

PROJECT REPORT

Estimate the Crop Yield using Data Analysis

1. INTRODUCTION

1.1. Project Overview

Crop production is one of the most important sources of income in India and India is one of the top countries in agriculture. It is important to understand the yield of crops in different conditions in an easier way. As per this project we will be collecting some dataset, analyzing them using visualizations, creating a dashboard and this will give us more insights of Crop production in India.

1.2. Purpose

Crop yield estimation using data analytics is an important task for farmers for rapid decisionmaking. An accurate crop yield analysis can help farmers to decide on what to grow and when to grow. Various crops are suited for different weather conditions, geographic locations, soil types, etc., have shown satisfactory yield in certain years and it is not easy to manually collect this data and perform analysis. Visualization of the data can help understand the pattern of production through the years depending on various factors, according to which effective decisions can be made with lesser errors.

2. LITERATURE SURVEY

2.1. Existing problem

[1] In this paper Akhilesh Kumar Sharma, Oorja Garg, and Krishna Modi (2021) worked at collecting and analyzing temperature, rainfall, soil, seed, crop production, humidity and wind speed data, which will help the farmers improve the produce of their crops. K-means clustering is employed on results. Its's not always very easy to implement each and everything using machine learning algorithms like K-means, as its accuracy reduces with larger datasets.

[2] In this study NingJin, BoTao WeiRen, DongyanZhang (2022) used a regional irrigation data for winter wheat grown on the Loess. But the results aren't very accurate.

[3] In this paper Jyoti Mahajan, Kriti Banal and Samridhi Mahajan (2021) used historical production and meteorological data and processed them for analysis and applying ML algorithms. However, this was prone to over fitting.

[4] In this study Yeshanbele Alebele, Wenhui Wang, Weiguo Yu, Xue Zhang (2021) proposed Gaussian kernel regression for rice yield estimation from optical and SAR imagery using a limited amount of ground truth data. But, efficiency was less in high dimensional spaces.

[5] In this work Laura Martínez-Ferrer, Maria Piles, Gustau Camps-Valls (2021) introduced the use of Gaussian processes (GPs) for the estimation. The proposed methodology combines synergistic information on canopy greenness, biomass, soil, and plant water content from optical and microwave sensors with the atmospheric variables. But this makes use of the entire feature sample.

2.2. References

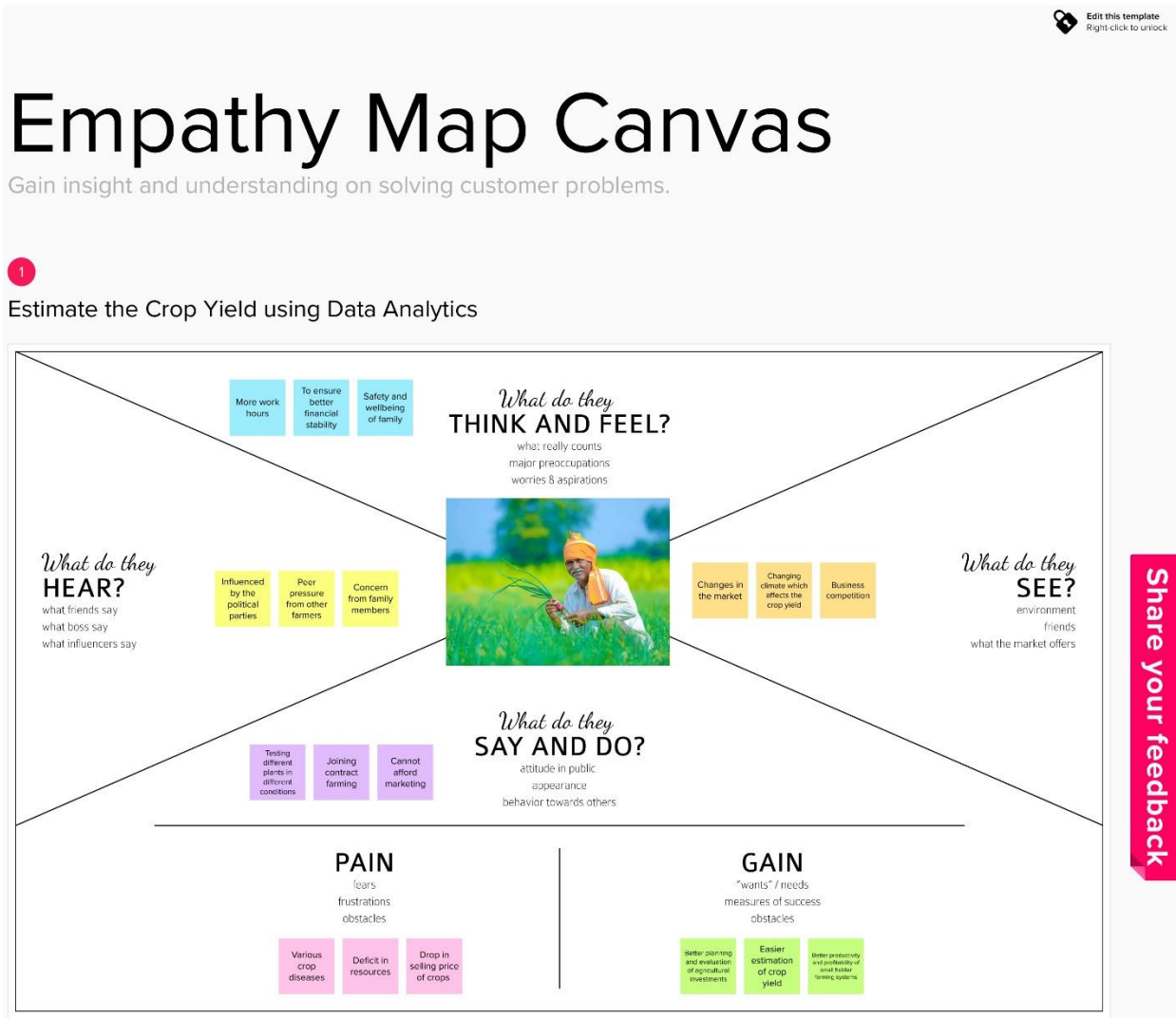
1. Akhilesh Kumar Sharma, Oorja Garg, and Krishna Modi (2021), "WB-CPI: Weather Based Crop Prediction in India Using Big Data Analytics," in IEEE Access, vol. 9, pp. 137869-137885, 2021.
2. Ning Jin, Bo Tao, Wei Ren, Liang He, Dongyan Zhang, Dacheng Wang, Qiang Yu, "Assimilating remote sensing data into a crop model improves winter wheat yield estimation based on regional irrigation data", Agricultural Water Management, Volume 266, 2022.
3. Mahajan, J., Banal, K. & Mahajan, S. "Estimation of crop production using machine learning techniques: a case study of J&K". Int. j. inf. tecnol. 13, 1441–1448 (2021).
4. Yeshanbele Alebele, Wenhui Wang, Weiguo Yu, Xue Zhang (2021), "Estimation of Crop Yield From Combined Optical and SAR Imagery Using Gaussian Kernel Regression," in IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing, vol. 14.
5. L. Martínez-Ferrer, M. Piles and G. Camps-Valls, "Crop Yield Estimation and Interpretability With Gaussian Processes," in IEEE Geoscience and Remote Sensing Letters, vol. 18, no. 12, pp. 2043-2047, Dec. 2021

2.3. Problem Statement Definition

It is important for farmers to better estimate and make right decisions for growing crops based on factors such as season and place, by observing the patterns of the past data, analyzing, and deciding upon the type of crop to grow and the area it should occupy. A dashboard displaying the visualized data makes it easier to read and understand.

3. IDEATION & PROPOSED SOLUTION

3.1. Empathy Map Canvas



3.2. Ideation & Brainstorming



3.3. Proposed Solution

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Using data analysis, to aid farmers in making better decisions in order to have healthy crop production.
2.	Idea/ Solution description	To deliver a perfectly analysed Dashboard of historical agricultural production data from several Indian states so that farmers may forecast their crop yield.
3.	Novelty / Uniqueness	The dataset contains information about the crops in various Districts, States, Seasons, and Areas. Therefore, using all these facts, a thoroughly researched report will assist farmers in making the best crop choice for their region during a specific growing season to increase output.
4.	Social Impact / Customer Satisfaction	The issues that farmers have with yield potential will all be resolved by this report. Therefore, this Dashboard will have a significant impact on farmers, and by adopting the advised crops, they can achieve enormous earnings.
5.	Business Model (Revenue Model)	Profit can be generated by marketing the solution as a freely accessible mobile application that anyone can use. Venture partnerships with the government may yield financial rewards.
6.	Scalability of the Solution	Regarding dataset storage and data gathering, there are no problems. As a result, the system may be readily scaled to manage rising user numbers, traffic, and requirements that must be met.

3.4. Problem Solution

Define CS, fit into CC	<div>1. CUSTOMER SEGMENT(S)</div> <div>Who is your customer? i.e. working parents of 0-5 y.o. kids</div> <div>CS</div> <div><div>➤ Our target customer here is the farmer who mainly works with the crops in the field</div></div>	<div>6. CUSTOMER CONSTRAINTS</div> <div>What constraints prevent your customers from taking action or limit their choices of solutions? i.e. spending power, budget, no cash, network connection, available devices.</div> <div>CC</div> <div><div>➤ Farmers don't make accurate predictions about the climate.</div><div>➤ They also stick to traditional methods of farming, therefore lacking modern irrigation, fertilization facilities</div></div>	<div>5. AVAILABLE SOLUTIONS</div> <div>Which solutions are available to the customers when they face the problem</div> <div>AS</div> <div><div>or need to get the job done? What have they tried in the past? What pros & cons do these solutions have? i.e. pen and paper is an alternative to digital notetaking</div><div>➤ They may have the dataset but a proper data report is not available to them</div></div>	Explore AS, differentiate
	<div>2. JOBS-TO-BE-DONE / PROBLEMS</div> <div>Which jobs-to-be-done (or problems) do you address for your customers? There could be more than one, explore different sides.</div> <div>J&P</div> <div><div>➤ Farmers need to have access to detailed reports and predictions to grow the right kind of crops and to take proper precautions</div></div>	<div>9. PROBLEM ROOT CAUSE</div> <div>What is the real reason that this problem exists? What is the back story behind the need to do this job? i.e. customers have to do it because of the change in regulations.</div> <div>RC</div> <div><div>➤ Inaccurate predictions could lead to usage of wrong seeds, improper irrigation, and unpreparedness for drastic climate changes</div></div>	<div>7. BEHAVIOUR</div> <div>What does your customer do to address the problem and get the job done? i.e. directly related: find the right solar panel installer, calculate usage and</div> <div>BE</div> <div><div>➤ Farmers properly study and analyze their soil and decide what can be grown there. They also test crops with different weather conditions</div></div>	
Focus on J&P, tap into BE, understand RC	<div>3. TRIGGERS</div> <div>What triggers customers to act? i.e. seeing their neighbour installing solar panels, reading about a more efficient solution in the news.</div> <div>TR</div> <div><div>➤ Destruction of crops because of climate change and growing competition in the market</div></div>	<div>10. YOUR SOLUTION</div> <div>If you are working on an existing business, write down your current solution first, fill in the canvas, and check how much it fits reality. If you are working on a new business proposition, then keep it blank until you fill in the canvas and come up with a solution that fits within customer limitations, solves a problem and matches customer behaviour.</div> <div>SL</div> <div><div>➤ It would help farmers a lot if crop yield predictions were made more accurately and the data is visualized and displayed on a dashboard for easier understanding</div></div>	<div>8. CHANNELS of BEHAVIOUR</div> <div>8.1 ONLINE What kind of actions do customers take online? Extract online channels from #7</div> <div>8.2 OFFLINE What kind of actions do customers take offline? Extract offline channels from #7 and use them for customer development.</div> <div>CH</div> <div><div>➤ It may not be possible online as not every farmer has access to technology and the internet, but they can benefit from it offline from an agricultural office</div></div>	Identify strong TR & EM
Identify strong TR & EM	<div>4. EMOTIONS: BEFORE / AFTER</div> <div>How do customers feel when they face a problem or a job and afterwards? i.e. lost, insecure > confident, in control - use it in your communication strategy & design.</div> <div>EM</div> <div><div>➤ Many farmers have faced huge losses in crop yield, which took months of hard work, leading them to commit suicide. When they are certain with the predictions and analysis, they are confident about making better decisions without much loss.</div></div>			

4. REQUIREMENT ANALYSIS

4.1. Functional requirement

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form
FR-2	User Profile	Details of User Details of Farm
FR-3	Required Data	Historical data of Crop Yield User Data(Farmer) to analyse
FR-4	Analysis	Data Pre-processing and analysis using IBM Cognos analytics Platform
FR-5	Estimation	To create an Interactive Dashboard, Report, Story visualizing the great insights about the estimation of Crop Yield.

