Generate Personalised Reports** – Create and deliver personalized reports Keep your stakeholders up-to-date, automatically. Create and share dynamic personalized, multi-page reports in the formats your stakeholders want.
- 6) **Gain Insights** - Make confident data decisions Get deeper insights without a data science background. Validate what you know, identify what you don't with statistically accurate time-series forecasting and pinpoint patterns to consider.
- 7) **Stay Connected** – Go Mobile Stay connected on the go with the new mobile app. Access data and get alerts right from your phone.

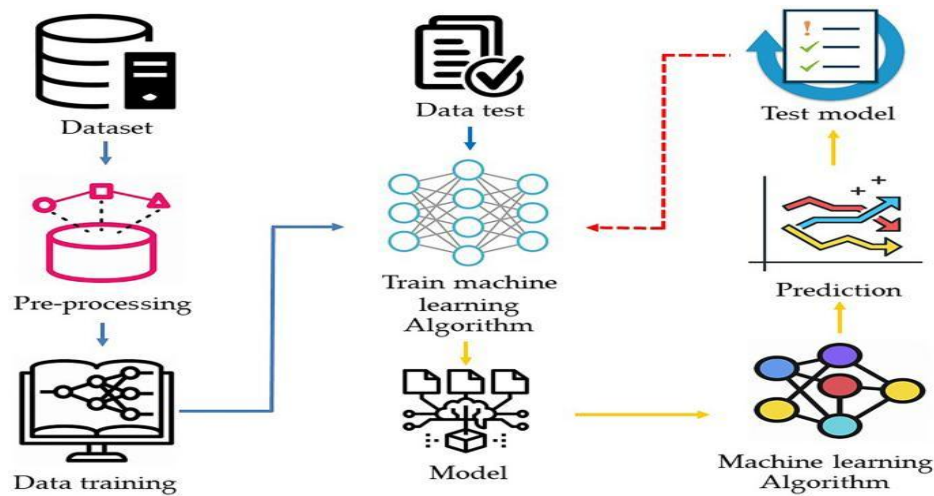
5.1 Data Flow Diagrams

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.



5.2 Solution & Technical Architecture

Technology architecture associates application components from application architecture with technology components representing software and hardware components. Its components are generally acquired in the marketplace and can be assembled and configured to constitute the enterprise's technological infrastructure. Technology architecture provides a more concrete view of the way in which application components will be realized and deployed



5.3 User Stories

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance Criteria	Priority	Release
Tester	Domain Expertise	USN-1	The data set is pre processed and trained	Introduction and data Processing	High	Sprint 1
		USN-2	Login Page is created for user interaction	Login page	High	Sprint 2
Developer	Data analysis tools	USN-3	The data set is classified and modelled using various tools	Data Modelling	High	Sprint 3
End User	Data visualization tools	USN-4	The output is analysed using big data tools and the outcome is visualized	Data Visualization	High	Sprint 4

6.PROJECT PLANNING & SCHEDULING

6.1 Sprint Planning & Estimation

Use the below template to create product backlog and sprint schedule

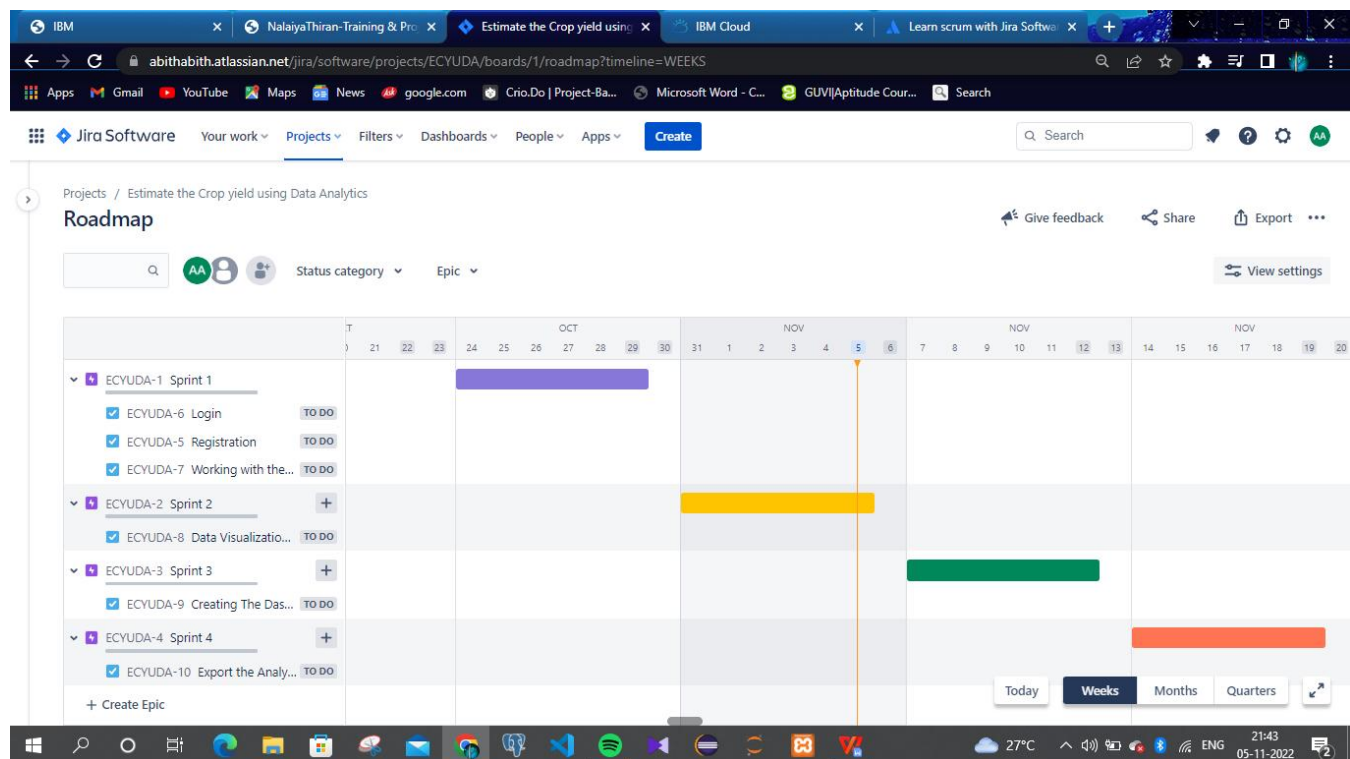
Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register for by entering my Agri - id card and request..	2	High	Charanraj S
		USN-2	As a user, I can register for the application through Gmail	2	Medium	Indhumathi M
	Login	USN-3	As a user, I can Call and request or Approach for dataset	2	High	Charanra S Nandhu G
	Working with the Dataset	USN-4	To work on the given dataset, Understand the Dataset.	4	High	Charanraj S Indhumathi M Nandhu G Abitha A
		USN-5	Load the dataset to Cloud platform then Build the required Visualizations	10	High	Charanraj S Indhumathi M Nandhu G Abitha A
Sprint-2	Data Visualization Chart	USN-6	Using the Crop production in Indian dataset, create various graphs and charts to highlight	4	Medium	Charanraj S Indhumathi M

