

Project Report

ESTIMATION OF CROP PRODUCTION USING DATA ANALYTICS

Date	19 NOVEMBER 2022
Team ID	PNT2022TMID03323
Project Name	Project - Project – Estimate the crop yield using Data Analytics

Team Members:

- **Nithya S**
- **Poorvaja A**
- **Sangamitra SD**
- **Shrinikkesh S M**

1.INTRODUCTION:

1.1 Project Overview:

The demand for food is found increasing with increase in population. With a rapid demand for cultivation of food, it is highly essential to analyze the growth of their production with respect to seasons, production, area, demands across cities etc. Hence we bring in an exemplary analytical dashboard for the farmers to understand all possible enhancements that has to be done to upscale their production. We have given all possible insights that will help the users to get quick overview.

1.2 Purpose:

Our Analytical Dashboard is completely user friendly and it is designed in a way that grabs the farmer's attention as the representation is made appetizing and interesting. . The main problem to be solved is predicting the crop yield using Data Analytics which helps farmers to analyse the Crop Production. To assist him in planning and harvesting. The ultimate purpose for analytics is to build a strong marketing strategy which can be achieved through our project.

2. LITERATURE SURVEY:

2.1 Existing Problem:

Crop production in India is one of the most important sources of income and India is one of the top countries to produce crops. It might be a tough task for a business man to analyze each column skimming through the datasets. And of course, mind calculation for about 40,000 rows is impossible. Also it is highly important to represent the visualization graphs with suitable data that can be read by the users.

2.2 References:

Agrawal et al discuss about various Data Mining tools such as Dashboards, TextMining tools. They provide an overview about these tools and the various scenarios in which they can be deployed [2]. The proposed architecture mainly focuses on open source tools for the development of the application. The user can select location from map for which the details are available at one click [3]. K. Sabarina and N. Priya, [2] has presented an efficient strategy for

crops Big data for the benefit of precision agricultural lowering data dimensionality. Predictive analytics can be used to make the smartest decision in farming by collection realtime data analysis with streaming data.

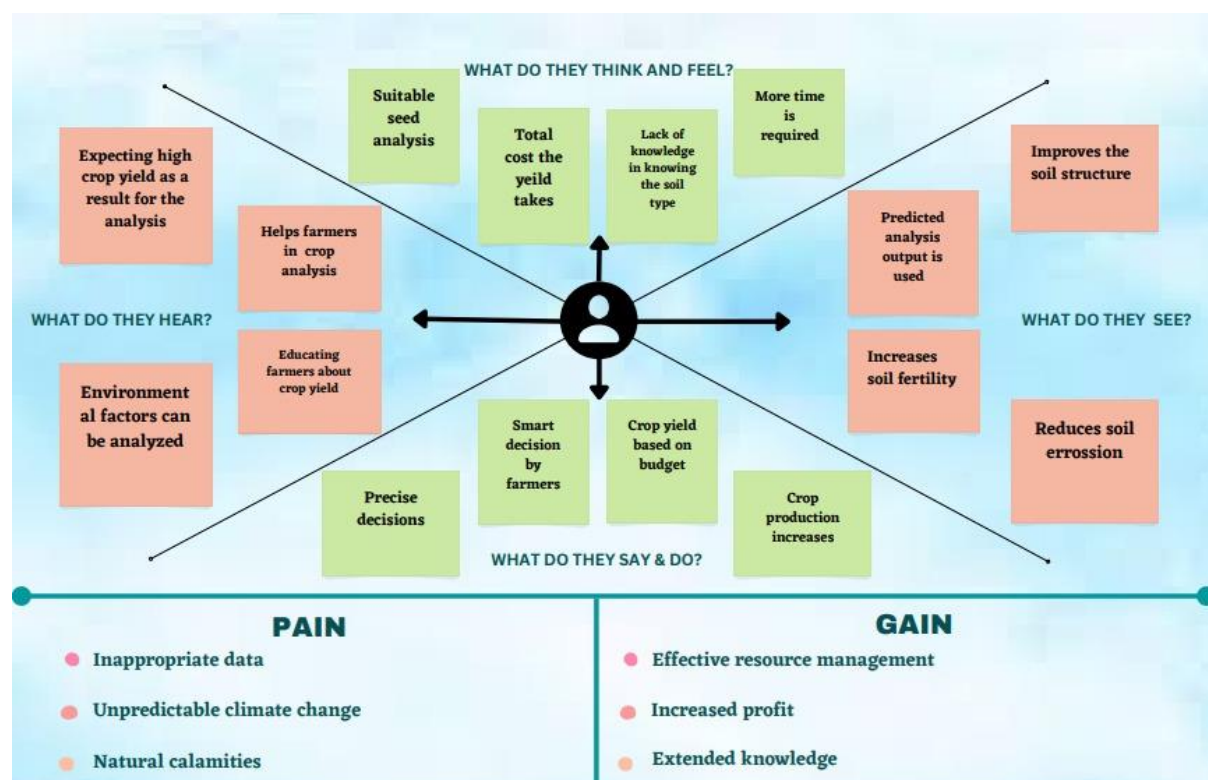
2.3 Problem Statement Definition:

It's high time we take a call and analyze the famer needs and increase or decrease the production based on seasons. Hence with the help of Cognos Analytics, we have built a dashboard where there are 5 tabs, each representing a unique relationship that needs to be solved. We have used Data Player to highlight the top values which would be more appetizing for the users. This tool predicts the crop yield based on the parameters like Rainfall, temperature, pesticides, etc. This helps in predicting the yield and increasing production.