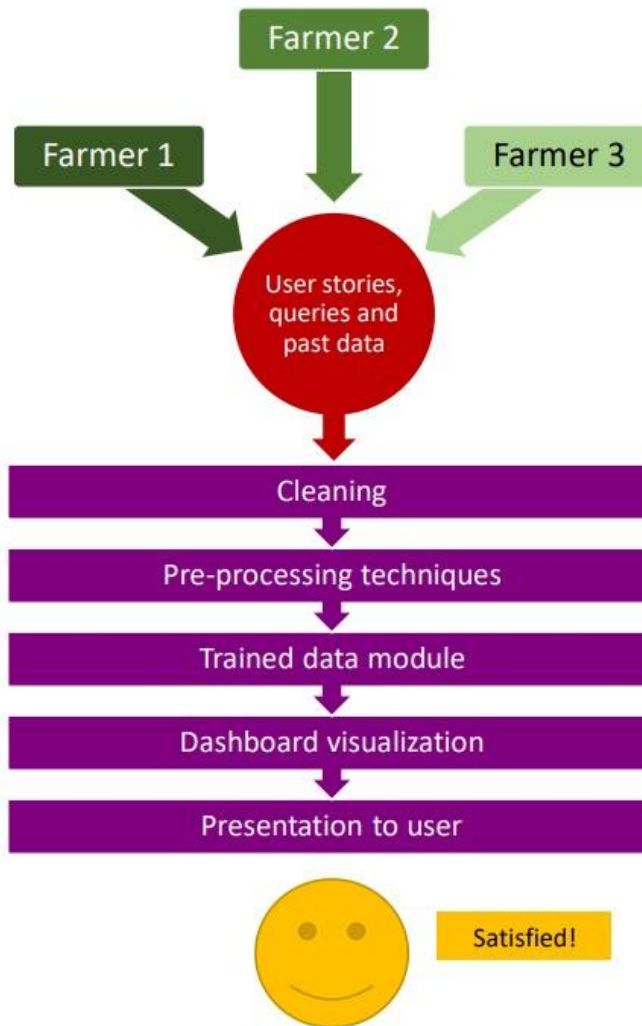
4.2. Non-Functional requirements

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	According to the past data, report is created. Crops to be sown in different Seasons will be advised or consulted to the farmers based on the Data Report.
NFR-2	Security	IBM Cognos platform have a secure user information.
NFR-3	Reliability	The interactive dashboard can make easily understandable of the data report.
NFR-4	Performance	Interaction makes better performance between all users and impressing by the visual advise.
NFR-5	Availability	The dashboard could be easily viewed and available in every smartphones, laptops, systems etc.
NFR-6	Scalability	The flexibility of the methodology to implement the proposed solution is very easy that can make increase in the estimation of crop yield in the different farms for different users.

5. PROJECT DESIGN

5.1. Data Flow Diagrams

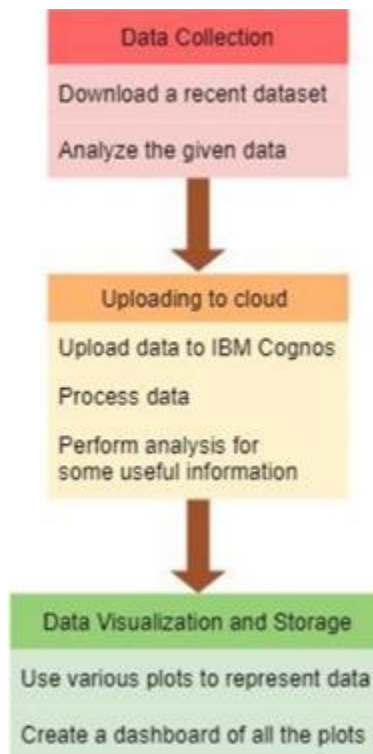
A Data Flow Diagram (DFD) is a traditional visual representation of the information flow within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.



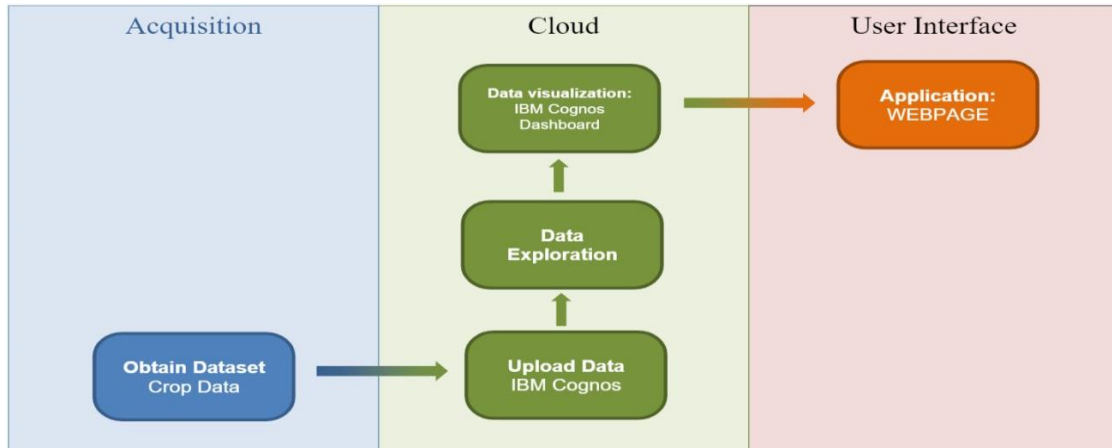
5.2. Solution & Technical Architecture

Solution Architecture

- Farmers need to be able to access this data wherever they are. They should be able to keep track of the crop yields anytime and easily
- A recent dataset can be obtained for analysis
- This data can be uploaded to a Cloud platform and processed
- Various plots can be used to represent that data and a dashboard containing all the plots can be displayed for better user experience



Technical Architecture



5.3. User Stories

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Farmer)	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-1
	Data	-	I can view the crop yield history, past profits and losses	I can access past dataset of crop yield in India	High	Sprint-2

	Analysis	USN-5	I can get clean,processed and analysed data		High	Sprint-3
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Customer Care Executive	Customer Care Executive (Communication)		As a user, i can provide support systems for companies that often communicate with the customers	I can maintain strong relationships with customer and client ,so I can ease theirqueries and increase productivity	Medium	Sprint-4
Estimator	Estimation		As a user, I can view the items that are to be estimated	I have a feel for the size of the various items in the product based	Medium	Sprint-4

6. PROJECT PLANNING & SCHEDULING

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	Abith Kumar Anil Kumar Karan Yuvega
		USN-3	As a user, I can register for the application through Gmail	2	Medium	Abith Kumar Anil Kumar
	Login	USN-4	As a user, I can Call and request or Approach for dataset	4	High	Karan Yuvega
	Working with the Dataset	USN-5	To work on the given dataset, Understand the Dataset.	2	High	Abith Kumar Anil Kumar Karan Yuvega
		USN-6	Load the dataset to Cloud platform then Build the required Visualizations.	10	High	Abith Kumar Yuvega
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	Anil Kumar Karan

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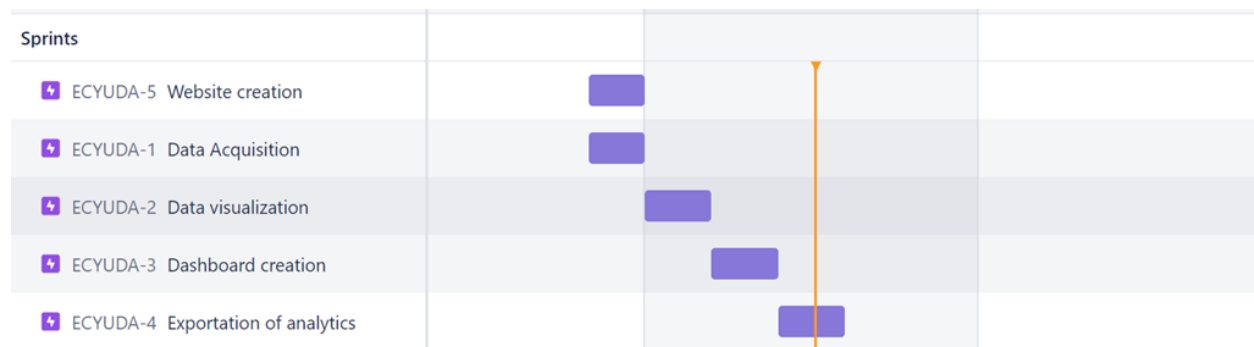
Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
			Build a visualization to show case top 10 States in Crop Yield Production by Area.	4	Medium	Karan Abith Kumar
			Build the required Visualization to showcase the Crop Production by State.	4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

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

Before the Start of Sprints



Creation of Sprints

▼ ECYUDA Sprint 1 27 Oct – 31 Oct (2 issues)

000Start sprint...

ECYUDA-6 Create a website

TO DO▼A

ECYUDA-7 Collect the dataset

TO DO▼AB

+ Create issue

▼ ECYUDA Sprint 2 1 Nov – 6 Nov (1 issue)

000Start sprint...

ECYUDA-8 Visualize the Dataset

TO DO▼K

+ Create issue

▼ ECYUDA Sprint 3 7 Nov – 12 Nov (3 issues)

000Start sprint...

ECYUDA-9 Create dashboard

TO DO▼AB

ECYUDA-10 Create story

TO DO▼Y

ECYUDA-11 Create Report

TO DO▼K

+ Create issue

▼ ECYUDA Sprint 4 13 Nov – 18 Nov (2 issues)

000Start sprint...