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
			the insights and visualizations. *Build a Visualization to showcase Average Crop Production by Seasons.			
			*Showcase the Yearly usage of Area in Crop Production.	4	Medium	Abitha A Nandhu G
			Build a visualization to show case top 10 States in Crop Yield Production by Area.	4	Medium	Indhumathi M Abitha A
			Build the required Visualization to showcase the Crop Production by State.	4	Medium	Charanraj S Nandhu G
			Build Visual analytics to represent the Sates with Seasonal Crop Production using a Text representation.	4	Medium	Nandhu G Abitha A
Sprint-3	Creating The dashboard	USN-8	Create the Dashboard by using the created visualizations.	20	High	Charanraj S Indhumathi M Nandhu G Abitha A
Sprint-4	Export The Analytics	USN-9	Export the created Dashboard	20	High	Charanraj S Indhumathi M Nandhu G Abitha A

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 Reports from JIRA



7.CODING & SOLUTIONING (Explain the features added in the project along with code)

7.1 Feature 1

Dashboard.html

```
<html>
<head>
<title>
Data Demo
</title>
<meta charset="utf-8">
<meta name="viewport" content="width=device.width, initial-scale=1">
<link href="https://cdn.jsdelivr.net/npm/bootstrap@S.2.1/dist/css/bootstrap.min.css" rel="stylesheet">
<script src="https://cdn.jsdelivr.net/npm/bootstrap@S.2.1/dist/js/bundle.min.js"></script>
</head>
<body>
<div class="container-fluid p-5 bg-primary text-white text-center">
</div>
<center><iframe
src="https://us3.ca.analytics.ibm.com/bi/?perspective=dashboard&pathRef=.my_folders%2Fcrop%
2Bdashboard&closeWindowOnLastView=true&ui_appbar=false&ui_navbar=false&
shareMode=embedded&action=view&mode=dashboard&subView=model00000184896a
43ef_000000000" width="100%" height="100%" frameborder="0" gesture="media" allow="encrypted-
media" allowfullscreen=""></iframe></center>
</body>
</html>
```

Login.html

```
<!DOCTYPE html>
<html>

<head>
<title>Login Form</title>
<link rel="stylesheet" type="text/css" href="..\static\css\login.css">
```

```
<link href="https://fonts.googleapis.com/css?family=Poppins:600&display=swap" rel="stylesheet">
<script src="https://kit.fontawesome.com/a81368914c.js"></script>
<meta name="viewport" content="width=device-width, initial-scale=1">
</head>

<body>

<div class="container">

<div class="img">
<div id="png"><a href="/" title="HOME"></a></div>

</div>

<div class="login-content">

<form action="{{url_for('login')}}" method="POST">
<div class="msg">{{ msg }}</div>

<h2 class="title">Welcome</h2>
<div class="input-div one">
<div class="i">
<i class="fas fa-user"></i>
</div>
<div class="div">

<input type="text" name="Username" placeholder="username" class="input" required>
</div>
</div>
<div class="input-div pass">
<div class="i">
<i class="fas fa-lock"></i>
</div>
<div class="div">

<input type="password" name="Password" placeholder="password" class="input" required>
</div>
</div>
<div class="btn">
<button type="login" class="btn btn-default">Login</button>
</div><br><br><br><br>
```



```
<!--Password-box-->
<div class="text">

<input placeholder=" Password" type="password" name="password"/>
</div>

<!--tremes-->

<div class="tremes">
<input class="check" type="checkbox" required/>
<p class="conditions">I read and agree to <a href="#">Termes &amp; Conditions</a></p>
</div>
<!--button-->
<div class="toop">
<button type="submit" class="btn btn-primary">CREATE ACCOUNT</button> </div><br>

</form>

<!--sign-in-->
<div
class="t">&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&~
p;<p class="conditions" id="p3">Already have an account ?&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&~
href="/login">Login</a></p> </div></div>
</div>
<!--text-container-->
<div class="text-container">

<h1 style="color: #2d2c2c;font-family:cursive;">Glad to see you</h1>

<div class="diag"></div>
</div>
</div>
</body>
</html>
```