3. IDEATION & PROPOSED SOLUTION:

3.1 Empathy Map Canvas:

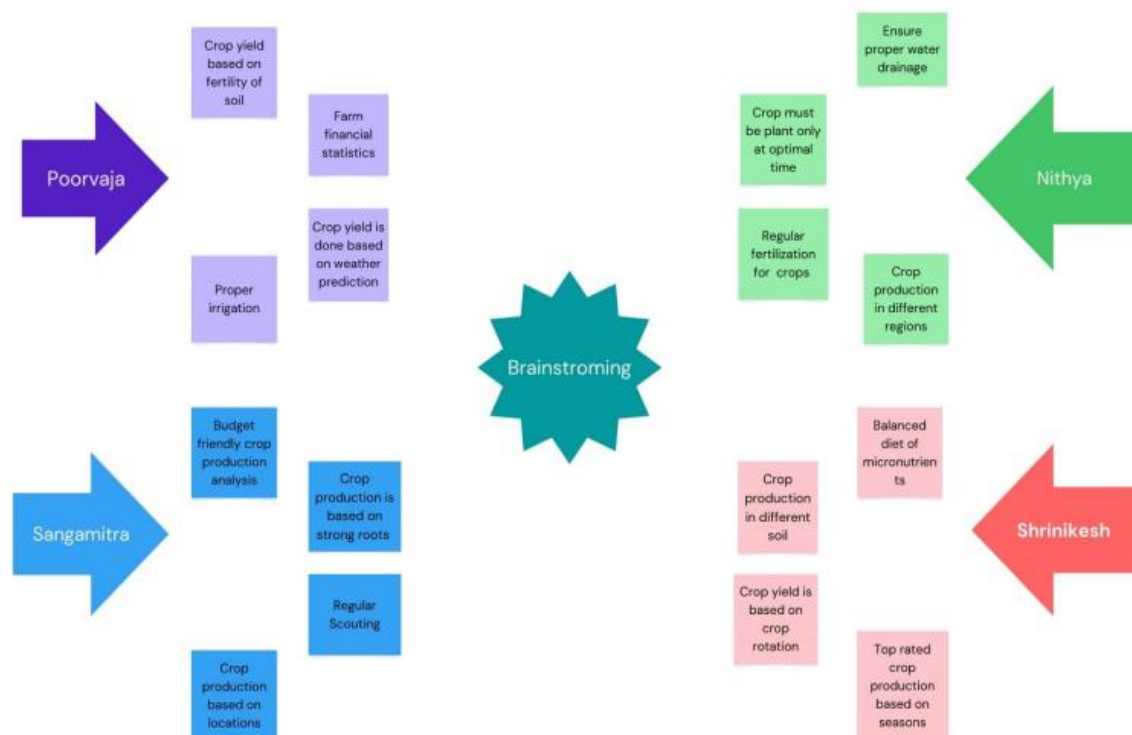
An empathy map is a simple, easy-to-digest visual that captures knowledge about a user's behaviours and attitudes. It is a useful tool to helps teams better understand their users. Creating an effective solution requires understanding the true problem and the person who is experiencing it. The exercise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



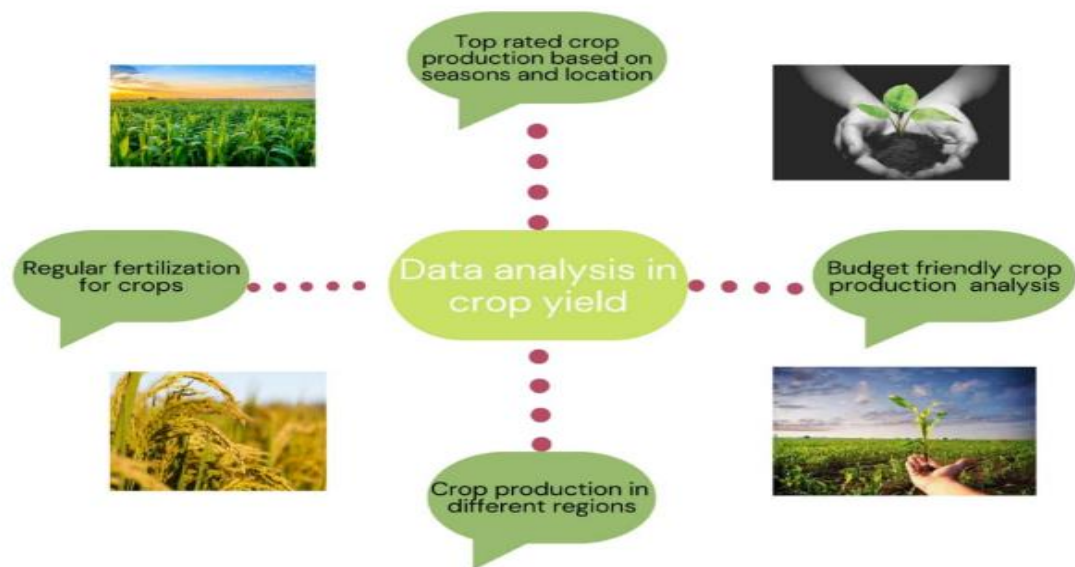
3.2 Ideation & Brainstorming:

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. 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. 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.

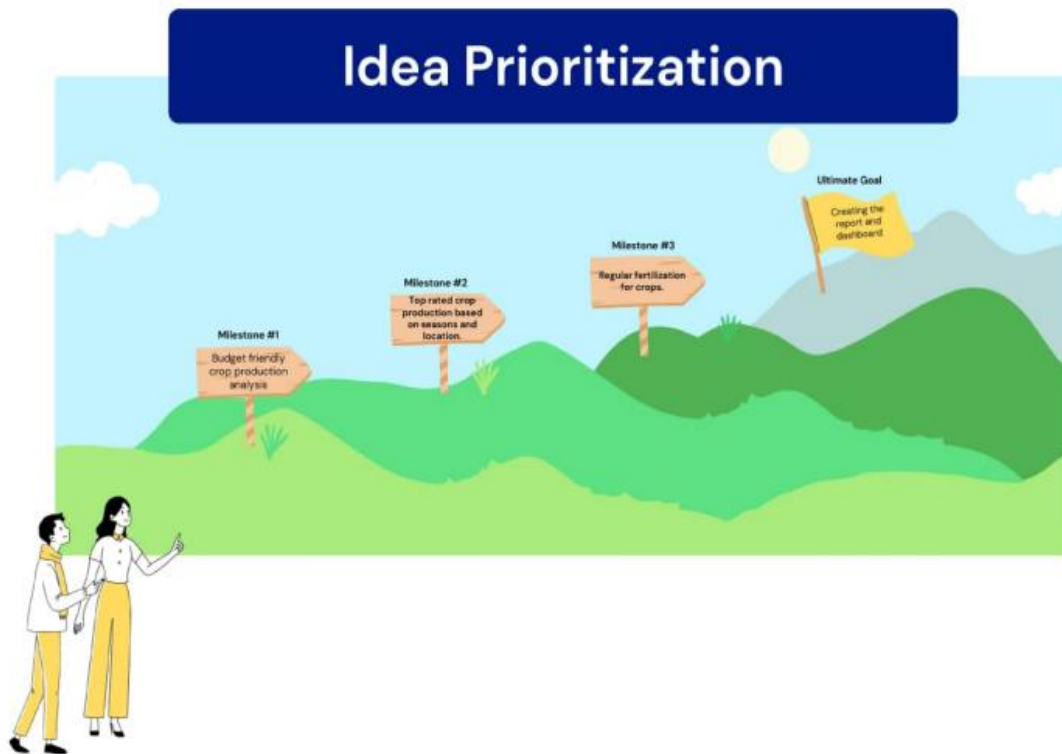
Step-1: Team Gathering, Collaboration and Select the Problem Statement



Step-2: Brainstorm, Idea Listing and Grouping



Step-3: Idea Prioritization



3.3 Proposed Solution:

1.Problem Statement (Problem to be solved):

The main problem to be solved is predicting the crop yield using Data Analytics which helps farmers to analyse the Crop Production. To assist him in planning and harvesting.

2.Idea / Solution description:

This tool predicts the crop yield based on the parameters like Rainfall, temperature, pesticides, etc. This helps in predicting the yield and increasing production.

3.Novelty / Uniqueness:

We are planning of integrating a Chatbot with our Dashboard so as to make it Interactive. Also, additional forecasting is planned to be done.

4.Social Impact / Customer Satisfaction:

Crop production in India is one of the most important sources of income. So, this tool helps farmers for predicting crop yield which in turn benefits the Indian economy and social beings

5.Business Model (Revenue Model):

This model helps farmer to monitor the crop yield and make decisions based on the output. This will help them to increase their productivity.

6. Scalability of the Solution:

This model performs well with large datasets and gives accurate predictions.

3.4 Proposed Solution Fit:

The Problem Solution Fit canvas is based on the principles of Lean Startup , LUM(LazyUserModel) 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 behaviour and the context around it. None of the existing canvases or frameworks were giving mean 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.

It helps you to:

1. Solve complex problems in away that fits the state of your customers.
2. Succeed faster and increase your solution adoption by tapping into existing medium and channels of behavior.
3. Sharpen your communication and marketing strategy with the right triggers and messaging.