ECYUDA-12 Export the analytics

TO DO▼A

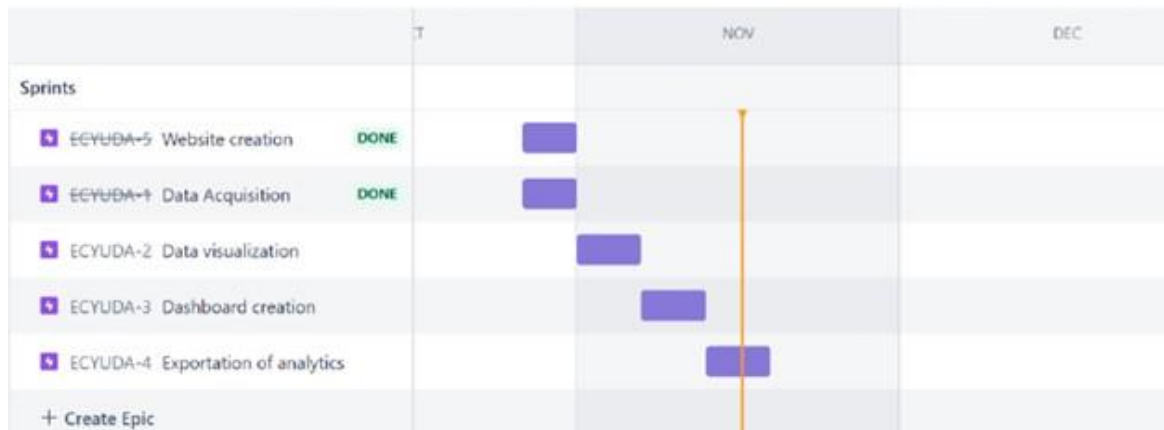
ECYUDA-13 Integrate dashboard with website

TO DO▼Y

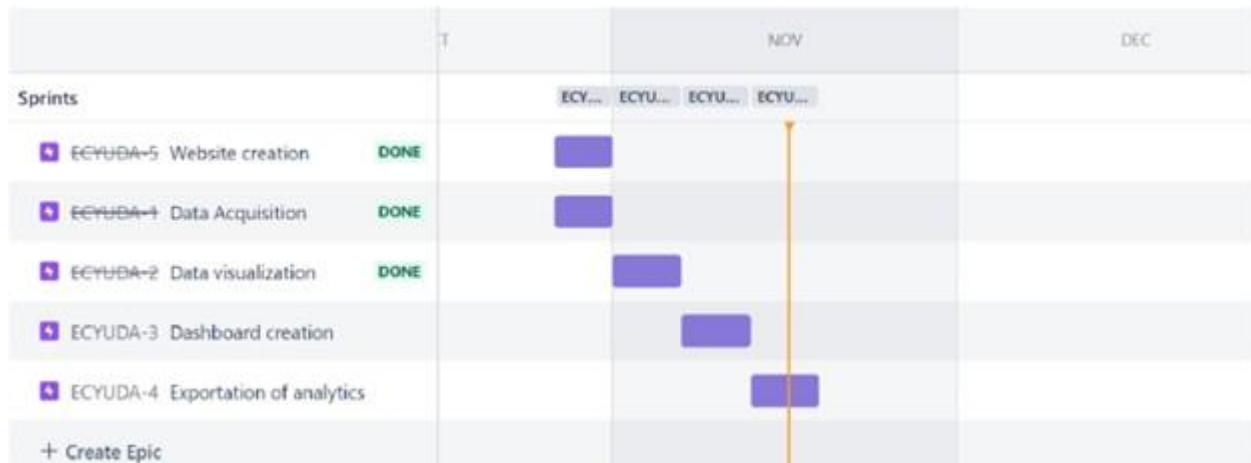
+ Create issue

Quickstart

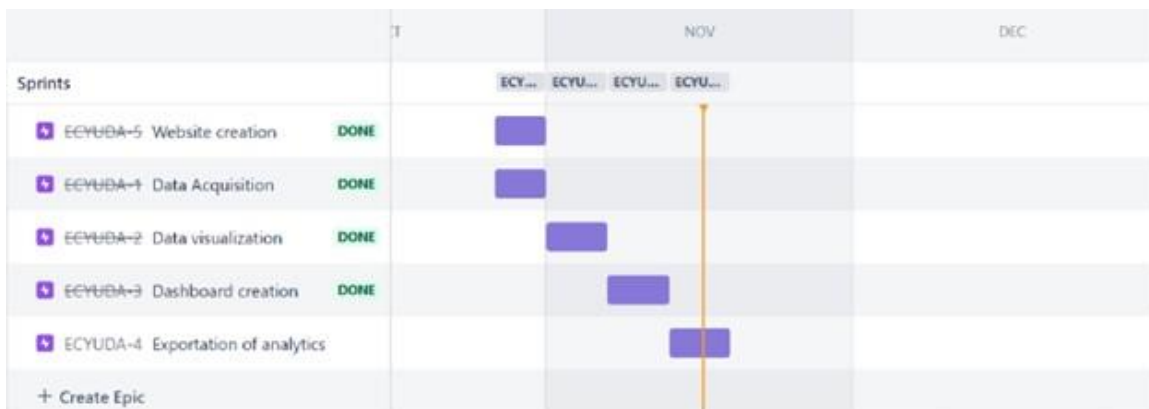
Sprint 1



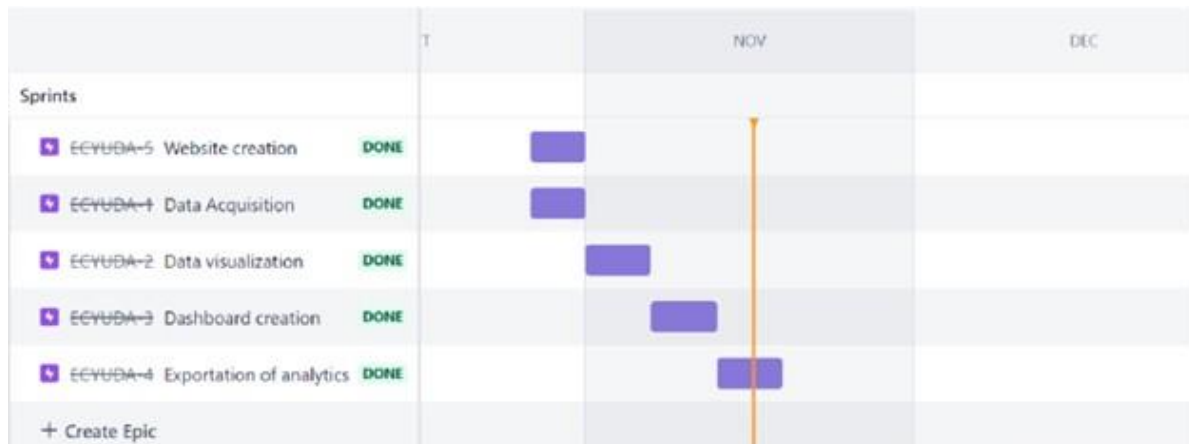
Sprint 2



Sprint 3



Sprint 4



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

7.1. Data set extraction from Kaggle using Kaggle-API

```
!pip install -q kaggle
!mkdir ~/.kaggle #creating kaggle directory
!cp kaggle.json ~/.kaggle/ #copying json file to folder
!kaggle datasets download -d abhiseklewan/crop-production-statistics-from-1997-inindia
!unzip /content/crop-production-statistics-from-1997-in-india.zip
```

7.2. Exploratory data analysis and estimation of crop yield using ML algorithm

Libraries

```
import seaborn as sns
import matplotlib.pyplot as plt
import pandas as pd
import numpy as np
%matplotlib inline
```

Data Exploration

```
df=pd.read_csv('/content/drive/MyDrive/IBM_CROP YIELD/CROP YIELD DATASET/crop_production.csv')
df.head()
```

	State_Name	District_Name	Crop_Year	Season	\
0	Andaman and Nicobar Islands	NICOBARS	2000	Khariif	
1	Andaman and Nicobar Islands	NICOBARS	2000	Khariif	
2	Andaman and Nicobar Islands	NICOBARS	2000	Khariif	
3	Andaman and Nicobar Islands	NICOBARS	2000	Whole Year	
4	Andaman and Nicobar Islands	NICOBARS	2000	Whole Year	

	Crop	Area	Production
0	Arecanut	1254.0	2000.0
1	Other Khariif pulses	2.0	1.0
2	Rice	102.0	321.0
3	Banana	176.0	641.0
4	Cashewnut	720.0	165.0

df.shape df.info()

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 246091 entries, 0 to 246090
Data columns (total 7 columns):
#   Column          Non-Null Count  Dtype
---  -
0   State_Name      246091 non-null object
1   District_Name   246091 non-null object
2   Crop_Year       246091 non-null int64
3   Season         246091 non-null object
4   Crop           246091 non-null object
5   Area           246091 non-null float64
6   Production      242361 non-null float64
dtypes: float64(2), int64(1), object(4)
memory usage: 13.1+ MB
```

df.isnull().sum()

```
State_Name      0
District_Name   0
Crop_Year       0
Season          0
Crop            0
Area            0
Production      3730
dtype: int64
```

3730/246091

0.015156994770227274 data =

df.dropna() print(data.shape)

(242361, 7)

df.isnull().sum()


```

State_Name      0
District_Name   0
Crop_Year       0
Season          0
Crop            0
Area            0
Production      3730
dtype: int64

```

```

sum_maxp = data["Production"].sum() data["percent_of_production"] =
data["Production"].map(lambda x:(x/sum_maxp)*100) data[:5]

```

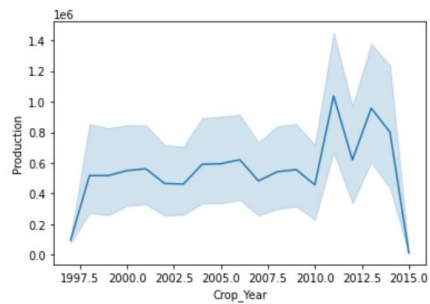
	State_Name	District_Name	Crop_Year	Season	\
0	Andaman and Nicobar Islands	NICOBARS	2000	Kharif	
1	Andaman and Nicobar Islands	NICOBARS	2000	Kharif	
2	Andaman and Nicobar Islands	NICOBARS	2000	Kharif	
3	Andaman and Nicobar Islands	NICOBARS	2000	Whole Year	
4	Andaman and Nicobar Islands	NICOBARS	2000	Whole Year	

	Crop	Area	Production	percent_of_production
0	Arecanut	1254.0	2000.0	1.416670e-06
1	Other Kharif pulses	2.0	1.0	7.083351e-10
2	Rice	102.0	321.0	2.273756e-07
3	Banana	176.0	641.0	4.540428e-07
4	Cashewnut	720.0	165.0	1.168753e-07

```

sns.lineplot(data["Crop_Year"],data["Production"])