login.css

```
*{
    padding: 0;
    margin: 0;
    box-sizing: border-box;
}

body{
    font-family: 'Poppins', sans-serif;
```

```
    overflow: hidden;
}

.wave{
    position: fixed;
    bottom: 0;
    left: 0;
    height: 100%;
    z-index: -1;
}

.container{
    width: 100vw;
    height: 100vh;
    display: grid;
    grid-template-columns: repeat(2, 1fr);
    grid-gap :7rem;
    padding: 0 2rem;
}

.img{
    display: flex;
    justify-content: flex-end;
    align-items: center;
}

.login-content{
    display: flex;
    justify-content: flex-start;
    align-items: center;
    text-align: center;
}

.img img{
    width: 500px;
}

form{
    width: 360px;
}

.login-content img{
    height: 100px;
}

.login-content h2{
```

```
        margin: 15px 0;
        color: #333;
        text-transform: uppercase;
        font-size: 2.9rem;
    }

    .login-content .input-div {
        position: relative;
        display: grid;
        grid-template-columns: 7% 93%;
        margin: 25px 0;
        padding: 5px 0;
        border-bottom: 2px solid #d9d9d9;
    }

    .login-content .input-div.one {
        margin-top: 0;
    }

    .i {
        color: #d9d9d9;
        display: flex;
        justify-content: center;
        align-items: center;
    }

    .i i {
        transition: .3s;
    }

    .input-div > div {
        position: relative;
        height: 45px;
    }

    .input-div > div > h5 {
        position: absolute;
        left: 10px;
        top: 50%;
        transform: translateY(-50%);
        color: #999;
        font-size: 18px;
        transition: .3s;
    }

    .input-div:before, .input-div:after {
```



```
        content: "";
        position: absolute;
        bottom: -2px;
        width: 0%;
        height: 2px;
        background-color: #38d39f;
        transition: .4s;
    }

    .input-div:before{
        right: 50%;
    }

    .input-div:after{
        left: 50%;
    }

    .input-div.focus:before, .input-div.focus:after{
        width: 50%;
    }

    .input-div.focus > div > h5{
        top: -5px;
        font-size: 15px;
    }

    .input-div.focus > .i > i{
        color: #38d39f;
    }

    .input-div > div > input{
        position: absolute;
        left: 0;
        top: 0;
        width: 100%;
        height: 100%;
        border: none;
        outline: none;
        background: none;
        padding: 0.5rem 0.7rem;
```

login.css

```
font-size: 1.2rem;
color: #555;
font-family: 'poppins', sans-serif;
```

```

}

.input-div.pass{
    margin-bottom: 4px;
}

a{
    display: block;
    text-align: right;
    text-decoration: none;
    color: #999;
    font-size: 0.9rem;
    transition: .3s;
}

a:hover{
    color: #38d39f;
}

.btn{
    display: block;
    width: 100%;
    height: 50px;
    border-radius: 25px;
    outline: none;
    border: none;
    background-image: linear-gradient(to right, #32be8f, #38d39f, #32be8f);
    background-size: 200%;
    font-size: 1.2rem;
    color: #fff;
    font-family: 'Poppins', sans-serif;
    text-transform: uppercase;
    margin: 1rem 0;
    cursor: pointer;
    transition: .5s;
}

.btn:hover{
    background-position: right;
}

@media screen and (max-width: 1050px){
    .container{
        grid-gap: 5rem;
    }
}

```

```
@media screen and (max-width: 1000px){
    form{
        width: 290px;
    }

    .login-content h2{
        font-size: 2.4rem;
        margin: 8px 0;
    }

    .img img{
        width: 400px;
    }
}

@media screen and (max-width: 900px){
    .container{
        grid-template-columns: 1fr;
    }

    .img{
        display: none;
    }

    .wave{
        display: none;
    }

    .login-content{
        justify-content: center;
    }
}

.container{
    overflow:scroll
}

.container::-webkit-scrollbar {
    display: none;
}

ul {
    position:relative;
    top:-20px;
    left:0%;
    right:10%;
    transform: translate(-50%, -50%);
    margin: 75px;
```

```
padding:0;
display:flex;
flex:auto;
}

ul li {
    list-style: none;
}

ul li a {
    position: relative;
    width:60px;
    height:60px;
    display:block;
    text-align:center;
    margin:0 10px;
    border-radius: 50%;
    padding: 6px;
    box-sizing: border-box;
    text-decoration:none;
    box-shadow: 0 10px 15px rgba(0,0,0,0.3);
    background: linear-gradient(0deg, #ddd, #fff);
    transition: .5s;
}

ul li a:hover {
    box-shadow: 0 2px 5px rgba(0,0,0,0.3);
    text-decoration:none;
}

ul li a .fab {
    width: 100%;
    height:100%;
    display:block;
    background: linear-gradient(0deg, #fff, #ddd);
    border-radius: 50%;
    line-height: calc(60px - 12px);
    font-size:24px;
    color: #262626;
    transition: .5s;
}

ul li:nth-child(1) a:hover .fab {
    color: #3b5998;
}
```

```

ul li:nth-child(2) a:hover .fab {
    color: #00aced;
}

ul li:nth-child(3) a:hover .fab {
    color: #dd4b39;
}

ul li:nth-child(4) a:hover .fab {
    color: #007bb6;
}

ul li:nth-child(5) a:hover .fab {
    color: #e4405f;
}

.app{
    position: relative;
    top: -70px;
    height: 5%;

}

#app1 {
    font-style: oblique;
    color:blue ;
}

#png{
    position: relative;
    top: -300px;
    right: 50px;

}

```

signup.css

```

@charset "utf-8";
/* CSS Document */
body{
    background-color:#eef1f8;
    margin:0px;
    padding:0px;
}
a{
    text-decoration:none;
}
.container{