4. REQUIREMENT ANALYSIS:

4.1 Functional Requirements:

- User sign up: The user needs to sign up through the website to estimate the crop production.
- Profile: The user must set up the profile and login to the webpage.
- Provide the necessary data: Based on the data provided the dashboard will be launched.
- Analysis: Analysing is an important part where the fields of the dataset are analysed.
- Estimation: The crop production will be estimated based on the data collected.

4.2 Non Functional Requirements:

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

FR No.	Non-Functional Requirement	Description
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NFR-1	Usability	Provide a simple UI. Actions can be easily performed by a few clicks. Features will be understandable.
NFR-2	Security	2 step authorization (for register) Have a backup dataset.
NFR-3	Reliability	Error must be low.(Improve accuracy) Must work without glitches.
NFR-4	Performance	It is affected by the implementing algorithm. Depending on the error metrics we have to choose an algorithm with high response time.
NFR-5	Availability	Must be available for the user 24 x 7 without interruptions.
NFR-6	Scalability	Should withstand a high number of users and large datasets.

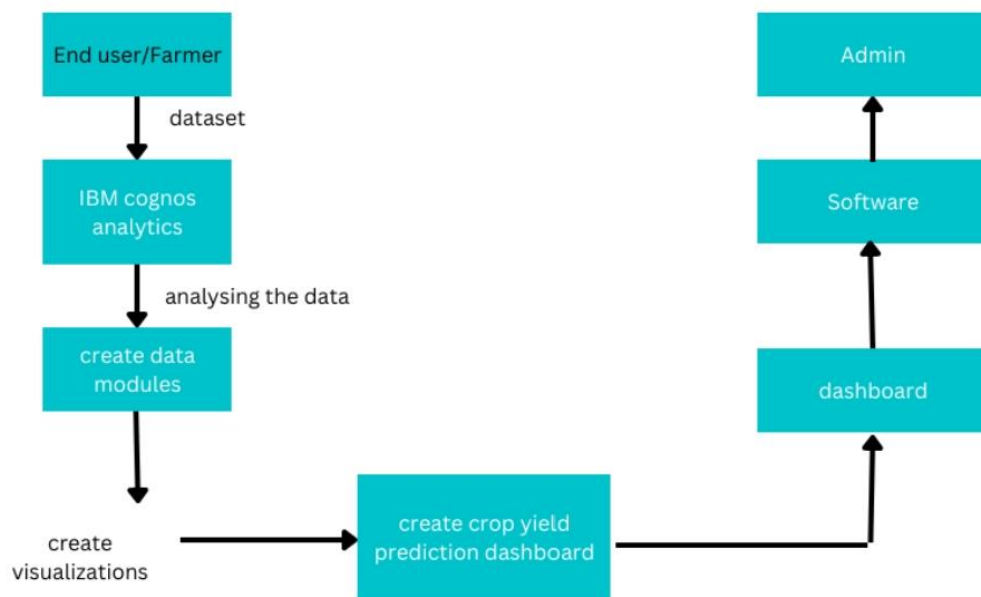
5.PROJECT DESIGN:

5.1 Data Flow Diagram:

✓ 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.

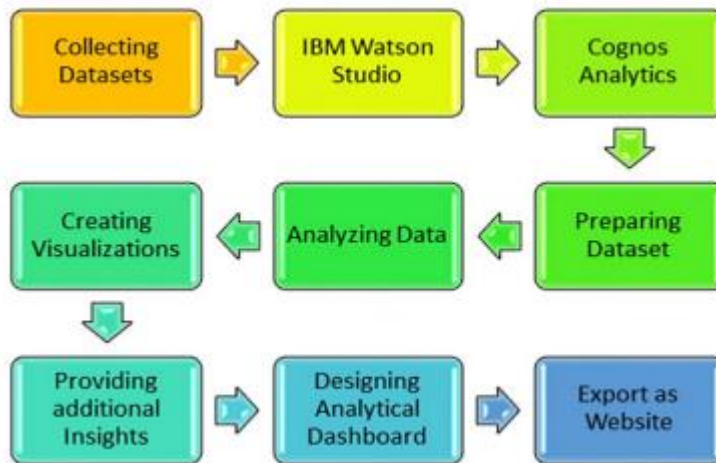
✓ It shows how data enters and leaves the system, what changes the information, and where data is stored.