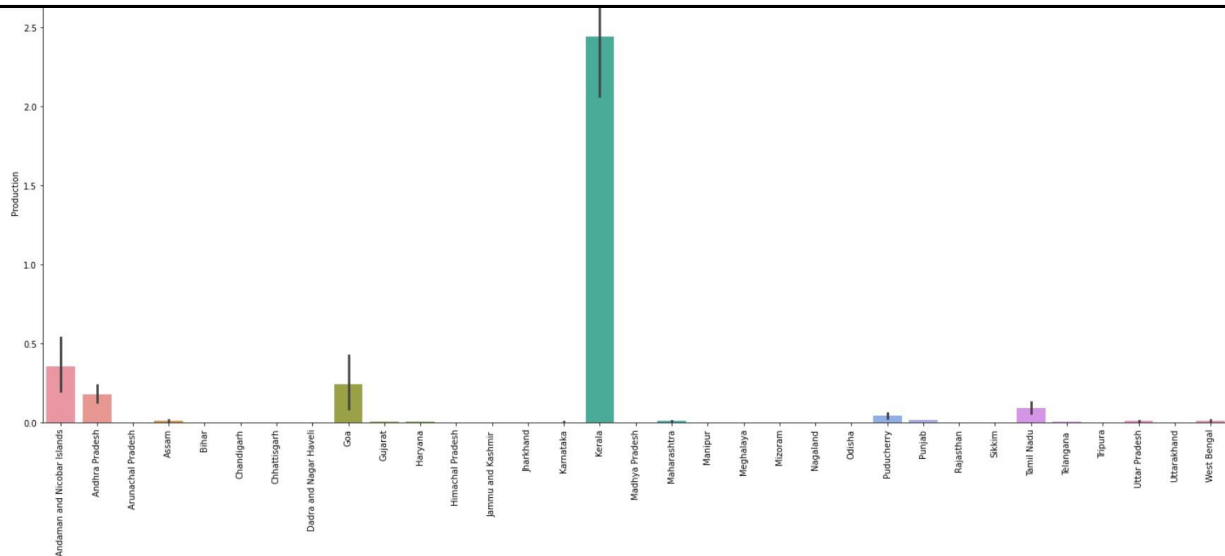
```



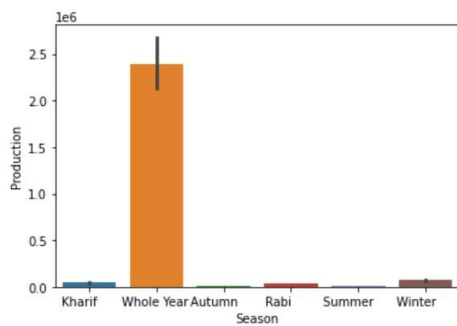
```

plt.figure(figsize=(25,10)) sns.barplot(data["State_Name"],data["Production"])
plt.xticks(rotation=90)

```



```
sns.barplot(data["Season"],data["Production"])
```



```
data.groupby("Season",axis=0).agg({"Production":np.sum})
```

```

          Production
Season
Autumn      6.441377e+07
Kharif      4.029970e+09
Rabi        2.051688e+09
Summer      1.706579e+08
Whole Year  1.344248e+11
Winter      4.345498e+08

```

```
data["Crop"].value_counts()[:5]
```

```

Rice          15082
Maize         13787
Moong(Green Gram) 10106
Urad          9710
Sesamum       8821
Name: Crop, dtype: int64

```

```

top_crop_pro = data.groupby("Crop")["Production"].sum().reset_index().sort_values(by='Production',asc ending=False)
top_crop_pro[:5]

```

```

           Crop  Production
28    Coconut  1.299816e+11
106  Sugarcane  5.535682e+09
95      Rice   1.605470e+09
119    Wheat   1.332826e+09
Coconut      87    Potato  4.248263e+08

```

```

coc_df = data[data["Crop"]=="Coconut "]
print(coc_df.shape) coc_df[:3]

```

```

      State_Name District_Name Crop_Year Season \
5  Andaman and Nicobar Islands  NICOBARS   2000 Whole Year
14 Andaman and Nicobar Islands  NICOBARS   2001 Whole Year
23 Andaman and Nicobar Islands  NICOBARS   2002 Whole Year

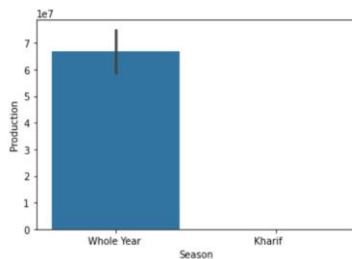
      Crop  Area  Production  percent_of_production
5  Coconut  18168.0  65100000.0          0.046113
14 Coconut  18190.0  64430000.0          0.045638
23 Coconut  18240.0  67490000.0          0.047806

```

```

sns.barplot("Season","Production",data=coc_df)

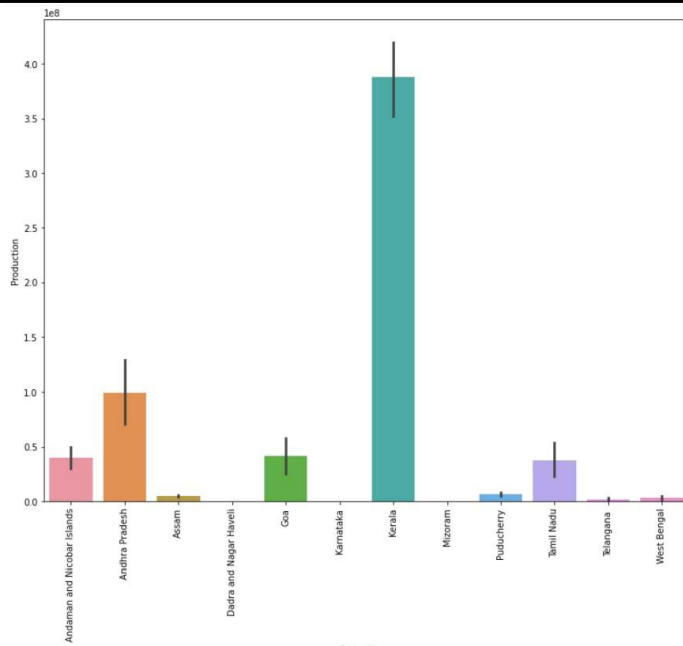
```



```

plt.figure(figsize=(13,10))
sns.barplot("State_Name","Production",data=coc_df)
plt.xticks(rotation=90) plt.show()

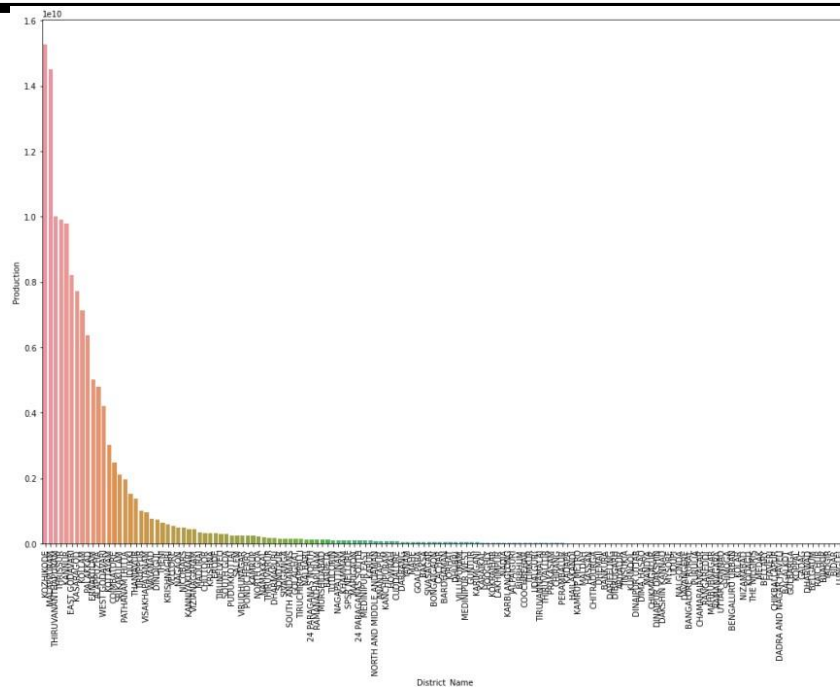
```



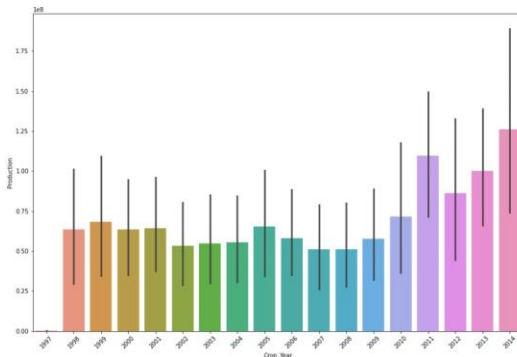
```
top_coc_pro_dis =
coc_df.groupby("District_Name")["Production"].sum().reset_index().sort_values(
    by='Production',ascending=False) top_coc_pro_dis[:5] sum_max =
top_coc_pro_dis["Production"].sum() top_coc_pro_dis["precent_of_pro"] =
top_coc_pro_dis["Production"].map(lambda x:(x/sum_max)*100) top_coc_pro_dis[:5]
```

	District_Name	Production	precent_of_pro
77	KOZHIKODE	1.527871e+10	11.754512
86	MALAPPURAM	1.451252e+10	11.165052
129	THIRUVANANTHAPURAM	1.001337e+10	7.703678
131	THRISSUR	9.920739e+09	7.632416
64	KANNUR	9.780310e+09	7.524379

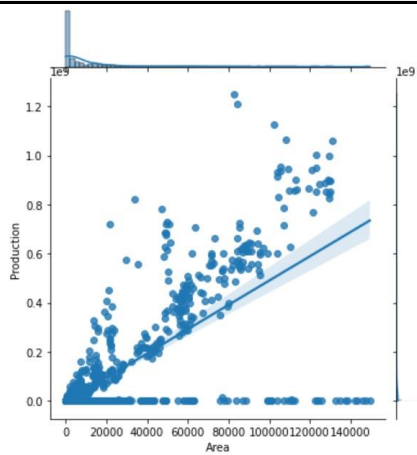
```
plt.figure(figsize=(18,12)) sns.barplot("District_Name","Production",data=top_coc_pro_dis)
plt.xticks(rotation=90) plt.show()
```



```
plt.figure(figsize=(15,10)) sns.barplot("Crop_Year", "Production", data=coc_df)
plt.xticks(rotation=45)
#plt.legend(rice_df['State_Name'].unique()) plt.show()
```



```
sns.jointplot("Area", "Production", data=coc_df, kind="reg")
```



Sugarcane

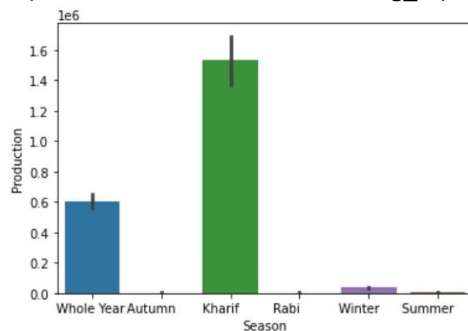
```
sug_df = data[data["Crop"]=="Sugarcane"]
```

```
print(sug_df.shape) sug_df[:3]
```

	State_Name	District_Name	Crop_Year	Season	\
7	Andaman and Nicobar Islands	NICOBARS	2000	Whole Year	
16	Andaman and Nicobar Islands	NICOBARS	2001	Whole Year	
26	Andaman and Nicobar Islands	NICOBARS	2002	Whole Year	

	Crop	Area	Production	percent_of_production
7	Sugarcane	1.0	2.0	1.416670e-09
16	Sugarcane	1.0	1.0	7.083351e-10
26	Sugarcane	5.0	40.0	2.833340e-08

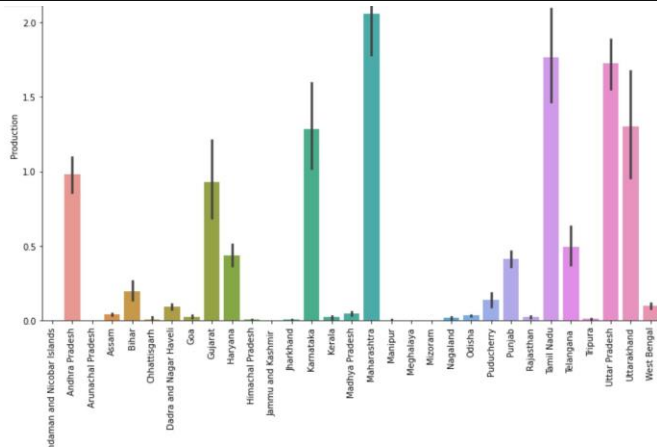
```
sns.barplot("Season", "Production", data=sug_df)
```