```

```
width:100%;
height:100%;
background-color:#FFFFFF;
position: absolute;
left:50%;
top:49%;
transform:translate(-50%,-50%);
box-shadow:2px 2px 30px rgba(66,57,238,0.2);
border-radius:20px;
display:flex;
justify-content: center;
align-items:center;
background-image: url('../images/bg.gif');
background-repeat:no-repeat;
background-size:cover;
}
.sign-up{
    position: relative;
    left: -250px;
width:50%;
display:flex;
flex-direction:column;
align-items: center;
}
.text-container{
    position: relative;
    top:-100px; padding-bottom:-50px;
width:50%;
height:100%;
display:flex;
flex-direction:column;
justify-content: center;
align-items: center;
margin-left:700px;
margin-bottom:-10px;
top:-40px
}
.heading{
    font-family:calibri;
    color:rgba(30,30,30,1);
position: relative;
left:80px ;
}
.text{
```

```
width:350px;
height:50px;
box-shadow:2px 6px 18px rgba(66,57,238,0.3);
border-radius: 30px;
display:flex;
align-items:center;
margin:10px;
}
.text input{
height:40px;
width:80%;
outline:none;
border:none;
font-size:14px;
margin:5px;
}
.text img{
margin-left:20px;
}
.conditions{
font-family:myriad pro;
color:#bbc1cb;
font-size:14px;
}
.trems{
top:20px ;
position: relative;
left:37px ;

display: flex;
align-items:center;
}
.conditions a{
color:#7d22e3;
font-weight:500;
}
button{
width:200px;
height:40px;
outline:none;
border:none;
border-radius:20px;
background:linear-gradient(-30deg,#3b02ed,#8e2ae0 55%);
box-shadow:2px 6px 16px rgba(66,57,238,0.3);
color:#FFFFFF;
font-weight:600;
```

```
letter-spacing:1px;
font-weight: 13px;
}
button:active{
transform:scale(1.1);
}
.text-container p{
width:70%;
text-align: center;
font-family:arial;
font-size: 15px;
font-weight: 400;
line-height:0px;
}
ul {
    position:relative;
    top:40px;
    left:25%;
    right:100px;
    transform: translate(-50%, -50%);
    margin: 75px;
    padding:0;
    display:flex;
    flex:auto;
}

ul li {
    list-style: none;
}

ul li a {
    position: relative;
    width:60px;
    height:60px;
    display:block;
    text-align:center;
    margin:0 10px;
    border-radius: 50%;
    padding: 6px;
    box-sizing: border-box;
    text-decoration:none;
    box-shadow: 0 10px 15px rgba(0,0,0,0.3);
    background: linear-gradient(0deg, #ddd, #fff);
    transition: .5s;
}
```



```
ul li a: hover {
    box-shadow: 0 2px 5px rgba(0,0,0,0.3);
    text-decoration: none;
}

ul li a .fab {
    width: 100%;
    height: 100%;
    display: block;
    background: linear-gradient(0deg, #fff, #ddd);
    border-radius: 50%;
    line-height: calc(60px - 12px);
    font-size: 24px;
    color: #262626;
    transition: .5s;
}

ul li: nth-child(1) a: hover .fab {
    color: #3b5998;
}

ul li: nth-child(2) a: hover .fab {
    color: #00aced;
}

ul li: nth-child(3) a: hover .fab {
    color: #dd4b39;
}

ul li: nth-child(4) a: hover .fab {
    color: #007bb6;
}

ul li: nth-child(5) a: hover .fab {
    color: #e4405f;
}

.toop {
    position: relative;
    top: 20px;
    left: 75px;
}

.check {
    position: relative;
    top: -8px;
    left: -5px;
}
```

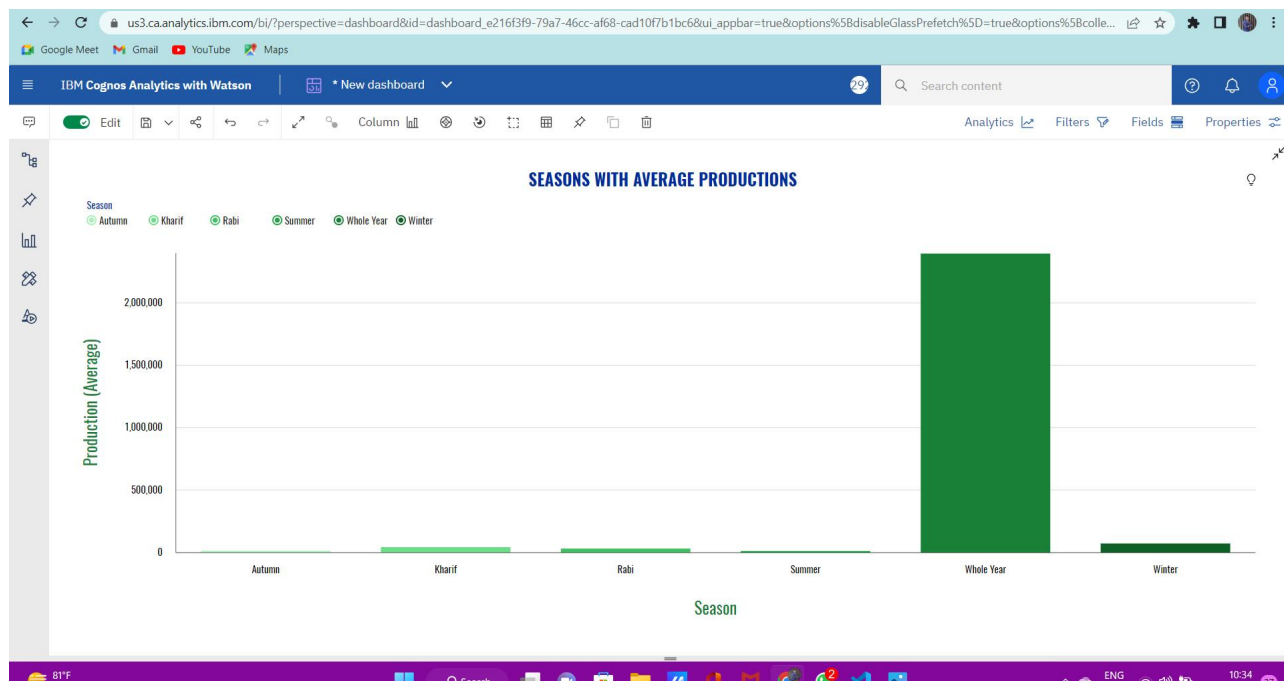
```
.para{
  position: relative;
  top: 0px;
  left: -45px;
}
.diag{
  position: relative;

  top:0px;
  margin: 0px;
  padding: 0px;
  left:-10px;
}
.fig1{
  position: relative;
  size:200%;
}
#png{
  position: relative;
  left: -270px;
  top: -45px;
}
.or{
  position: relative;
  left:180px;
}
.s1{
  position: relative;
  left: 140px;
}
.t{
  position: relative;
  left:-100px ;
  top:10px;
}
```

7.2 FEATURE 2

1. Seasons with Average Productions

As production of crops depends on different seasons, so let's plot the graphs to visualize the average production based on different seasons.

