

PROJECT TITLE: Estimate the crop yield using Data Analytics

TEAM ID: PNT2022TMID12429

TEAM MEMBERS:

1. Kishore S
2. Naveen Prasanth
3. Arun Saravanan N
4. Jeyanthinathan

CHAPTER 1

INTRODUCTION

Agriculture is important for human survival because it serves the basic need.

A well-known fact that the majority of population ($\geq 55\%$) 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

CHAPTER 2

LITERATURE SURVEY

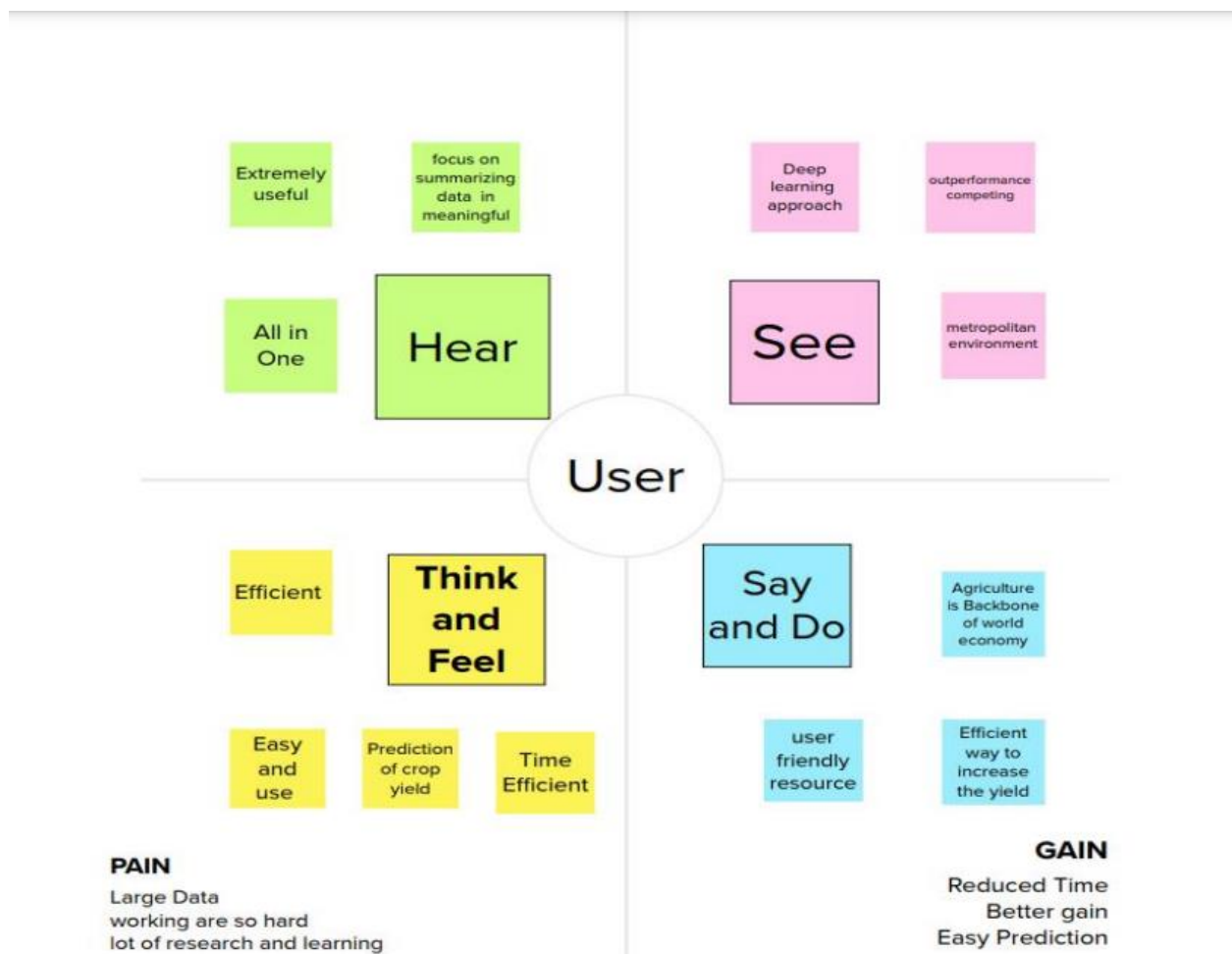
S.NO	PAPER TITLE	AUTHORS	ADVANTAGES	REFERENCELINK
1.	Agriculture Data Analytics in Crop Yield Estimation	B M Sagar, Cauvery N K	Smart farming; agriculture data; crop yield; data analytics; prediction	https://ijeecs.iaescore.com/index.php/IJEECS/article/view/13056
2.	Data analytics platforms for agricultural systems	Ngakan Nyoman Kutha Krisnawijaya, BedirTekinerdogan, CagatayCatal, Rik van derTol	First Systematic Literature Review (SLR) that explicitly focuses on data analytics platforms for agricultural systems. In the SLR 535 papers were retrieved, of which 45 primary studies were selected for a detailed analysis. The features and obstacles of data analytics platform for agricultural systems are presented in detailed.	https://www.sciencedirect.com/science/article/pii/S0168169922001302
3.	Crop Yield Prediction Using Deep Reinforcement Learning Model for Sustainable Agrarian Applications	D. Elavarasan and P. M. D. Vincent,	Predicting crop yield based on the environmental, soil, water and crop parameters has been a potential research topic. Deep-learning-based models are broadly used to extract significant crop features for prediction	https://ieeexplore.ieee.org/document/9086620