```
plt.figure(figsize=(13,8))
```

```
sns.barplot("State_Name", "Production", data=sug_df)
```

```
plt.xticks(rotation=90) plt.show()
```



```
top_sug_pro_dis =
```

```
sug_df.groupby("District_Name")["Production"].sum().reset_index().sort_val ues(
```

```
by='Production',ascending=False) top_sug_pro_dis[:5] sum_max =
```

```
top_sug_pro_dis["Production"].sum() top_sug_pro_dis["precent_of_pro"] =
```

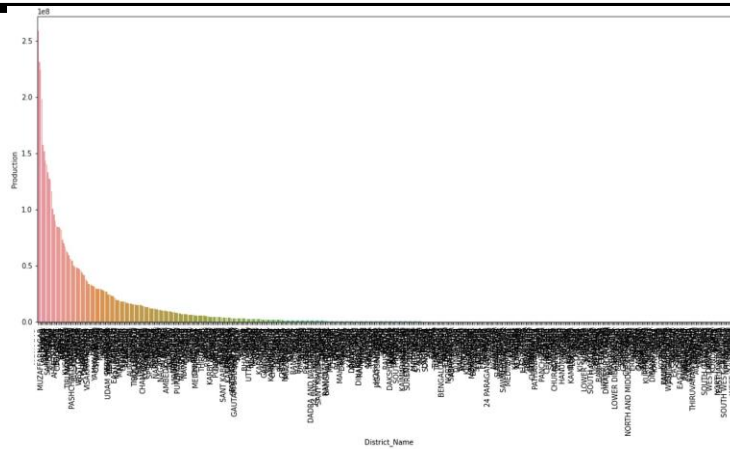
```
top_sug_pro_dis["Production"].map(lambda x:(x/sum_max)*100) top_sug_pro_dis[:5]
```

	District_Name	Production	precent_of_pro
360	MUZAFFARNAGAR	258698795.0	4.673296
81	BIJNOR	230907185.0	4.171251
283	KHERI	224383685.0	4.053407
63	BELGAUM	198207649.0	3.580546
294	KOLHAPUR	157210426.0	2.839947

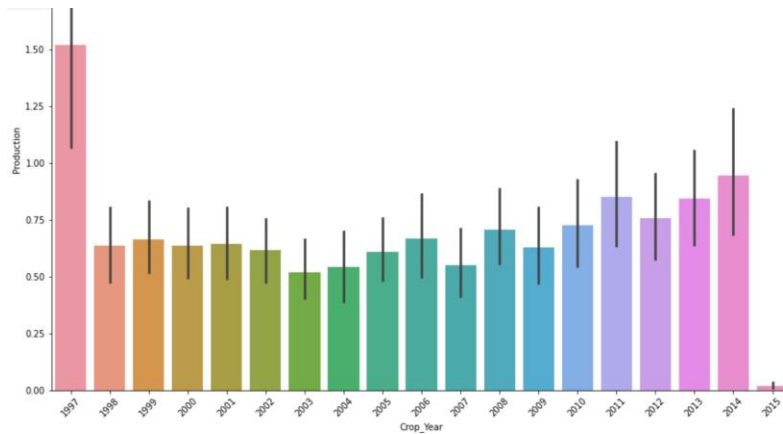
```
plt.figure(figsize=(18,8)) sns.barplot("District_Name","Production",data=top_sug_pro_dis)
```

```
plt.xticks(rotation=90)
```

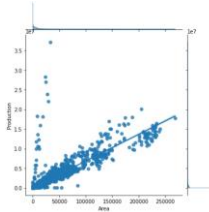
```
plt.show()
```



```
plt.figure(figsize=(15,10)) sns.barplot("Crop_Year","Production",data=sug_df)
plt.xticks(rotation=45)
#plt.legend(rice_df['State_Name'].unique()) plt.show()
```



```
sns.jointplot("Area","Production",data=sug_df,kind="reg")
```



Rice

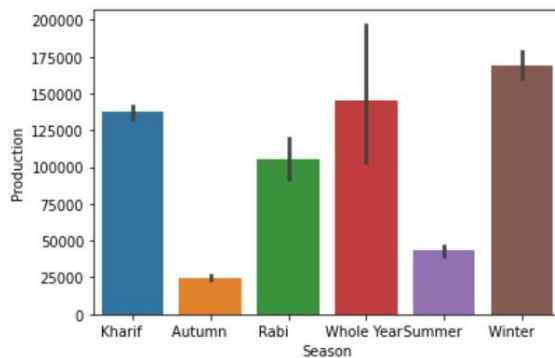
```
rice_df = data[data["Crop"]=="Rice"]
print(rice_df.shape) rice_df[:3]
```


(15082, 8)

	State_Name	District_Name	Crop_Year	Season	Crop	\
2	Andaman and Nicobar Islands	NICOBARS	2000	Kharif	Rice	
12	Andaman and Nicobar Islands	NICOBARS	2001	Kharif	Rice	
18	Andaman and Nicobar Islands	NICOBARS	2002	Kharif	Rice	

	Area	Production	percent_of_production
2	102.0	321.00	2.273756e-07
12	83.0	300.00	2.125005e-07
18	189.2	510.84	3.618459e-07

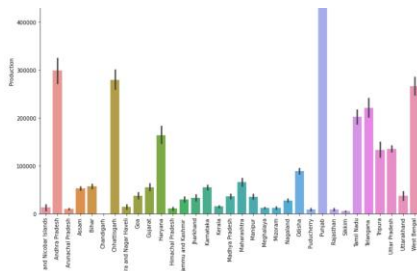
```
sns.barplot("Season","Production",data=rice_df)
```



```
plt.figure(figsize=(13,10))
```

```
sns.barplot("State_Name","Production",data=rice_df)
```

```
plt.xticks(rotation=90) plt.show()
```



```
top_rice_pro_dis =
```

```
rice_df.groupby("District_Name")["Production"].sum().reset_index().sort_values(
```

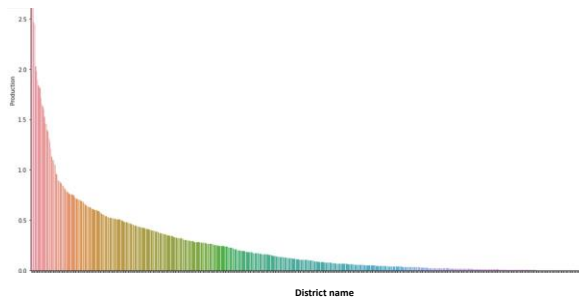
```
by='Production',ascending=False) top_rice_pro_dis[:5] sum_max =
```

```
top_rice_pro_dis["Production"].sum() top_rice_pro_dis["percent_of_pro"] =
```

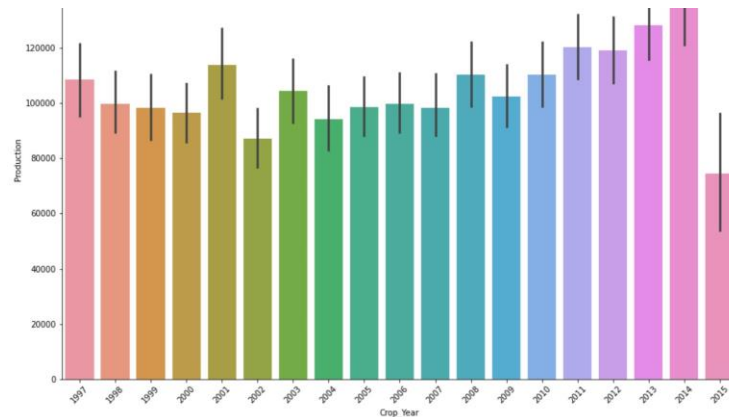
```
top_rice_pro_dis["Production"].map(lambda x:(x/sum_max)*100) top_rice_pro_dis[:5]
```

	District_Name	Production	precent_of_pro
58	BARDHAMAN	34239976.0	2.132707
374	MEDINIPUR WEST	29192719.0	1.818328
612	WEST GODAVARI	27845309.0	1.734402
169	EAST GODAVARI	24690929.0	1.537925
494	SANGRUR	24448000.0	1.522794

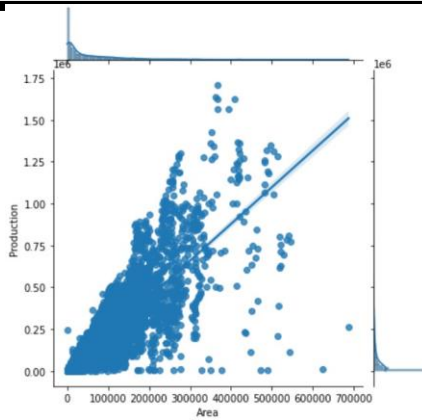
```
plt.figure(figsize=(18,12)) sns.barplot("District_Name","Production",data=top_rice_pro_dis)
plt.xticks(rotation=90) plt.show()
```



```
plt.figure(figsize=(15,10)) sns.barplot("Crop_Year","Production",data=rice_df)
plt.xticks(rotation=45)
#plt.legend(rice_df['State_Name'].unique()) plt.show()
```



```
sns.jointplot("Area","Production",data=rice_df,kind="reg")
```



Feature Selection `data1 = data.drop(["District_Name", "Crop_Year"], axis=1)`

`data1.head()`

`print(data1['Season'].unique()) print(data1['State_Name'].unique())`

`data1['Crop'].unique()`

`['Kharif ' 'Whole Year ' 'Autumn ' 'Rabi ' 'Summer`

`,`

`'Winter '']`

`['Andaman and Nicobar Islands' 'Andhra Pradesh' 'Arunachal Pradesh'`

`'Assam' 'Bihar' 'Chandigarh' 'Chhattisgarh' 'Dadra and Nagar`

`Haveli'`

`'Goa' 'Gujarat' 'Haryana' 'Himachal Pradesh' 'Jammu and Kashmir ' 'Jharkhand' 'Karnataka' 'Kerala'`

`'Madhya Pradesh' 'Maharashtra'`

`'Manipur'`

`'Meghalaya' 'Mizoram' 'Nagaland' 'Odisha' 'Puducherry' 'Punjab'`

`'Rajasthan' 'Sikkim' 'Tamil Nadu' 'Telangana ' 'Tripura' 'Uttar`

`Pradesh'`

`'Uttarakhand' 'West Bengal'] array(['Areca nut', 'Other Kharif pulses', 'Rice', 'Banana',`

`'Cashew nut',`

`'Coconut ', 'Dry ginger', 'Sugarcane', 'Sweet potato',`

`'Tapioca',`

`'Black pepper', 'Dry chillies', 'other oilseeds', 'Turmeric', 'Maize', 'Moong(Green Gram)', 'Urad',`

`'Arhar/Tur',`

`'Groundnut',`

`'Sunflower', 'Bajra', 'Castor seed', 'Cotton(lint)', 'Horsegram',`

`'Jowar', 'Korra', 'Ragi', 'Tobacco', 'Gram', 'Wheat',`

`'Masoor',`