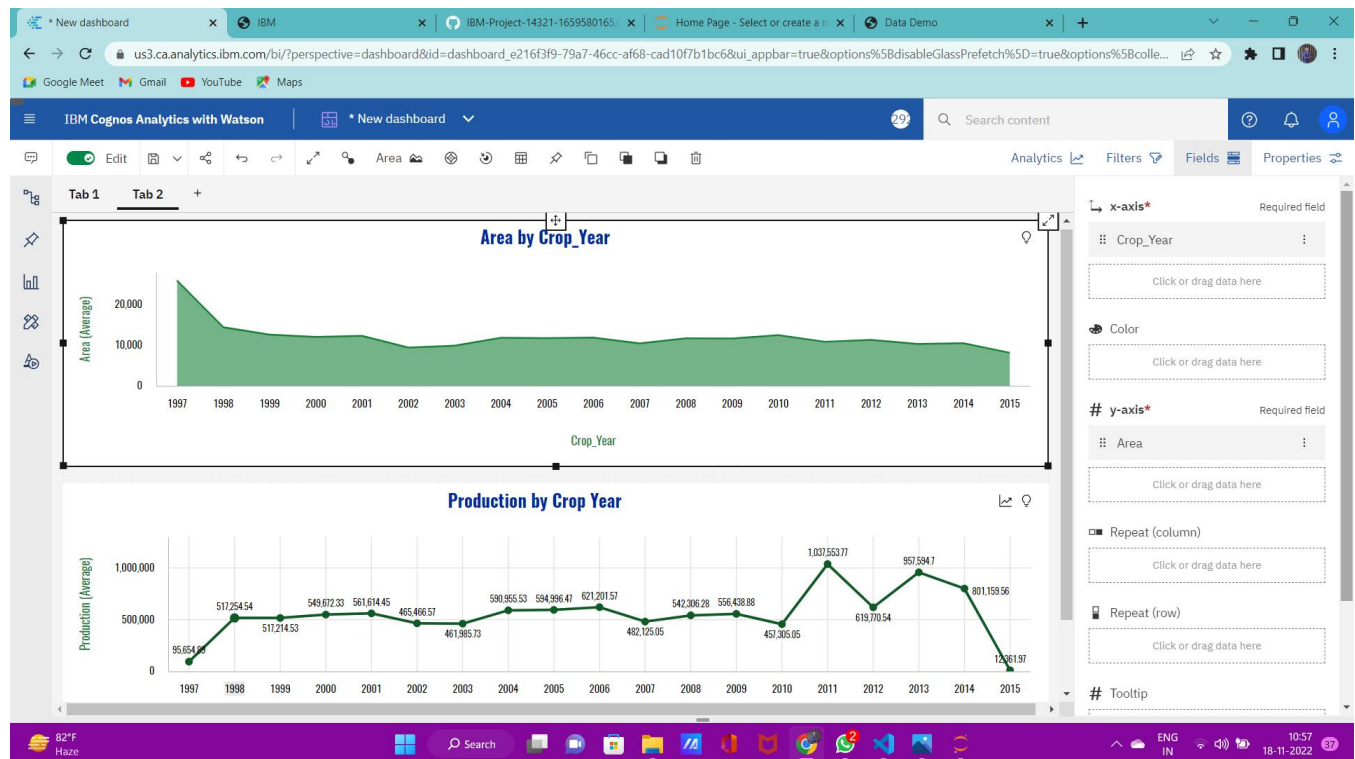


Data Visualisation 1

The above figure shows the seasons with average production

2. With Years Usage of Area and Production

In our dataset we also have a year's columns by which we will plot a line and area graphs to see the change in these both data with respect to increase in years.