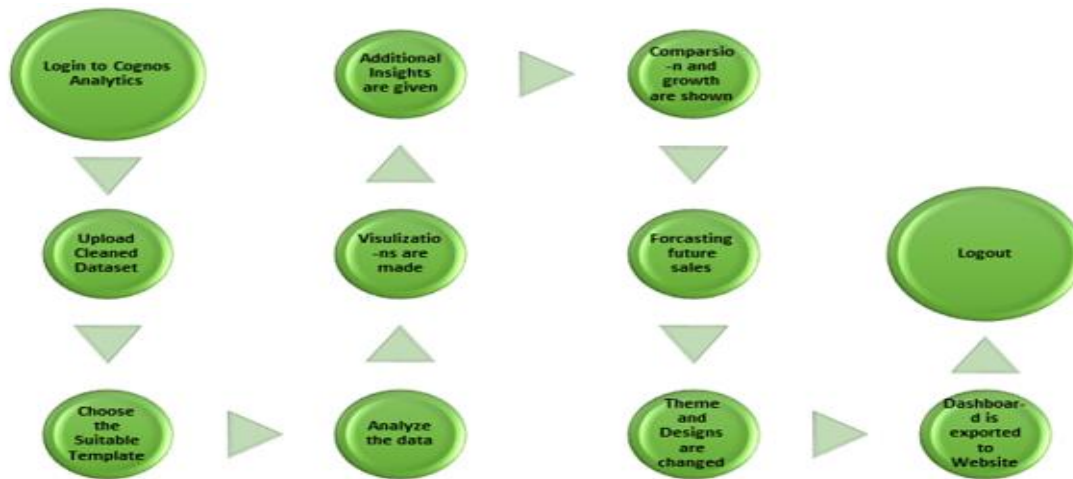
5.2 Solution & Technical Architecture:

Solution architecture is a complex process – with many sub-processes – that bridges the gap between business problems and technology solutions. Its goals are to:

- Find the best tech solution to solve existing business problems.
- Describe the structure, characteristics, behaviour, and other aspects of the software to project stakeholders.
- Define features, development phases, and solution requirements.
- Provide specifications according to which the solution is defined, managed, and delivered



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 email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
		USN-3	As a user, I can register for the application through Facebook	I can register & access the dashboard with Facebook Login	Low	Sprint-2
		USN-4	As a user, I can register for the application through Gmail	I can view the chart	Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password	If the user forgot the password can reset the password	High	Sprint-1
	Dashboard	USN-6	As a user, I can view the dashboard	I can edit my email id, phone number, profile photo	High	Sprint-2
Customer web user	Registration	USN-7	As a user, I can register for the application by entering my email, password, and confirming my password.	I can edit my user name, upload profile photo	Medium	Sprint-1
Customer Care Executive	Communication	USN-8	As a user I can communicate with the customers	I can solve the queries by maintaining the strong relationship with the client	High	

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.	5	High	Nithya S Poorvaja A
		USN-2	As a user, I will receive confirmation email once I have registered for the application	4	Medium	Sangamitra S D
		USN-3	Creating the website for login application	2	Medium	Shrinikkesh S M
		USN-4	Upload the dataset into cognos analytics	4	Low	Sangamitra S D
		USN-5	Create new dashboard	5	Medium	Poorvaja A
Sprint-2	Login	USN-6	Build a Visualization to showcase Average Crop Production by Seasons.	4	Medium	Nithya S Sangamitra S D
			Showcase the Yearly usage of Area in Crop Production	4	Medium	Poorvaja A Shrinikkesh S M
			Top 10 States in Crop Yield Production by Area.	4	Medium	Nithya S
			Crop Production by State	4	Medium	Poorvaja A
			Sates with Seasonal Crop Production using a Text representation.	4	Medium	Sangamitra S D

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-3	Creating The dashboard	USN-7	Create the Dashboard by using the created visualizations.	20	High	Nithya S Poorvaja A Sangamitra S D Shrinikkesh S M
Sprint-4	Export The Analytics	USN-8	Finally export the created dashboard	20	High	Nithya S Poorvaja A Sangamitra S D Shrinikkesh S M

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

7. Testing

7.1 Test cases

Test case ID	Feature Type	Component	Test Scenario	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Status	Comments	TC for Automation(Y/N)	BUG ID	Executed By
LoginPage_TC_001	Functional	Home Page	Verify user is able to see the Login/Signup popup when user clicked on My account button	Web page to Login, Verified User	1.Enter URL and click go 2.Click on My Account dropdown button 3.Verify login/Signup popup displayed or not	https://us3.ca.analytics.ibm.com/bi/?perspective=dashboard&pathRef=public_folder%2FEstimate%2Bcrop%2Bproduction&action=viewmode=dashboard&subViewmode=00000183d4483e_00000000	Login/Signup popup should display	Working as expected	Pass	Executed as Expected	Yes		NITHYA S
LoginPage_TC_002	UI	Home Page	Verify the UI elements in Login/Signup popup	Webpage of Estimate The Crop Yield Using Data Analytics	1.Enter URL and click go 2.Click on My Account dropdown button 3.Verify login/Signup 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	https://us3.ca.analytics.ibm.com/bi/?perspective=dashboard&pathRef=public_folder%2Fcrop%2Bproduction&action=viewmode=dashboard&subViewmode=00000183d4483e_00000000	Application should show below UI elements: a.email text box b.password text box c.Login button with orange colour d.New customer? Create account link e.Last password? Recovery password link	Working as expected	Pass	Executed as Expected	Yes	BUG-1234	NITHYA S
LoginPage_TC_003	Functional	Home page	Verify user is able to log into application with Valid credentials	Webpage(Login Page) of Estimate The Crop Yield Using Data Analytics	1.Enter URL(https://us3.ca.analytics.ibm.com/bi/?perspective=dashboard&pathRef=public_folder%2FEstimate%2Bcrop%2Bproduction&action=viewmode=dashboard&subViewmode=000001847c05801f_00000000) and click go	Username: nithya@gmail.com password: Testing123	User should navigate to user account homepage			Executed as Expected	Yes		NITHYA S