```

'Sesamum', 'Linseed', 'Safflower', 'Onion', 'other misc. pulses', 'Samai', 'Small
millets', 'Coriander', 'Potato',
'Other Rabi pulses', 'Soyabean', 'Beans &
Mutter(Vegetable)',
'Bhindi', 'Brinjal', 'Citrus Fruit', 'Cucumber', 'Grapes',
'Mango',
'Orange', 'other fibres', 'Other Fresh Fruits', 'Other
Vegetables',
'Papaya', 'Pome Fruit', 'Tomato', 'Mesta', 'Cowpea(Lobia)',
'Lemon', 'Pome Granet', 'Sapota', 'Cabbage', 'Rapeseed
&Mustard',
'Peas (vegetable)', 'Niger seed', 'Bottle Gourd', 'Varagu',
'Garlic', 'Ginger', 'Oilseeds total', 'Pulses total', 'Jute',
'Peas & beans (Pulses)', 'Blackgram', 'Paddy', 'Pineapple',
'Barley', 'Sannhamp', 'Khesari', 'Guar seed', 'Moth',
'Other Cereals & Millets', 'Cond-spcs other', 'Turnip', 'Carrot',
'Redish', 'Arcanut (Processed)', 'Atcanut (Raw)',
'Cashewnut Processed', 'Cashewnut Raw', 'Cardamom', 'Rubber',
'Bitter Gourd', 'Drum Stick', 'Jack Fruit', 'Snak Guard',
'Tea',
'Coffee', 'Cauliflower', 'Other Citrus Fruit', 'Water Melon',
'Total foodgrain', 'Kapas', 'Colocosia', 'Lentil', 'Bean',
'Jobster', 'Perilla', 'Rajmash Kholar', 'Ricebean (nagadal)',
'Ash Gourd', 'Beet Root', 'Lab-Lab', 'Ribed Guard', 'Yam',
'Pump Kin', 'Apple', 'Peach', 'Pear', 'Plums', 'Litchi',
'Ber',
'Other Dry Fruit', 'Jute & mesta'], dtype=object) from sklearn.preprocessing import
LabelEncoder crop_encoder=LabelEncoder()
data1['State_Name']=crop_encoder.fit_transform(data1['State_Name'])
data1['Season']=crop_encoder.fit_transform(data1['Season'])
data1['Crop']=crop_encoder.fit_transform(data1['Crop']) data1.head()

```

	State_Name	Season	Crop	Area	Production	percent_of_production
0	0	1	2	1254.0	2000.0	1.416670e-06
1	0	1	74	2.0	1.0	7.083351e-10
2	0	1	95	102.0	321.0	2.273756e-07

```

3          0  4  7 176.0   641.0   4.540428e-07 4          0  4 22 720.0   165.0
1.168753e-07 print(data1['Season'].unique()) print(data1['State_Name'].unique())
data1['Crop'].unique()

[1 4 0 2 3 5]
[ 0  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
 24 25 26 27 28 29 30 31 32] array([ 2, 74, 95,  7, 22, 28, 38, 106, 108, 109, 15, 37, 123,   114, 59,
 63, 116,  3, 43, 107,  6, 25, 33, 45, 48, 53,
   90, 111, 41, 119, 61, 102, 57, 98, 67, 122, 99, 103, 32,
   87, 69, 105, 10, 13, 18, 27, 35, 42, 60, 68, 121, 73,
   75, 77, 85, 112, 62, 34, 55, 86, 101, 19, 92, 80, 65,
   17, 117, 39, 40, 66, 88, 49, 81, 16, 76, 83,  8, 100,
   52, 44, 64, 70, 31, 115, 21, 93,  1,  5, 23, 24, 20,   97, 14, 36, 46, 104, 110, 29, 26, 71, 118, 113,
  51, 30,
   56,  9, 47, 82, 91, 96,  4, 11, 54, 94, 120, 89,  0,
   78, 79, 84, 58, 12, 72, 50])

```

Test Train Split `x = data1.drop("Production",axis=1) y = data1[["Production"]]` `from`
`sklearn.model_selection import train_test_split x_train,x_test,y_train,y_test =`
`train_test_split(x,y,test_size=0.33, random_state=42) print("x_train :",x_train.shape) print("x_test`
`:",x_test.shape) print("y_train :",y_train.shape) print("y_test :",y_test.shape) x_train : (162381, 5)`
`x_test : (79980, 5) y_train : (162381, 1)`
`y_test : (79980, 1)`

```
x_train[:5]
```

```

State_Name Season Crop Area percent_of_production 4843      1      1  59 785.0
1.486087e-06
20626      3      0  95 1250.0      5.829598e-07
240277     32      4 106   2.0      1.452087e-07
20664      3      1  49  60.0      4.646678e-07
157859     22      3  63 605.0      6.729184e-08

```

1)Random Forest

```

from sklearn.ensemble import RandomForestRegressor model =
RandomForestRegressor() model.fit(x_train,y_train) preds = model.predict(x_test)
from sklearn.metrics import r2_score r = r2_score(y_test,preds) print("R2score when
we predict using Randomn forest is ",r)

```

R2score when we predict using Randomn forest is 0.9981341380489299 preds[:5] array([4479.26 ,
436.42 , 123.3237381 , 7.982 ,

183.38333333]) y_test[:5]

Production 51163

4529.0

55141 425.0

104122 254.0

161230 7.0

229232 130.0

2)Linear Regression

from sklearn.linear_model import LinearRegression model =

LinearRegression() model.fit(x_train,y_train)

LinearRegression(copy_X=True, fit_intercept=True, n_jobs=None, normalize=False)

preds_lg = model.predict(x_test)

from sklearn.metrics import mean_squared_error, r2_score

mean_squared_error(y_test,preds_lg)

1.7004942250319832e-11 preds_lg[:5]

array([[4529.00000093], [

425.00000081],

[253.99999425],

[7.00000048],

[130.00000039]]) y_test[:5]

Production 51163

4529.0 55141 425.0

104122 254.0

161230 7.0

229232 130.0

3) Decision Tree

```
from sklearn.tree import DecisionTreeRegressor regressor =  
DecisionTreeRegressor(random_state=42) regressor.fit(x_train,y_train)  
preds_dt = regressor.predict(x_test)  
mean_squared_error(y_test,preds_dt) r2_score(y_test,preds_dt)
```