CHAPTER 3

3.1 EMPATHY MAP CANVAS:

An empathy map canvas is a more in-depth version of the original empathy map, which helps identify and describe the user's needs and pain points. And this is valuable information for improving the user experience.

An empathy map canvas helps brands provide a better experience for users by helping teams understand the perspectives and mindset of their customers. Using a template to create an empathy map canvas reduces the preparation time and standardizes the process so you create empathy map canvases of similar quality.




3.2 IDEATION & BRAINSTORMING

Ideation may present itself in any one of a wide variety of ways and arenas. The book “Ideation: The Birth and Death of Ideas,” written by Douglas Graham and Thomas Bachmann, lists several different forms that ideation may take, including the following:

- **Solving Problems** – Ideation is often specifically aimed at problem-solving. For example, production managers at a company may be charged with coming up with ideas on how to reduce production costs.
- **Derivative Ideation** – Derivative ideation refers to building on an existing idea, such as developing complementary products or accessories to sell along with a company’s main product.
- **Innovation** – An example of innovation ideation is the process of a pharmaceutical company developing new medicines. Such a type of ideation often involves doing extensive research and experimentation as part of the ideation process.
- **Development of a “Revolutionary Idea”** – Ideation sometimes ends up creating a totally new line of thought or set of ideas, such as the development of a new philosophy.
- **Serendipitous Ideation** – Serendipitous ideation refers to situations where someone just happens to come up with a new idea even though they weren’t consciously trying to do so.
- **Combination Ideation** – Ideation often includes combining multiple ideas to create a new process or way of doing something.



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

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
 2-8 people recommended


[Share 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



How might we [your problem statement]?




Key rules of brainstorming


To run a smooth and productive session

 Stay in topic.


 Encourage wild ideas.

 Defer judgment.

 Listen to others.

 Go for volume.

 If possible, be visual.



Need some inspiration?
See a limited version of this template to kickstart your work.

[Open example](#) →

Step-2: Brainstorm, Idea Listing and Grouping

2

Brainstorm

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

10 minutes

TIP

You can select a sticky note and hit the green "Pin" icon to attach it to the canvas!

