Project Title

Agriculture Data Analytics in Crop Yield Estimation using IBM Cognos

Category: IBM Cloud Application

Project Description:

Introduction: - Agriculture is important for human survival because it serves the basic need. A well-known fact that the majority of population (≥55%) in India is into agriculture. Due to variations in climatic conditions, there exist bottlenecks for increasing the crop production in India. It has become challenging task to achieve desired targets in Agri based crop yield. Various factors are to be considered which have direct impact on the production, productivity of the crops. Crop yield prediction is one of the important factors in agriculture practices. Farmers need information regarding crop yield before sowing seeds in their fields to achieve enhanced crop yield. The use of technology in agriculture has increased in recent year and data analytics is one such trend that has penetrated into the agriculture field. The main challenge in using data in agriculture is identification of effectiveness of data analytics. Efforts are going on to understand how data analytics can agriculture productivity.

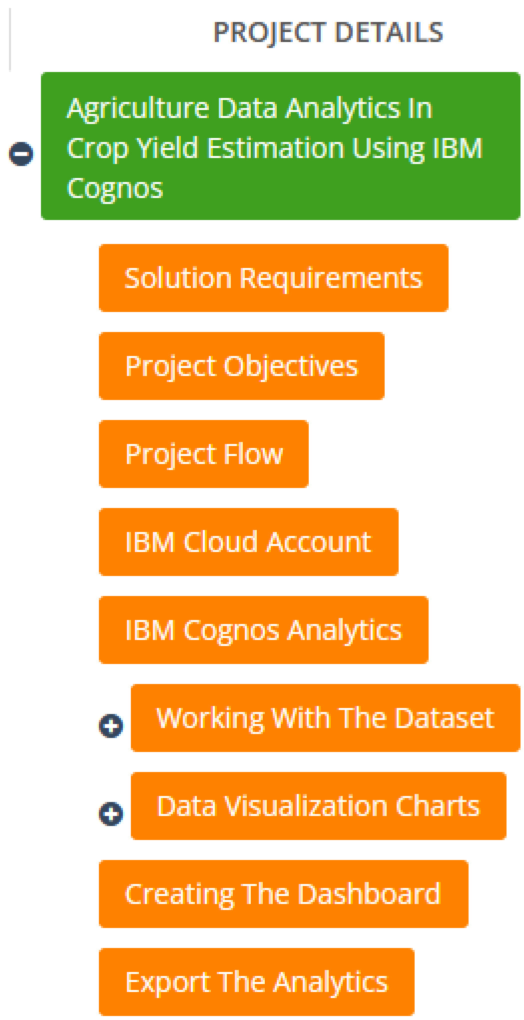
The present project on crop production in India is one of the important sources of income and India is one of the top countries to produce crops. As per this project we will be analyzing some important visualization, creating a dashboard and by going through these we will get most of the insights of Crop production in India.

Agriculture is the field that enables the farmers to grow ideal crops in accordance with the environmental balance. In India, wheat and rice are the major grown crops along with sugarcane, potatoes, oil seeds etc. Farmers also grow non-food items like rubber, cotton, jute etc. More than 70% of the household in the rural area depend on agriculture. This domain provides employment to more than 60% of the total population and has a contribution to GDP also (about 17%) [8]. In the farm output, India ranks second considering the world wide scenario. This is the widest economic sector and has an important role regarding the framework of socio-economic fabric of India. Farming depends on various factors like climate and economic factors like temperature, irrigation, cultivation, soil, rain fall, pesticide and fertilizers. Historical information regarding crop yield provides major input for companies engaged in this domain. These companies make use of agriculture products as raw materials, animal feed, paper production and so on. The estimation of production of crop helps these companies in planning supply chain decision like production scheduling. The industries such as fertilizers, seed, agrochemicals and agricultural machinery plan production and activities like marketing based on the estimates of crop yield [8]. Farmers experience was the only way for prediction of crop yield in the past days. Technology penetration into agriculture field has led to automation of the activities like yield estimation, crop health monitoring etc. Crop yield prediction has generated a lot interest in the research community and also for agriculture related organizations. Crop yield prediction helps the farmers in various ways by providing the record of previous crop yield. This is helpful to government in framing policies related to crops such as crop insurance policies, supply chain operation policies. Knowing what crops has been grown, and how much area of it had been shown historically, combined with the prices at which it could have been sold at the nearest market-place provides the income-growth profile of the farmer [8]. Agriculture sector is struggling to increase the productivity of crop in India. Monsoon rainfall is the main source of water for more than 60 percent of the crops. Smart agriculture driven by Information Technology is the emerging trend in the research in this area in recent days. One of the areas being explored is the problem of yield prediction which is a major concern. Data Analytics are being widely used as a part of solution for crop yield prediction. Various other techniques are under evaluation for estimation of crop production of the future years [8]. Data analytics is the process in which the hidden patterns are discovered using analysis of large data sets. The data mining and data analytics techniques use artificial intelligence, statistics, machine learning and database system. In data analytics, unsupervised and supervised methods are being used. In unsupervised learning.