```
0.9986419000899257 preds_dt[0]
```

```
4355.0 y_test[0:]
```

Production

```
51163    4529.0
```

```
55141    425.0
```

```
104122   254.0
```

```
161230     7.0
```

```
229232   130.0 ...    ...
```

```
23491  6710000.0
```

```
164745    30.0
```

```
31176  26496.0
```

```
22509    411.0
```

```
42211  97846.0
```

```
[79980 rows x 1 columns]
```

8. TESTING

Steps To Execute	Test Data	Expected Result	Actual Result	Status	Comments	TC for Automation(Y/N)	BUG ID	Executed By
1.Enter URL and click go 2.Click on the Register here button 3.Verify Singup options for new user displayed 4.Verify Login options for existing	https://cropyield.s3.amazonaws.com/object-storage/appdomain.cloud/IBM%20WEBSITE%20(2)/IBM%20WEBSITE/IBM%20WEBSITE/login%20Page.html	Login/Signup options or elements should display	Working as expected	Pass	Login or Signup are displayed.	NO	NO BUG	Yuvega S
1.Enter URL and click go 2. New customer?Click on the Register here 3.Verify Singup with below UI elements: a. Username text box b.password and Reconfirm Passwordtext box c.Submit and Reset button d.Already a user?Verify Login with below UI elements : 1. Username text box 2. Password text box	https://cropyield.s3.amazonaws.com/object-storage/appdomain.cloud/IBM%20WEBSITE%20(2)/IBM%20WEBSITE/IBM%20WEBSITE/login%20Page.html	Application should show below UI elements: a. Username text box b.password text box c.Submit button with Blue colour d.New customer? Create account by clicking on Register here e. password and Confirm password text box.	Working as expected	Pass	All the UI elements added for user login are available.	NO	NO BUG	G Anil Kumar
1.Enter URL and click go 2.Enter Valid username text box 4.Enter valid password in password text box 5.Click on Submit button	Username:anil password: anil123	User should navigate to user account homepage	Working as expected	Pass	User is able to navigate to home page	NO	NO BUG	Karan G
1.Enter URL and click go 2.Enter Valid username text box 3.Enter Invalid password in password text box 4.Click on Submit button	Username: sahan password: sa123	Application should Popup 'Incorrect Username or password ' validation message.	Working as expected	Pass	Invalid username or password popup is obtained	NO	NO BUG	Abith Kumar R
1.Enter URL and click go 2.Enter Invalid username text box 3.Enter valid password in password text box 4.Click on Submit button	Username: anil password: anil123	Application should Popup 'Incorrect Username or password ' validation message.	Working as expected	Pass	Invalid username or password popup is obtained	No	NO BUG	G Anil Kumar

1.Enter URL and click go 2.Enter Invalid username text box 3.Enter Invalid password in password text box 4.Click on Submit button	Username: anil password: saha1	Application should Popup 'Incorrect Username or password ' validation message.	Working as expected	Pass	Invalid username or password popup is obtained	NO	NO BUG	Karan G
Check whether the Home page has Technical Architecture and Navigation Bar.		User should navigate to user account homepage	Working as expected	Pass	User is navigated to home page.	NO	NO BUG	Yuvega S
Check whether the user is able to Navigate using navigation bar.		User should navigate to different pages using navigation bar	Working as expected	Pass	User was able to navigate to different pages	NO	NO BUG	Abith Kumar R
1.Click on the Dashboard button in navigation bar. 2.After clicking the Dashboard option you will get page with different dashboards. 3.Choose any one of the dashboard and explore them.		User able to see different dashboards and use them.	Working as expected	Pass	User was able to view different dashboards and analyse them.	NO	NO BUG	Karan G
1.Click on the Report button in navigation bar. 2. After clicking the Report option you will get page with different Report cards.		User is able to navigate to Report page and view the report page	Working as expected	Pass	User was able to view different report pages and analyse them.	No	NO BUG	G Anil Kumar
1.Click on the story button in navigation bar. 2.After clicking the story button you will get page with different story .		User is able to navigate to Story page and view the Story page	Working as expected	Pass	User was able to view different slides in a story and analyse them.	NO	NO BUG	Karan G

1.Click on the story button in navigation bar. 2.After clicking the story button you will get page with different story .		User is able to navigate to Story page and view the Story page	Working as expected	Pass	User was able to view different slides in a story and analyse them.	NO	NO BUG	Karan G
1.Click on the Contact us button in navigation bar. 2.After clicking the contact button you will get the contact details of contributors and you can directly contact with them.		User is able to navigate to Contact us page and view the details of contributors.	Working as expected	Pass	User was able to navigate to ContactUs page to contact the team.	NO	NO BUG	Yuvega S
1.Click on the logout button in navigation bar. 2.After clicking the logout button you will directed to the login page.		User is able to navigate to login page after clicking the logout option.	Working as expected	Pass	User was able to logout from the page	NO	NO BUG	Abith Kumar R

Defect Analysis

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	10	5	2	4	21
Duplicate	1	0	2	0	3
External	3	2	0	1	6
Fixed	12	3	3	20	38
Not Reproduced	0	0	1	0	1
Skipped	0	0	1	1	2
Won't Fix	0	4	2	1	7
Totals	26	14	11	27	78

9. RESULTS

9.1. Performance Metrics

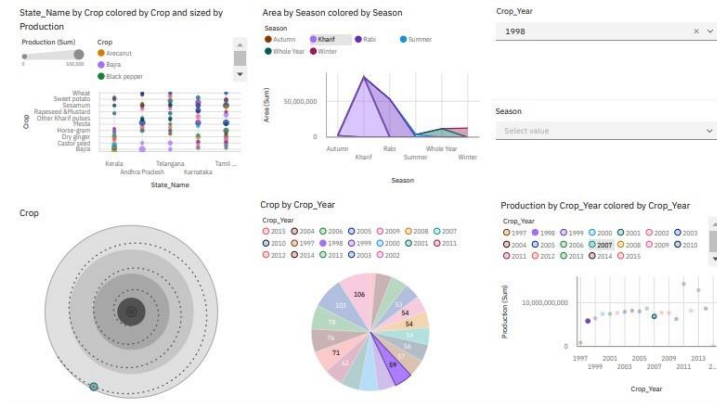
Machine Learning

Random forest R2score=0.9981341380489299

Linear Regression mean squared error=1.7004942250319832e-11

Decision Tree R2score=0.9986419000899257

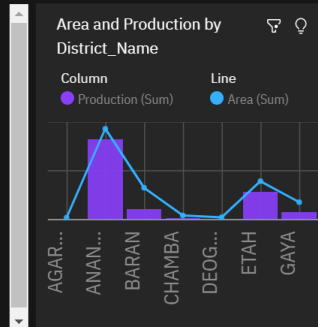
Dashboard:



Story:

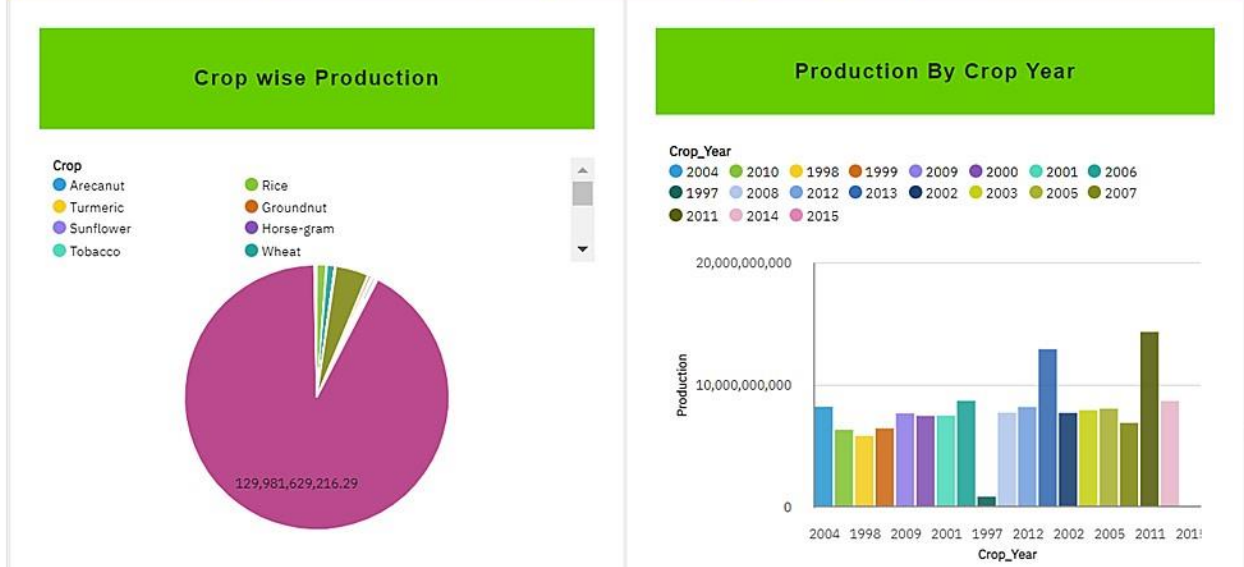
Area and Production in certain Districts

- This graph is about the crop production and area covered by various districts of India.
- Here, **Anantapur** in Andhra Pradesh holds the largest crop area of **18 million hectares** and produces **81 million tonnes/hectare** of crop
- **Deoghar** in Jharkhand, has covers the least area (**360,000 hectares**) and production (**1480.00 tonnes/hectare**)



Report:

Estimate The Crop Yield Using Data Analytics



10. ADVANTAGES & DISADVANTAGES

Advantages

- Applying different algorithms according to the dataset and based on visualization.
- Knowledge of building ML models
- You will be able to know how to pre-process/clean the data using different data preprocessing techniques.

Disadvantages

- As the given dataset is very small, the model is not able to make predictions on large values.
- For more accurate and real time results, we would need a dataset which contains millions of datapoints.

11. CONCLUSION

This project, "ESTIMATE THE CROP YIELD USING DATA ANALYTICS", has helped to predict the crop yield using the attributes such as

State_Name,District_Name,Crop_Year,Season,Crop,Area and Production.The model is build using IBM Cognos Watson. Technology has helped largely in the agricultural field. New concepts like digital agriculture, smart farming, precision agriculture etc have come up today. Successful analysis has been performed on the crop data based on weather condition, geographic location and area coverage. Also, the major trends have been identified.

12. FUTURE SCOPE

Lot of steps were involved in the data visualization and creation of dashboard. It would be much more convenient and efficient to identify the target attribute only, hence reducing the computational work. There should also be a proper algorithm selection process

13. APPENDIX

13.1. Source Code

Login Page

```
<!DOCTYPE html>
<html lang="en">
  <head>
    <meta charset="UTF-8" />
    <meta http-equiv="X-UA-Compatible" content="IE=edge" />
    <meta name="viewport" content="width=device-width, initial-scale=1.0" />
    <link rel="preconnect" href="https://fonts.googleapis.com" />
    <link rel="preconnect" href="https://fonts.gstatic.com" crossorigin />
    <link
href="https://fonts.googleapis.com/css2?family=Open+Sans:wght@300;600&display=swap"
rel="stylesheet"
/>
    <title>LOGIN SYSYEM</title>
    <style>    body{
      background-size: cover;
    }
    * {
      font-family: "Open Sans", sans-serif;
    }
    .container_login {
```

```
background-color: #f5f5f5;
display: flex;
justify-content: center;
align-items: center;
height: 100vh;
width: 100vw;
}
div {
margin-bottom: 10px;
}
input {
padding: 10px 15px;
border: 1px solid dodgerblue;
border-radius: 5px;
width: 200px;    outline: 0px;
}
input:focus {
border: 2px solid darkblue;
}
button {
background-color: blue;
font-size: larger;    width: fit-content;
border-radius: 5px;
padding: 5px 8px;
color: white;
margin: 0px 10px 10px 0px;
border: 0;
}
button:hover {
background-color: dodgerblue;
}
#CB {
width: auto;
}
p {
```

```
margin: 0px;
}
a {
  text-decoration: none;
}
#fp {
  margin-left: 30px;
}
a:hover {
  color: dodgerblue;
  text-decoration: none;
}
#b {
  color: white;
}
</style>
</head>
<body>
<article class="container_login" >
  <form>
    <h2>Please sign in</h2>
    <div>
      <input
        type="text"
        placeholder="Username"
        id="username"
        required
      />
    </div>
    <div>
      <input
        type="password"
        placeholder="Password"
        id="password"
        required
      />
    </div>
  </form>
</article>
```

```

    />
  </div>
  <div><input id="CB" type="checkbox" /> Remember Me</div>
  <button type="button" onclick="login()" class="btn btn-primary">
Submit</button>
  <p>
    New Users,
    <a href="registration.html" target="_blank">Register here!!</a>
  </p>

  <script src="javascript.js">
</script>

</form>
</article>
</body>
</html> Registration
<!DOCTYPE html>
<html lang="en">
<head>
  <title>Registration</title>
  <meta charset="utf-8">
  <meta name="viewport" content="width=device-width, initial-scale=1">
  <link href="https://cdn.jsdelivr.net/npm/bootstrap@5.2.2/dist/css/bootstrap.min. css" rel="stylesheet">
  <script
src="https://cdn.jsdelivr.net/npm/bootstrap@5.2.2/dist/js/bootstrap.bundle
.min.js"></script>
  <style>  body{
    background-size: cover;
  }
  body{
    background-size: cover;
  }
  h2{
    font-size:40px;

```



```

        <br>
        <button type="button" onclick="register()" class="btn btn-primary">Submit</button>
        <input type="reset" class="btn btn-primary">
    </div>
    <br>
    <p>Already an user?<a href="login
Page.html">Login</a></p>
    </div>
</div>
</div>
</div>
</form>
</div>
</div>
<script src="javascript.js"></script>
</body>
</html>

```

Index

```

<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8" />
    <meta http-equiv="X-UA-Compatible" content="IE=edge" />
    <meta name="viewport" content="width=device-width, initial-scale=1.0" />
    <title>Home</title>
    <style>    body{
        background-size: cover;
    }
    .container {
        height: 50px;
        font-family: Arial, Helvetica, sans-serif;
        background-color: rgb(8, 94, 215);
        display: flex;
        flex-direction: row;
        justify-content: flex-end;
        align-items: center;
    }

```

```
}

a {
  color: whitesmoke;
  text-decoration: none;
}

a:hover {

  color: navy;
  text-decoration: none;
}

.nav_items {

  color: whitesmoke;
  padding: 0px;
  font-size: larger;
  margin: 0px 40px 0px 40px;
}

input,
textarea {
  padding: 10px 15px;
  margin-top: 5px;
  margin-bottom: 10px;
  border: 1px solid navy;
  border-radius: 5px;
  width: 500px;   outline: 0px;
}

input:focus,
textarea:focus {
  border: 2px solid navy;
}

ul {
  padding-left: 0px;
}

.contactGrid {
  display: grid;
```

```
grid-template-rows: repeat(2, 170px);
grid-template-columns: repeat(2, 300px);
}

.contactBox {
  background-color: dodgerblue;
  color: white;
  border: 2px solid white;
  padding: 20px;
  display: flex;
  flex-direction: column;
  justify-content: center;
  align-items: center;
}

h4 {
  margin: 0px;
}

.contactInfo,
.lastPart {
  display: flex;
  justify-content: space-around;
  align-items: center;
  margin-bottom: 40px;
}

.icons {
  width: 30px;
  height: 30px;
  margin-right: 10px;
}

.contactBox:hover {
  background-color: dodgerblue;
}

button {
  background-color: tomato;
  font-size: larger;
  border-radius: 5px;
```

```
width: 150px;    height: auto;
padding: 10px;
color: white;
margin: 0px 10px 10px 0px;
border: 0;
}
button:hover {
    background-color: dodgerblue;
}
.matter {
    color: #1b0760;
    font-weight: bold;
    text-align: center;
    font-size: large;
}
img {
    margin: 50px;
    height: 250px;
    width: 1000px;
    border-radius: 5px;
}
</style>
</head>
<body background="ICONS/home1.jpg">
<nav>
<article class="container">
    <ul>
        <a class="nav_items" href="index.html">Home</a>
    </ul>
    <ul>
        <a class="nav_items" href="dashboard.html">Dashboard</a>
    </ul>
    <ul>
        <a class="nav_items" href="report.html">Report</a>
    </ul>
```

```
</ul>
  <a class="nav_items" href="story.html">Story</a>
</ul>

<ul>
  <a class="nav_items" href="contactUs.html">Contact Us</a>
</ul>

<ul>
  <a class="nav_items" href="login Page.html">Log out</a>
</ul>
</article>
</nav>
```

```
<!-- BODY -->
```

```
<article style="text-align: center">
```

```
<h1>Estimate the Crop Yield using Data Analytics</h1>
```

```
<p class="matter">
```

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, Story, Report and by going through these we will get most of the insights of Crop production in India.