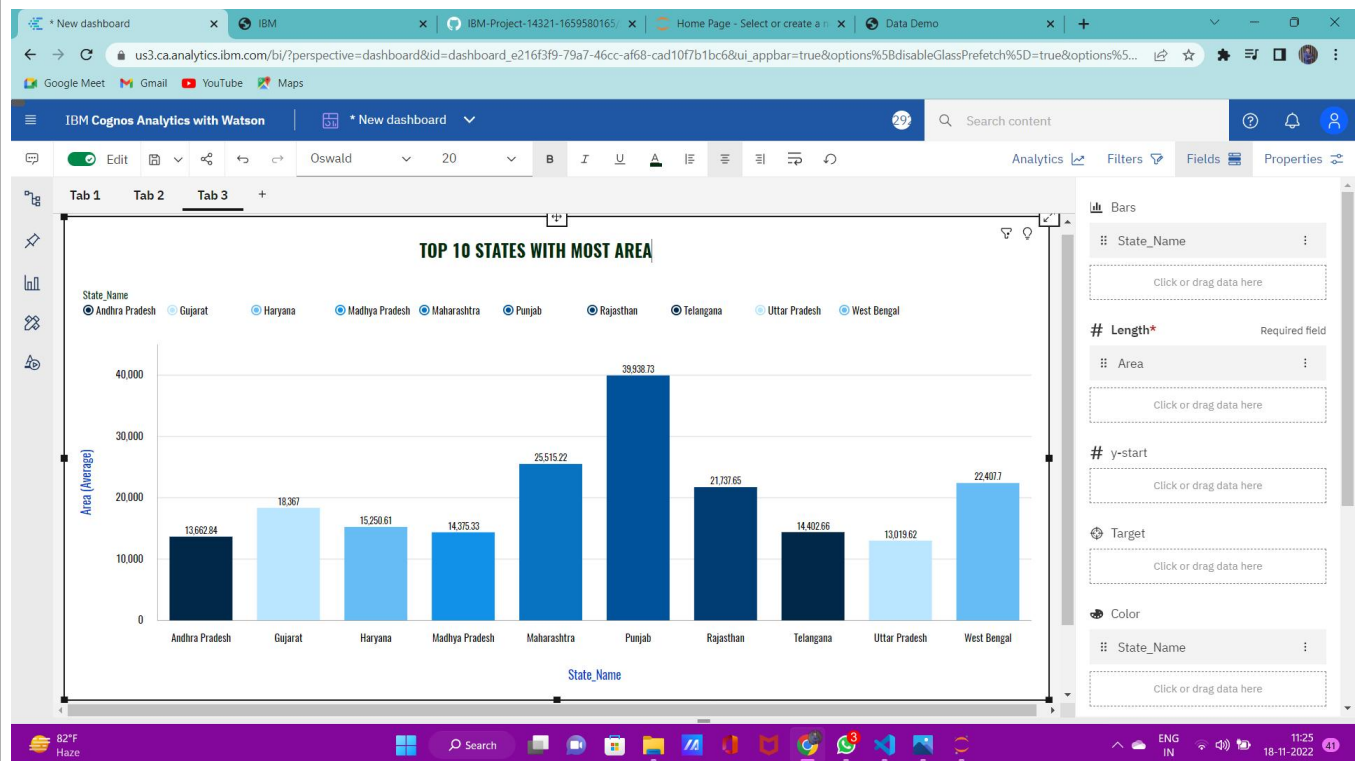


Data Visualisation 2

The above figure shows With Years Usage of Area and Production

3. Top 10 States with Most Area

As we have an area data in our dataset, we will be plotting some graphs to visualize the top 10 Indian states.

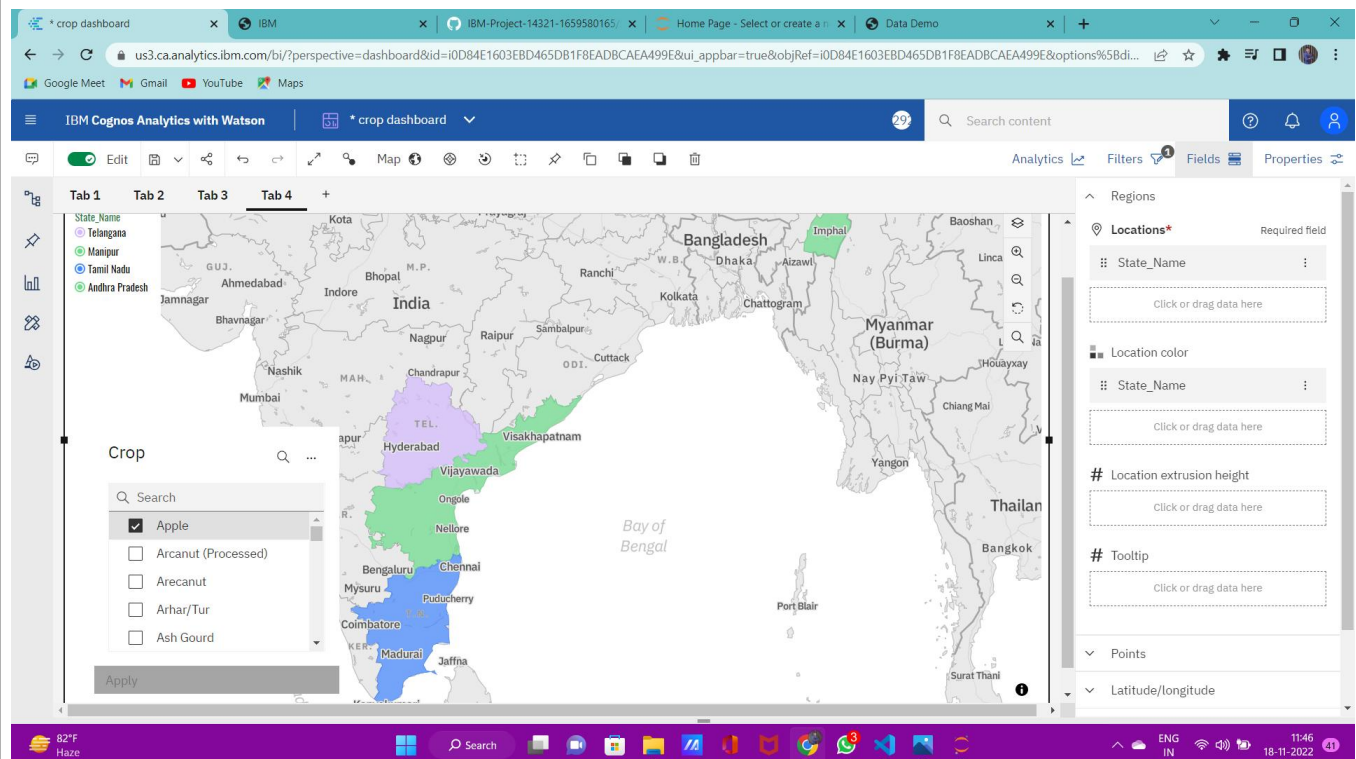


Data Visualisation 3

The above figure shows the visualize top 10 states with most area

4. State with Crop Production

There are so many different crops produced in Indian and most of us don't know which crop is belonging to which state so we will be plotting and highlight the states in map according to different crops.