Literature Review on Crop Yield Prediction

At present we are at the immense need of another Green revolution to supply the food demand of growing population. With the decrease of available cultivable land globally and the decreased cultivable water resources, it is almost impossible to report higher crop yield. Agricultural based big data analytics is one approach, believed to have a significant role and positive impact on the increase of crop yield by providing the optimum condition for the plant growth and decreasing the yield gaps and the crop damage and wastage. With this aim the present paper reviews about the various advances, design models, software tools and algorithms applied in the prediction assessment and estimation of the crop yield. India is basically agriculture based country and approximately 70% our country economics is directly or indirectly related to the agricultural crops. The principle crop which occupies the highest (60-70%) percentage of cultivable land in the Indian soil is the paddy culture and it is the major crop especially in central and south parts of the India. Rice crop cultivation plays an imperative part in sustenance security of India, contributing over 40% to general yield generation. The enhanced yield of the rice crop depends largely on the water availability and climatic conditions. For example, low precipitation or temperature extremes can drastically diminish rice yield. Growing better strategies to foresee yield efficiency in a mixture of climatic conditions can help to understand the role of different principle factors that influence the rice crop yield. Big data analytic methods related to the rice crop yield prediction and estimation will certainly support the farmers to understand the optimum condition of the significant factors for the rice crop yield, hence can achieve higher crop yield.