Test case ID	Feature Type	Component	Test Scenario	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Status	Comments	TC for Automation(Y/N)	BUG ID	Executed By
LoginPage_TC_004	Functional	Login page	Verify user is able to log into application with Invalid credentials	Webpage(Login page) of Estimate The Crop Yield Using Data Analytics	1.Enter URL(https://us3.ca.analytics.ibm.com/bi/?perspective=dashboard&pathRef=public_folder%2FEstimate%2Bcrop%2Bproduction&action=viewmode=dashboard&subViewmode=000001847c05801f_00000000) and click go 2.Click on My Account dropdown button 3.Enter Invalid username/email in Email text box 4.Enter valid password in password text box 5.Click on login button	Username: nithya@gmail.com password: Testing123	Application should show 'Incorrect email or password' validation message.	Working as expected	Pass	Executed as Expected	Yes		NITHYA S

Feature Type	Component	Test Scenario	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Status	Comments	TC for Automation(Y/N)	BUG ID	Executed By
Functional	Login page	Verify user is able to log into application with InValid credentials	Webpage(Login page) of Estimate The Crop Yield Using Data Analytics	1.Enter URL(https://tus3.ca.analytics.ibm.com/fbi/?perspective=dashboard&pathRef=public_folders%2FEstimate%2Bether%2Bcrop%2Byield%2Busing%2BDat%2BAnalytics%2FCrop%2Bproduction&action=view&mode=dashboards&subView=model000001847c058011_00000000) and click go 2.Click on My Account dropdown button 3.Enter Valid username/email in Email text box 4.Enter Invalid password in password text box 5.Click on login button	Username: nithya@gmail.com password: Testing123678686786876	Application should show 'Incorrect email or password' validation message.	Working as expected	Pass	Executed as Expected	Yes		NITHYA S
Functional	Login page	Verify user is able to log into application with InValid credentials	Webpage(Login page) of Estimate The Crop Yield Using Data Analytics	1.Enter URL(https://tus3.ca.analytics.ibm.com/fbi/?perspective=dashboard&pathRef=public_folders%2FEstimate%2Bether%2Bcrop%2Byield%2Busing%2BDat%2BAnalytics%2FCrop%2Bproduction&action=view&mode=dashboards&subView=model000001847c058011_00000000) and click go 2.Click on My Account dropdown button 3.Enter InValid username/email in Email text box 4.Enter Invalid password in	Username: nithya password: Testing123678686786876	Application should show 'Incorrect email or password' validation message.	Working as expected	Pass	Executed as Expected	Yes		NITHYA S

7.2 USER ACCEPTACE

1.Purpose of Document

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

2. Defect Analysis

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	20
Duplicate	1	0	3	0	4
External	2	3	0	1	6
Fixed	11	2	4	20	37
Not Reproduced	0	0	1	0	1
Skipped	0	0	1	1	2
Won't Fix	0	5	2	1	8
Totals	24	14	13	26	77