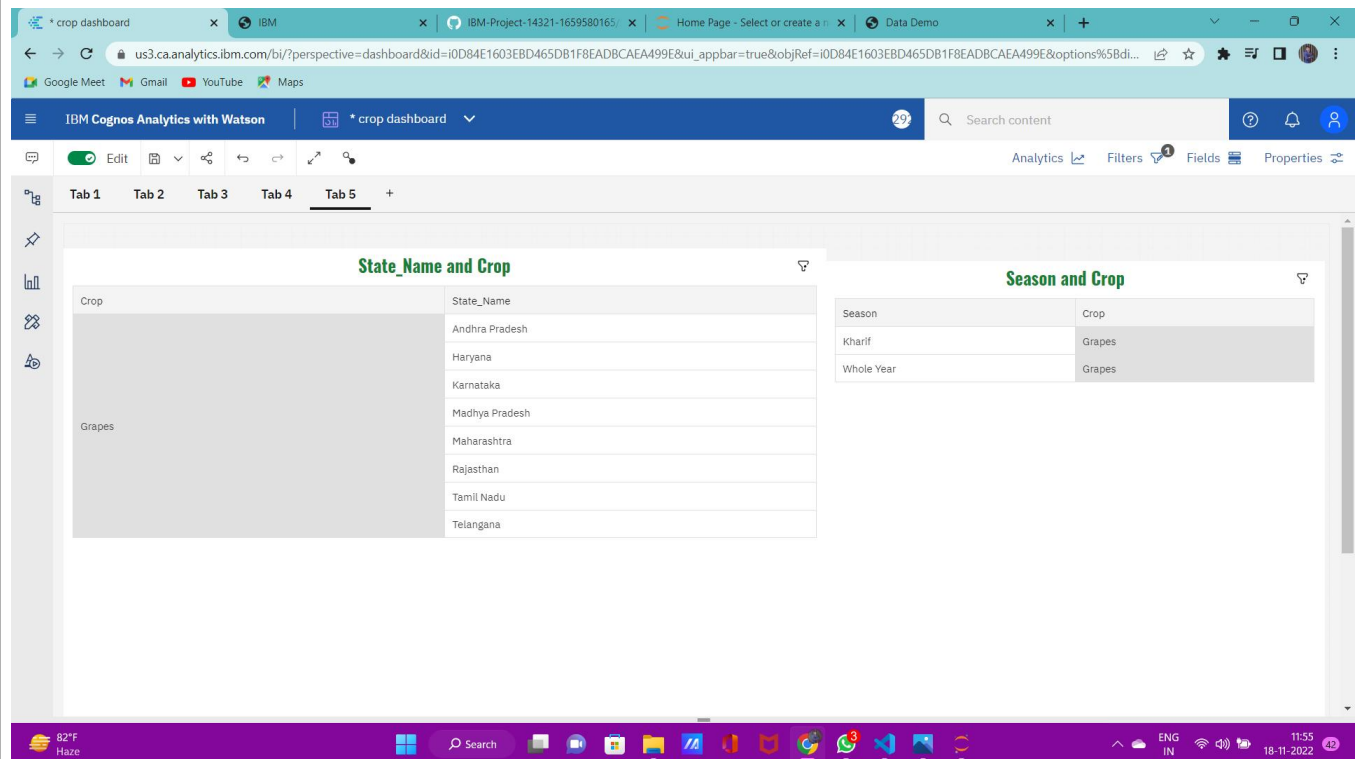


Data Visualisation 4

The above figure shows the visualisation contains state with crop production

5.States with The Crop Production Along with Season (Text Table)

Taking forward the previous plot we will be fetching the state name and showing it in a text table whenever different crops are chosen.



Data Visualisation 5

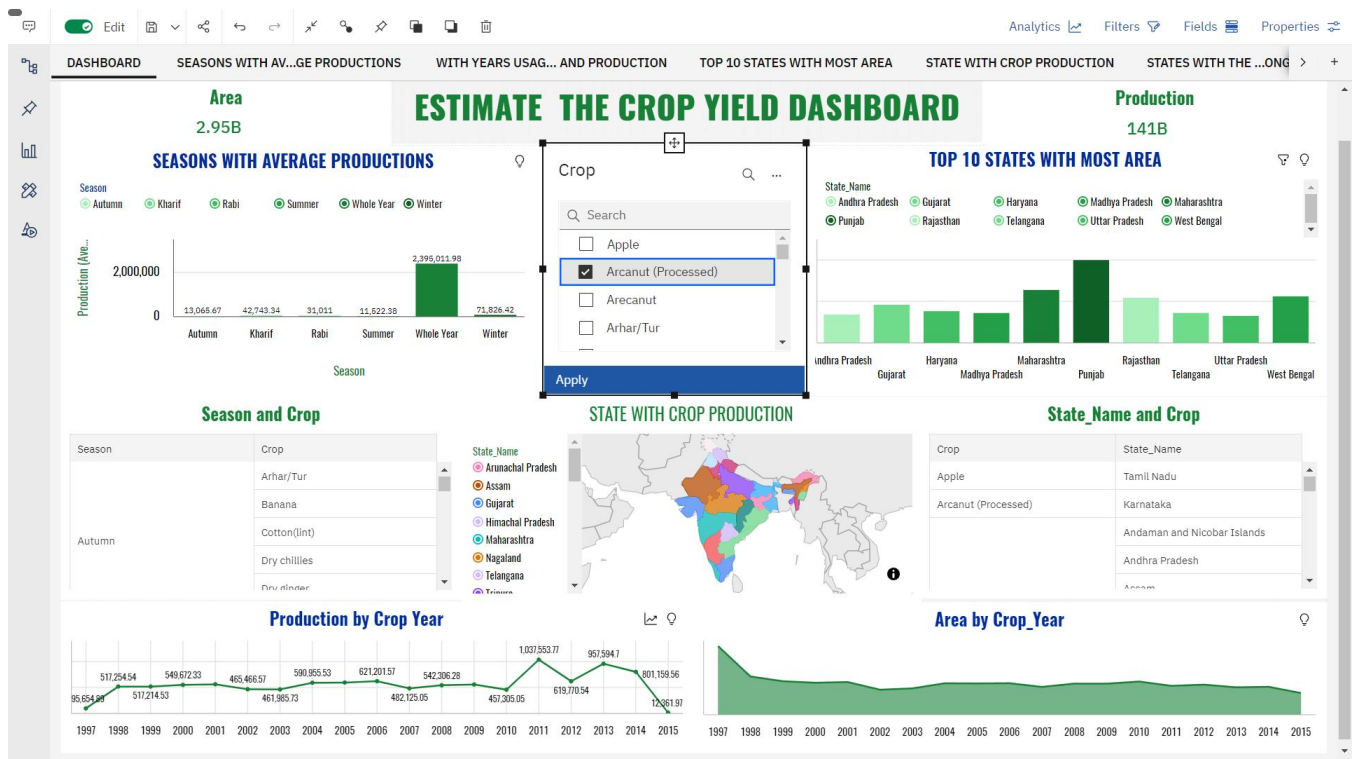
The above figure shows the table of states with the crop production along with season

6. Dashboard creation

This project is based on a understanding the crop production of India. Dataset has 2,46,092 data points (rows) and 6 features (columns) describing each crop production related details.