```
</p>
```

```
<h2>Technical Architecture :</h2>
```

```

```

```
</article>
```

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

Dashboard

```
<!DOCTYPE html>
```

```
<html lang="en">
```

```
<head>
```

```
<meta charset="UTF-8" />
```

```
<meta http-equiv="X-UA-Compatible" content="IE=edge" />
```

```
<meta name="viewport" content="width=device-width, initial-scale=1.0" />
```

```
<title>Dashboard</title>

<style>  body{
    background-size: cover;
}

.container {
    height: 50px;
    font-family: Arial, Helvetica, sans-serif;
    background-color: rgb(8, 94, 215);
    display: flex;
    flex-direction: row;
    justify-content: flex-end;
    align-items: center;
}

a {
    color: whitesmoke;
    text-decoration: none;
}

a:hover {
    color: black;
    text-decoration: none;
}

.nav_items {
    color: whitesmoke;    padding: 0px;
    font-size: larger;
    margin: 0px 40px 0px 40px;
}

ul {
    padding-left: 0px;
}

h4 {
    margin: 0px;
}

</style>
```

```
</head>
<body background="ICONS/home1.jpg">
  <nav>
    <article class="container">
      <ul>
        <a class="nav_items" href="index.html">Home</a>
      </ul>
      <ul>
        <a class="nav_items" href="dashboard.html">Dashboard</a>
      </ul>
      <ul>
        <a class="nav_items" href="report.html">Report</a>
      </ul>
      <ul>
        <a class="nav_items" href="story.html">Story</a>
      </ul>
      <ul>
        <a class="nav_items" href="contactUs.html">Contact Us</a>
      </ul>
      <ul>
        <a class="nav_items" href="login Page.html">Log out</a>
      </ul>
    </article>
  </nav>
  <h1 style="text-align: center;">Dashboard</h1>
  <div>    <iframe src="https://us1.ca.analytics.ibm.com/bi/?perspective=dashboard&pathRe
f=.my_folders%2FCROP%2BPRODUCTION%2BIBM%2BPROJECT%2FDashboards%2FDashboard
%2B1&closeWindowOnLastView=true&ui_appbar=false&ui_navbar=fals
e&shareMode=embedded&action=view&mode=dashboard&subView=mo
del00000184813c1c8f_00000000"
    width="1250"
    height="1000"
    frameborder="0"    gesture="media"
    allow="encrypted-media"
    allowfullscreen=""></iframe>
  </div>
```

```
</br>

<div>  <iframe src="https://us1.ca.analytics.ibm.com/bi/?perspective=dashboard&pathRe
f=.my_folders%2FCROP%2BPRODUCTION%2BIBM%2BPROJECT%2FDashboards%2FDashboard
%2B2&closeWindowOnLastView=true&ui_appbar=false&ui_navbar=fals
e&shareMode=embedded&action=view&mode=dashboard&subView=mo
del00000184894b86be_00000003"

    width="1250"
    height="800"
    frameborder="0"    gesture="media"
    allow="encrypted-media"
    allowfullscreen=""></iframe>
</div>
</br>

<div>  <iframe src="https://us1.ca.analytics.ibm.com/bi/?perspective=dashboard&pathRe
f=.my_folders%2FCROP%2BPRODUCTION%2BIBM%2BPROJECT%2FDashboards%2FDashboard
%2B3&closeWindowOnLastView=true&ui_appbar=false&ui_navbar=fals
e&shareMode=embedded&action=view&mode=dashboard&subView=mo
del000001848965777c_00000002"

    width="1250"
    height="800"
    frameborder="0"    gesture="media"
    allow="encrypted-media"
    allowfullscreen=""></iframe>
</div>
</br>

<div>  <iframe src="https://us1.ca.analytics.ibm.com/bi/?perspective=dashboard&pathRe
f=.my_folders%2FCROP%2BPRODUCTION%2BIBM%2BPROJECT%2FDashboards%2FDashboard
%2B4&closeWindowOnLastView=true&ui_appbar=false&ui_navbar=fals
e&shareMode=embedded&action=view&mode=dashboard&subView=mo
del000001848985cb66_00000004"

    width="1250"
    height="800"
    frameborder="0"    gesture="media"
    allow="encrypted-media"
    allowfullscreen=""></iframe>
</div>
```



```
</br>
</body> </html>
```

Report

```
<!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="UTF-8" />
  <meta http-equiv="X-UA-Compatible" content="IE=edge" />
  <meta name="viewport" content="width=device-width, initial-scale=1.0" />
  <title>REPORT</title>
  <style>    body{
      background-size: cover;
    }
    .container {
      height: 50px;
      font-family: Arial, Helvetica, sans-serif;
      background-color: rgb(8, 94, 215);
      display: flex;
      flex-direction: row;
      justify-content: flex-end;
      align-items: center;
    }
    a {
      color: whitesmoke;
      text-decoration: none;
    }
    a:hover {
      color: black;
      text-decoration: none;
    }
    .nav_items {
      color: whitesmoke;    padding: 0px;
      font-size: larger;
      margin: 0px 40px 0px 40px;
```

```
}

ul {
  padding-left: 0px;
}

h4 {
  margin: 0px;
}

</style>
</head>
<body background="ICONS/home1.jpg">
<nav>
  <article class="container">
    <ul>
      <a class="nav_items" href="index.html">Home</a>
    </ul>
    <ul>
      <a class="nav_items" href="dashboard.html">Dashboard</a>
    </ul>
    <ul>
      <a class="nav_items" href="report.html">Report</a>
    </ul>
    <ul>
      <a class="nav_items" href="story.html">Story</a>
    </ul>
    <ul>
      <a class="nav_items" href="contactUs.html">Contact Us</a>
    </ul>
    <ul>
      <a class="nav_items" href="login Page.html">Log out</a>    </ul>
    </article>
  </nav>

  <h1 style="text-align: center;">Report</h1>
```

```
<div>    <iframe
src="https://us1.ca.analytics.ibm.com/bi/?pathRef=.my_folders%2FCROP%2BPRO
DUCTION%2BIBM%2BPROJECT%2FREPORT%2FREPORT_P1&closeWindowOnLastView=tru
e&ui_appbar=false&ui_navbar=false&shareMode=embedded&actio
n=run&format=HTML&prompt=false"
    width="1250"
    height="500"
    frameborder="0"    gesture="media"
    allow="encrypted-media"
    allowfullscreen=""></iframe>
</div>
</br>
<div>    <iframe
src="https://us1.ca.analytics.ibm.com/bi/?pathRef=.my_folders%2FCROP%2BPRO
DUCTION%2BIBM%2BPROJECT%2FREPORT%2FREPORT_P2&closeWindowOnLastView=tru
e&ui_appbar=false&ui_navbar=false&shareMode=embedded&actio
n=run&format=HTML&prompt=false"
    width="1250"
    height="500"
    frameborder="0"    gesture="media"
    allow="encrypted-media"
    allowfullscreen=""></iframe>
</div>
</br>
<div>
    <iframe src="https://us1.ca.analytics.ibm.com/bi/?pathRef=.my_folders%2FCROP%2BPRO
DUCTION%2BIBM%2BPROJECT%2FREPORT%2FREPORT_P3&closeWindowOnLastView=tru
e&ui_appbar=false&ui_navbar=false&shareMode=embedded&actio
n=run&format=HTML&prompt=false"
    width="1250"
    height="500"
    frameborder="0"    gesture="media"
    allow="encrypted-media"
    allowfullscreen=""></iframe>
</div>
```

```
</br> </body>
</html>
```

Story

```
<!DOCTYPE html>
<html lang="en">
  <head>
    <meta charset="UTF-8" />
    <meta http-equiv="X-UA-Compatible" content="IE=edge" />
    <meta name="viewport" content="width=device-width, initial-scale=1.0" />
    <title>STORY</title>
    <style>    body{
      background-size: cover;
    }
    .container {
      height: 50px;
      font-family: Arial, Helvetica, sans-serif;
      background-color: rgb(8, 94, 215);
      display: flex;
      flex-direction: row;
      justify-content: flex-end;
      align-items: center;
    }
    a {
      color: whitesmoke;
      text-decoration: none;
    }
    a:hover {
      color: black;
      text-decoration: none;
    }
    .nav_items {
      color: whitesmoke;    padding: 0px;
      font-size: larger;
      margin: 0px 40px 0px 40px;
    }
  }
```

```
ul {  
  padding-left: 0px;  
}  
  
h4 {  
  margin: 0px;  
}  
</style>  
</head>  
<body background="ICONS/home1.jpg">  
  <nav>  
    <article class="container">  
      <ul>  
        <a class="nav_items" href="index.html">Home</a>  
      </ul>  
      <ul>  
        <a class="nav_items" href="dashboard.html">Dashboard</a>  
      </ul>  
      <ul>  
        <a class="nav_items" href="report.html">Report</a>  
      </ul>  
      <ul>  
        <a class="nav_items" href="story.html">Story</a>  
      </ul>  
      <ul>  
        <a class="nav_items" href="contactUs.html">Contact Us</a>  
      </ul>  
      <ul>  
        <a class="nav_items" href="login Page.html">Log out</a>  
      </ul>  
    </article>  
  </nav>  
  <h1 style="text-align: center;">Story</h1>
```

```
<iframe src="https://us1.ca.analytics.ibm.com/bi/?perspective=story&pathRef=.m
y_folders%2FCROP%2BPRODUCTION%2BIBM%2BPROJECT%2FStory%2FSTORY_CROP%2BYIELD
&closeWindowOnLastView=true&ui_appbar=false&ui_navbar=false&am
p;shareMode=embedded&action=view&sceneId=model00000184813fdfa4_000
00000&sceneTime=10000"

  width="1250"
  height="500"
  frameborder="0"  gesture="media"
  allow="encrypted-media"
  allowfullscreen=""></iframe>
</body>
</html>
```

JavaScript `var`

```
data = [
  {
    username:"anil",
    password:"123"
  },
  {
    username:"karan",
    password:"123"
  },
  {
    username:"yuvega",
    password:"@123"
  },
  {
    username:"abith",
    password:"abith123"
  },
  {
    username:"rani ",
    password:"rani123"
```

```

    }
}

function login(){
    var uname = document.getElementById("username").value
    var pass = document.getElementById("password").value

    for (i = 0; i<data.length; i++){
        if (uname == data[i].username && pass == data[i].password){
            window.location.replace("index.html")
            return false
        }
    }
    alert("Incorrect password")
}

function register(){
    var runame = document.getElementById("username").value
    var rpass = document.getElementById("password").value
    var rpass1 = document.getElementById("password1").value
    if (rpass == rpass1){
        var rdata = {
            username: runame,
            password: rpass
        }
    }else{
        alert("password doesn't match")
        return
    }

    for (i = 0; i<data.length; i++){
        if (runame == data[i].username){
            alert("Username not available")
            return false
        }
    }

    data.push(rdata)
}

```

```
window.location.replace("index.html")  
}
```

13.2. GitHub & Project Demo Link

Github Link : IBM-EPBL/IBM-Project-16217-1659609654

Project Demo Link :

[https://drive.google.com/file/d/1MaJ3msr1L_FD8GJsJ4QEFX0f1Ka660M5/view?usp=share link](https://drive.google.com/file/d/1MaJ3msr1L_FD8GJsJ4QEFX0f1Ka660M5/view?usp=share_link)