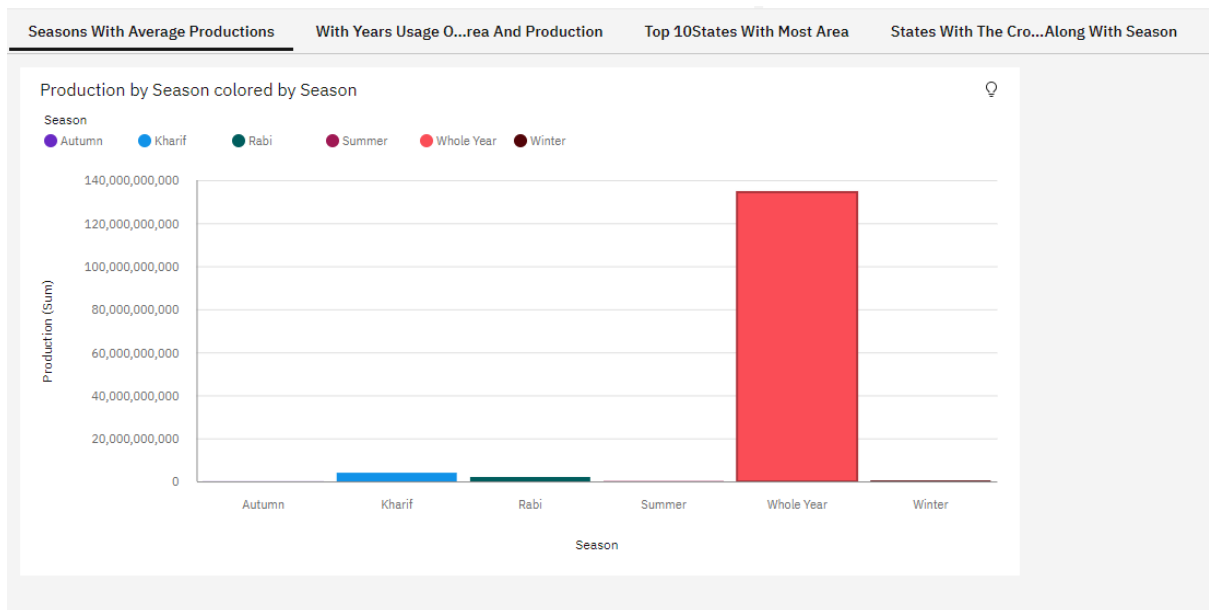
3. Test Case Analysis

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

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	7	0	0	7
Client Application	51	0	0	51
Security	2	0	0	2
Outsource Shipping	3	0	0	3
Exception Reporting	9	0	0	9
Final Report Output	4	0	0	4
Version Control	2	0	0	2

8. RESULTS

The final dashboard created with 5 tabs are attached below:



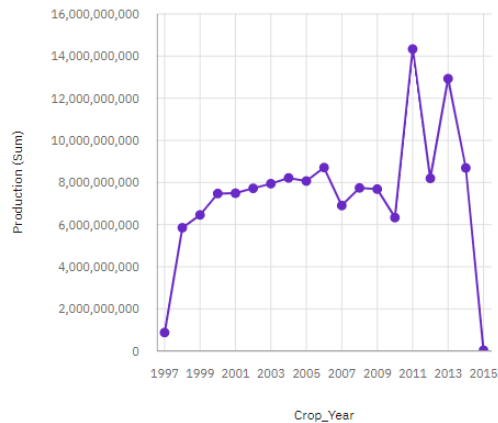
Seasons With Average Productions

With Years Usage O...rea And Production

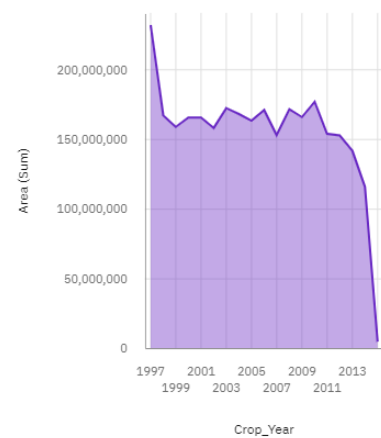
Top 10States With Most Area

States With The Cro...Along With Season

Production by Crop_Year



Area by Crop_Year



Seasons With Average Productions

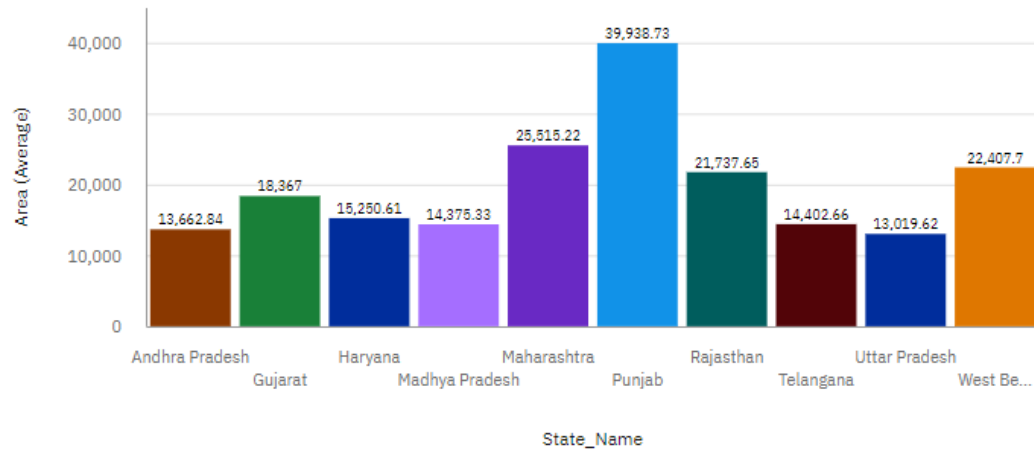
With Years Usage O...rea And Production

Top 10States With Most Area

Area by State_Name colored by State_Name

State_Name

● Andhra Pradesh
 ● Gujarat
 ● Haryana
 ● Madhya Pradesh
 ● Maharashtra
 ● Punjab
 ● Rajasthan
 ● Telangana
 ● Uttar Pradesh
 ● West Bengal



State_Name and Crop

Crop	State_Name
Arecanut	Andaman and Ni...
	Andhra Pradesh
	Puducherry
Arhar/Tur	Andhra Pradesh
	Assam
	Bihar
	Chandigarh
	Chhattisgarh
	Dadra and Nagar ...
	Gujarat
	Haryana
	Himachal Pradesh