- State Name - All the Indian State names.
- District Name -Different District names.
- Crop Year- contains the crop years.
- Season – Different seasons for crop production.
- Area- Total number of areas covered.
- Production- production of crops.

Once you've created views on different tabs in Cognos analytics, you can pull them into a dashboard.



Dashboard

The above figure shows the agriculture data analytics in crop yield estimation dashboard

7. TESTING

TEST CASES:

Test Cases
Testcase 1: Logging in with registered login details.

Testcase 2: Registering with existing user's details.

Testcase 3: Producing visualisations for given input.

User Acceptance Testing

Purpose of Document:

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

Defect Analysis:

This report shows the number of resolved or closed bugs at each security 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

TEST CASE ANALYSIS

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

9.1Performance Metrics

Project team shall fill the following information in model performance testing template.

S.No	Parameter	Screenshot / Values
1	Dashboard design	No of Visualizations / Graphs – 6
2	Data Responsiveness	Yes, the website is responsive completely, that ia by resizing the browser window size as per the test scenario
3	Amount Data to Rendered (DB2Metrics)	Totally there are 246092 records in the dataset.
4	Utilization of Data Filters	Data Filter used in Estimate The Crop Yield is the Crop attribute.
5	Effective User Story	<p>No of Scene Added – 8</p> <ul style="list-style-type: none">* To create the Registration page of the Website* To create the Log in page of the Website* To create the Dashboard page of the Website* To work on the given dataset, Understand the Dataset* Load the dataset to Cloud platform then Build the required Visualizations* Using the Crop production in Indian dataset, create various graphs and charts to highlight the insights and visualizations.* Build a Visualizations to showcase Average Crop Production by Seasons* Showcase the Yearly usage of Area in Crop Production
6	Descriptive Reports	<p>No of Visualizations / Graphs – 6</p> <ul style="list-style-type: none">* Visualization1 - Average Crop Production by Seasons* Visualization2 - Yearly usage of area in crop production* Visualization3 - Top 10 States in Crop Yield Production by Area* Visualization 4 - Crop Production by State

		* Visualization5 - Represent the States with Seasonal Crop Production using a Text representation * Visualization6 - Dashboard
--	--	---

10.ADVANTAGES & DISADVANTAGES

The advantage of this Crop yield estimation it is relatively less timeConsuming 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.The disadvantage of the system is number of data used for the estimation are less.This method is highly subjective, as the informations are collected from the farmers knowledge and experience.

11.CONCLUSION

As a result of penetration of technology into agriculture field, there is a marginal improvement in the productivity. The innovations have led to new concepts like digital agriculture, smart farming, precision agriculture etc. In the literature, it has been observed that analysis has been done on agriculture productivity, hidden patterns discovery using data set related to seasons and crop yields data. We have noticed and made analysis about different crops cultivated, area and productions in different states and districts using IBM Cognos some of them are

- 1) Seasons with average productions. In this analytics we come to know in which seasons the average production is more and in which seasons the production is less.
- 2) Production by crop year. In this analysis we come to know in which years the production is high and low.
- 3) Production by District. With this analytics we can aware of the districts with the selected crops cultivated and states too.
- 4) Production by Area. From this we can know how much area should be cultivated and the production will be getting will be estimated. Finally created the dashboard and made analysis that in which state and in which year with crop area and to what extent the production will be are analysed.

12.FUTURE SCOPE

In coming years, can try applying data independent system which is a format our system should work. In reference to rainfall can depict whether extra water availability is needed or not. Integrating soil details to the system is an advantage, as for the selection of crops knowledge on soil is also a parameter. This research work can be enhanced to higher level by availing it to whole India.

13.APPENDIX

13.1 Source Code

app.py

```
import ibm_db
import re
from flask import Flask, render_template, request, redirect, url_for, session, flashp

app = Flask(__name__)
app.secret_key="i don't care"
myconn=ibm_db.connect('DATABASE=bludb;HOSTNAME=9938aec0-8105-433e-8bf9-0fbb7e483086.c1ogj3sd0tgtu0lqde00.databases.appdomain.cloud;PORT=32459;SECURITY=SSL;SSL
ServerCertificate=DigiCertGlobalRootCA.crt;UID=qgp34127;PWD=BhgVBtkd3CWLEi71', " ", "
")

@app.route("/signup")
def signup():
    return render_template("signup.html")

@app.route('/register', methods=['GET', 'POST'])
def register():
    msg = "
    if request.method == 'POST' :
        username = request.form['username']
        password = request.form['password']

        query = 'SELECT * FROM admin WHERE username =?;'
        stmt=ibm_db.prepare(myconn,query)
        ibm_db.bind_param(stmt,1,username)
        ibm_db.execute(stmt)
        account = ibm_db.fetch_assoc(stmt)
        print(account)
        if account:
            msg = 'Account already exists !'
        elif not re.match(r'[A-Za-z0-9]+', username):
            msg = 'name must contain only characters and numbers !'
```

```

else:
query = "INSERT INTO ADMIN (username,password) VALUES (?,?)"
stmt=ibm_db.prepare(myconn,query)
ibm_db.bind_param(stmt,1,username)
ibm_db.bind_param(stmt,2,password)
ibm_db.execute(stmt)
msg = 'You have successfully registered !'
return render_template('login.html', msg = msg)
@app.route("/")
@app.route("/login",methods=['GET','POST'])
def login():
if request.method=="POST":
Username=request.form['Username']
Password=request.form['Password']
query="select * from admin where username=? and password=?;"
stmt=ibm_db.prepare(myconn, query)
ibm_db.bind_param(stmt, 1, Username)
ibm_db.bind_param(stmt, 2, Password)
ibm_db.execute(stmt)
data=ibm_db.fetch_assoc(stmt)
if data:
session['loggedin']=True
return render_template('demo.html')

else:
flash("Incorrect Username or Password")
return render_template("login.html")

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

```

13.2 GitHub & Project Demo Link

<https://github.com/IBM-EPBL/IBM-Project-14321-1659580165>

Project Demo Link

<https://youtu.be/oGxqFefJoM8>