KISHOR

Types of soil

Interval between crops

Monsoons that affect

Quality of soil

ARUN SARAVANAN

Soilwater Condition

Crop Growth Rate

Watered Crop Growth

Irrigation type

JEYANTHINATHAN

Resistance of crop to disease

Soil Fertility

Usage of organic manure

Crop Rotation

ANISH PRASANTH

Crop Type

Pests and Control

Crop Diseases

Yield production

1

2

3

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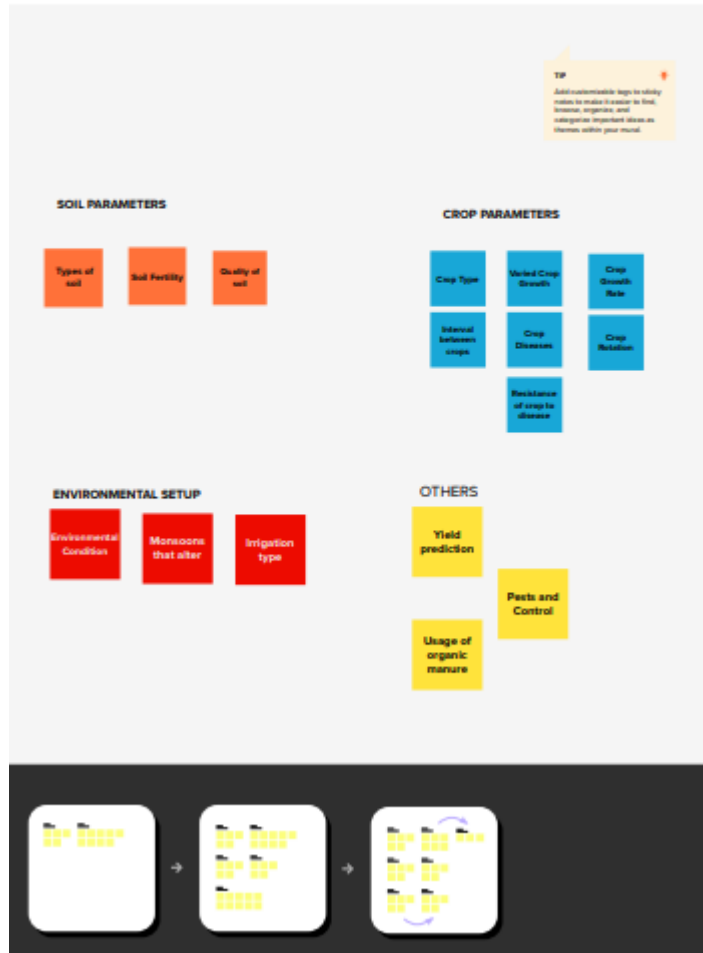
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5

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 and break it up into smaller sub-groups.

🕒 20 minutes



Step-3: Idea Prioritization



3.3 PROPOSED SOLUTION

Define CS, fit into CC	<p>1. CUSTOMER SEGMENT(S) CS</p> <p>1.customer who is unable to estimate the yield of the crop.</p> <p>2.customer find it difficult because it requires more statistical data to be Analyzed</p> <p>3.customer is the person who involved in agricultural sector.</p>	<p>6. CUSTOMER CONSTRAINTS CC</p> <p>1.To much costs of pesticides</p> <p>2.No proper system for efficient storage of natural resources</p> <p>3.To much of data to be analyzed which is hard to prepare and support.</p>	<p>5. AVAILABLE SOLUTIONS AS</p> <p>1.Previously there was no proper tool for estimation farmers estimate on there own by estimating the crop yield by using grain weight and some crop models</p> <p>2.This method do not provide much profit and this is not systematic manner.</p>	Explore AS, differentiate
Focus on J&P, tap into BE, understand RC	<p>2. JOBS-TO-BE-DONE / PROBLEMS J&P</p> <p>1.Using minimum resources and increasing productivity</p> <p>2.Advising the customer about marketing,harvesting and crop Rotation</p> <p>3.Promoting less use of pesticides and improving organic farming</p>	<p>9. PROBLEM ROOT CAUSE RC</p> <p>1.For an normal individual it is hard to estimate crop yield because it takes long time must data need to be verified and studied which is practical not possible</p> <p>2.No proper system for efficient storage of natural resources</p> <p>3.To much cost of pesticides and other agriculture products</p>	<p>7. BEHAVIOUR BE</p> <p>1.Suggesting the crop to be planted in the coming season can be done by this model by evaluating various criterias</p> <p>2.This application provides a way for crop rotation</p>	Focus on J&P, tap into BE, understand RC

CHAPTER 4

REQUIREMENT ANALYSIS

Functional Requirements:

Functional requirements are product features or functions that developers must implement to enable users to accomplish their tasks. So, it's important to make them clear both for the development team and the stakeholders. Generally, functional requirements describe system behaviour under specific conditions.

The system sends an approval request after the user enters personal information. A search feature allows a user to hunt among various invoices if they want to credit an issued invoice. The system sends a confirmation email when a new user account is created.

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Data visualization charts	Creating various graphs and charts to highlight the Required insights and visualizations
FR-4	Dataset Requirments	Understanding the dataset and then load it to cloud Platform then build the required visualizations to Provide visual analytical solutions

Non-functional Requirements:

These are basically the quality constraints that the system must satisfy according to the project contract. The priority or extent to which these factors are implemented varies from one project to other. They are also called non-behavioral requirements.