Crop

Search

☐ Apple
☐ Arcanut (Processed)
☐ Arecanut
☐ Arhar/Tur
☐ Ash Gourd
☐ Atcanut (Raw)
☐ Bajra
☐ Banana
☐ Barley
☐ Bean

Apply

Season and Crop

Season	Crop
Autumn	Arhar/Tur
	Banana
	Cotton(lint)
	Dry chillies
	Dry ginger
	Groundnut
	Jowar
	Jute
	Maize
	Moong(Gree...
	Onion
	Paddy

Crop

Search

☒ Apple
☐ Arcanut (Processed)
☐ Arecanut
☐ Arhar/Tur
☐ Ash Gourd
☐ Atcanut (Raw)
☐ Bajra
☐ Banana
☐ Barley
☐ Bean

Apply

State_Name for State_Name regions

State_Name

☐ Arunachal Pradesh
☐ Himachal Pradesh
☐ Telangana
☐ Bihar
☐ Jharkhand

State_Name

☐ Assam
☐ Maharashtra
☐ Tripura
☐ Chandigarh
☐ Karnataka

State_Name

☐ Gujarat
☐ Nagaland
☐ West Bengal
☐ Chhattisgarh
☐ Manipur

9. ADVANTAGES AND DISADVANTAGES:

ADVANTAGES:

- Data analytics is a critical part of improving business operations in every industry.
- An organization can utilize data analytics to improve decision-making, analyze customer trends, track customer satisfaction and identify opportunities for new products and services to meet growing market needs.
- 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.

DISADVANTAGES:

- There might be data redundancy and the results might not be accurate
- The seasons might mislead and the prediction goes wrong.

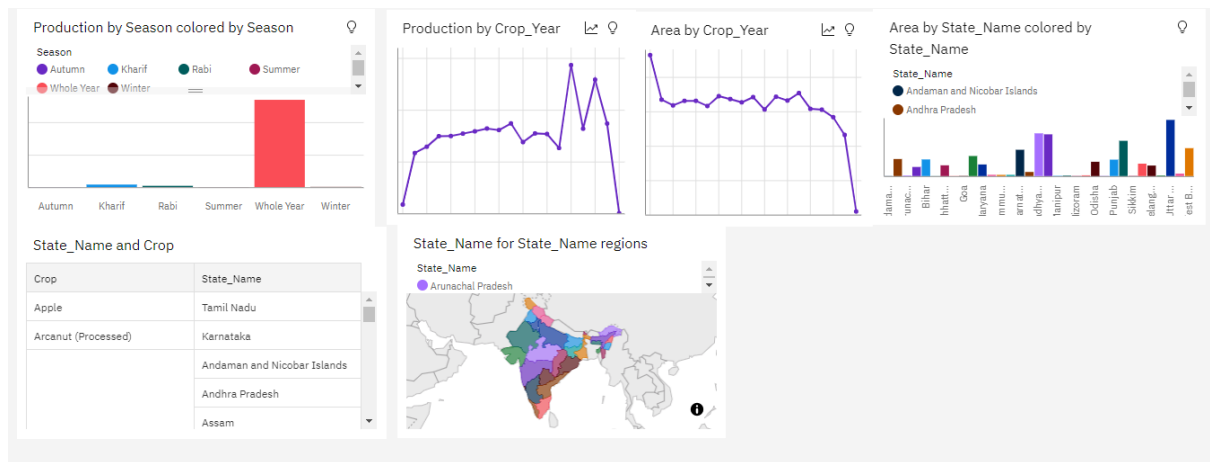
10.CONCLUSION

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 soils, hidden patterns discovery using data set related to climatic conditions and crop yields 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.

11. FUTURE SCOPE

Crop production in India is one of the most important sources of income and India is one of the top countries to produce crops. Our project mainly focuses on getting dominant insights from the data that helps the farmers to choose which crop to use wisely. The operating sector such as Collecting datasets, Analyzing the data, and Providing relationships and Insights. This process makes to help farmers to predict in which season what crop to use and helps to forecast future sales strategically. The accurate prediction of crop yield certainly benefits the farmers in choosing the right method to reduce the crop damage and gets best prices for their crops. In coming decades, two most significant and important factors found to influence crop yield is, increase in the global population and economy, which greatly demands the higher and sustainable agricultural based crop yields. The capacities of food production at global level is going to be very limited due to the less availability of cultivable land, water resources, difficulties in maintaining the sustainable crop production levels, effects of changes in the global climatic conditions and also by various biophysical parameters which influence the crop yield. The farmers need to be educated on the application of scientifically proven methods to quantify the crop yield capacities and same need to be informed to higher authorities to maintain transparency in sharing the actual information, which helps in making the policy based, research oriented, development and investment related decisions that aim to influence future crop yield.

12.APPENDIX



DEMO LINK

https://youtu.be/D6_7i8R7Y3E

GITHUB LINK

<https://github.com/IBM-EPBL/IBM-Project-19754-1659705733>