They basically deal with issues like:

- Usability
- Security
- Scalability
- Performance
- Availability

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

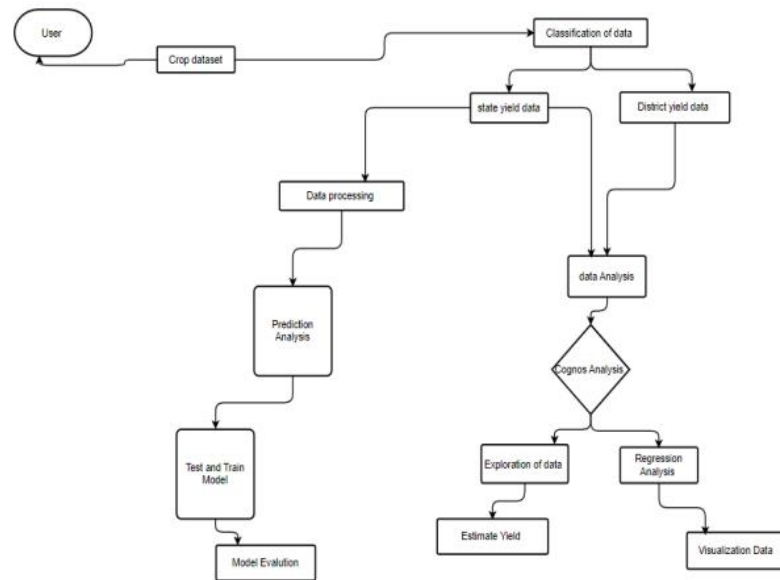
FR No.	Non-Functional Requirement	Description
NFR-1	Usability	The insights are useful for farmers, Indian government or anyone related to agriculture sector.
NFR-2	Security	The data is securely loaded in IBM cloud platform and also Cognos security is a component of IBM Cognos framework that manages the user access to data.
NFR-3	Performance	Predicts accurate results and also faster
NFR-4	Availability	The insights are available to users anytime and user can also fetch required results anywhere, anytime
NFR-5	Scalability	It can be scaled well by adding different features or data and can still get useful insights according to data.

CHAPTER 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.



User Stories

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority
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
		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
		USN-3	As a user, I can register for the application through Gmail	I can receive confirmation email	Medium
Customer (Web user)	Login	USN-4	As a user, I can log into the application by entering email & password	I can access my account using my details	High
	Dashboard	USN-5	User can view his/her complete crop yield analysis	I can view my crop yield analysis and accuracy	High
	Dashboard	USN-6	User can view the estimated crop yield through report generation	I can view the crop yield in the dashboard	High

CHAPTER 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	Working with Crop data set	USN-1	Understanding the crop data set	10	High	ArunSaravanan, Kishore
Sprint-1	Working with the crop data set	USN-2	Loading the crop data set	10	Medium	ArunSaravanan, Jeyanthi Nathan
Sprint-2	Cleaning the data	USN-3	To remove null values or replace the mean values	5	Medium	NaveenPrasnth, JeyanthiNathan
Sprint-2	Prepare the data	USN-4	Migrate the data into as per requirement.	5	Medium	ArunSaravanan, Kishore
Sprint-2	Data Exploration	USN-5	Understanding the data set which was loaded in the IBM Cognos	10	High	NaveenPrasnth, JeyanthiNathan
Spring-3	Data Visualization	USN-6	Implementing the visualisation and creating chat, Pivot table.	10	High	ArunSaravanan, Kishore
Sprint -3	Dashboard	USN-7	Comparing the various type of charts using Dashboard.	10	Medium	NaveenPrasnth, JeyanthiNathan
Sprint-4	Report	USN-8	Generate the report with the help of dashboard	10	High	ArunSaravanan, Kishore
Sprint-4	Export	USN-9	Export the report and share it to the Github repository.	10	Low	NaveenPrasnth, JeyanthiNathan

Product Backlog, Sprint Schedule, 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	25 Oct 2022	31 Oct 2022	20	31 Oct 2022
Sprint-2	20	6 Days	01 Nov 2022	06 Nov 2022	20	06 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	13 Nov 2022	20	14 Nov 2022
Sprint-4	20	6 Days	13 Nov 2022	19 Nov 2022	20	19 Nov 2022

Velocity:

Imagine we have a 10-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)

Total Sprint Points = 80

Total Sprint = 4

Average Velocity = $80/4 = 20$

CHAPTER 7

CODING & SOLUTIONING

The source code is uploaded in the Github Sprint wise folders.

- **GitHubLink: <https://github.com/IBM-EPBL/IBM-Project-17124-1659628680>**