Crop yield prediction using Data Analytics In India crop yield is season dependent and majorly influenced by the biological and economic causes of an individual crop. Reporting of progressive agricultural yield in all the seasons is an ample task and an advantageous task for every nation with respect to assesses the overall crop yield prediction and estimation. At present a common issue worldwide is, farmers are stressed in producing higher crop yield due to the influence of unpredictable climatic changes and significant reduction of water resource worldwide. A study was carried out to collect the data on world climatic changes and the available water resources which can be used to encourage advanced and novel approaches such as big data analytics to retrieve the information of the previous results to the crop yield prediction and estimation. Study imported that the selection and usage of the most desirable crop according to the existing conditions, support to achieve the higher and enhanced crop yield [8]. 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. A research group conducted a work with an objective of accurate prediction of crop yield through big data analytics to assess various crop yield influencing factors such as Area under Cultivation (AUC) interims of hectors, Annual Rainfall (AR) rates and Food Price Index (FPI) and to develop relationship among these parameters. Regression Analysis (RA) methodology was applied to examine the selected factors and their impact on crop prediction and final yield. RA methodology is a multivariable investigation practice which can categorize the factors in to groups such as explanatory and response variables and helps to assess their interaction to obtain a resolution. All the selected factors of the present study design known as AR, AUC and FPI were measured for a period of 10 years between the years 1990-2000. A novel method called Linear Regression (LR) is applied to analyze the relationship between explanatory variables (AR, AUC, FPI) and the crop yield considered as response variable. Study reported that the R2 value for the studied factors clearly indicate that crop yield is principally depends on AR. Study also reported that the other two factors (AUC and FPI) screened were also found to have significant impact after the AR. Study shall be continued to analyze the impact of for other substantial factors like Minimum Support Price (MSP), Cost Price Index (CPI), Wholesale Price Index (WPI) etc. and their relationship on the yields of different crops [8]. Crop yield gaps, measured as difference between expected yields based on the potency and actual farm yield received. In order to achieve the higher crop yield, farmers must need to tackle the influencing factors such as influence of change in climate conditions on the prospects of crop yields, and change in the usage of agricultural land to assess and ultimately reduce the crop yield gaps. Several researchers reported the applications of bio simulation models to estimate the crop yield gaps in the last decade. The impact of the crop yield gaps assessment studies conducted through bio simulation based methodologies were negatively influenced by quality and resolution of climate and soil data, as well as unscientifically expectations about crop yield prediction systems and crop yield assessment modelling designs calibration method. An explicit rationale model which can effectively applied at various levels of the availability of quality information for identifying data sources to analyze crop yield and measuring yield gaps at definite geographical locations and works based on the rise in titer approach. The model is highly helpful in retrieving the useful data from the available, poor quality, less rigorous data sources or if the data is not available. A case study was discussed on the application of selected model design to quantify the yield gaps of maize crop in the state of Nebraska (USA), and also at the different geographical locations representing the nations Argentina and Kenya at national scale level. Different geographical locations such as Nebraska (USA), Argentina and Kenya were identified to symbolize the distinct scenarios of Agri based data availability and the quality for the selected variables assessed to predict and estimate the crop yield gaps. The definitive aspiration of the planned method is to afford transparent, easily accessible, reproducible and technically sound and strong guidelines for predicting the yield gaps. The proposed guidelines were also relevant for understanding and to simulate the influence of change in climate conditions and usage of cultivable land changes from national to global scales. As indicated, the better understanding of data importance and usefulness for analyzing crop yield and estimating yield gaps as illustrated can help in identifying the data gaps in the crop yield and allow focusing on the various efforts taken at the global level to address the most critical issue [8]. Analyzing the yields of crop is necessary to update the policies to ensure food security. A research group conducted a study with the aim in suggesting a novel data mining method to predict the yields of crop depends on agricultural big data analytics methodologies, which were progressively contrast with conventional data mining methodologies in the process of handling data and modelling designs. Study suggested that the method employed should be user friendly, work based on progressive big-data responsive processing structure, supposed to utilize the existing agricultural based significant datasets and would still be used with the larger volumes of data growing at enormous rates. Nearest neighbours modelling is one such novel data mining technique which works on the results collected based on data processing structures form the farmers and suggest a well unbiased result on the base of accuracy and prediction time in advance. Study further discussed a case study on the assessment of actual crop dataset in China from 1995-2014. Study reported that the novel model employed has publicized an improved performance and was found to be progressive in reporting prediction accuracy percentage of the compared methodologies with conventional designs [8]. Simulation models based on field experiment are valuable technologies for studying and understanding crop yield gaps, but one of the critical challenge remain with these methods is scaling up of these approach to assess the data collated between different time intervals from the broader geographical regions. Satellite retrieved data have frequently been revealed to present data sets that, by itself or in grouping with other information and model designs, can precisely determine the yields of crop in agricultural lands. The yield maps developed shall provide an unique opportunity to overcome both spatial and temporal based scaling up challenges and thus improve the ideology of crop yield gaps prediction. A review was conducted to discuss the applications of remote sensing technology to determine the impact and causes of yield gaps. Even though the example discussed by the research group demonstrates the usefulness of remote sensing in the prediction of yield gaps, but also many areas of possible application with respect to the crop yield assessment, prediction and improvement remain unexplored. Study proposed two less complicated, easily assessable methods to determine and quantify the yield gaps between various agricultural fields. First method works closely with the constructive maps representing the average crop yields, it can be used directly to accesses specific crop yield influencing factors for further studies whereas the second method use the remote sensing technology to retrieve the data for providing the useful information regarding the crop yield prediction and estimation [8]. 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, intern helps in making the policy based, research oriented, development and investment related decisions that aim to influence future crop yield. Crop production abilities and yield gaps can be assessed and measured by comparing the possible yields at normal conditions with respect to the crop production under, respectively, irrigated and rain fed conditions by keeping the crop yield levels limited by the less availability of the water as benchmarks. Yield gaps can be defined as the difference between the expected crop yields with respect to the actual crop yield and accurate, spatially unambiguous awareness and information about the yield gaps is necessary to achieve sustainable amplification of agricultural yields. Keeping an aim of discussing the impact of the various methods practiced in measuring the yield gaps with a spotlight on the local-to-global importance of outcomes, a research group carried out a survey on the various methods applied to estimate yield gaps. Study reported few standard operation methods, employed in quantifying the crop yield potential on the data collected from the farmers of western Kenya, Nebraska (USA) and Victoria (Australia). Study recommended for the use of accurate and recent yield data assessed through calibrated crop model designs and further up scaling validated methods in the prediction of crop yield gaps The bottom-up application of this global protocol allows verification of estimated yield gaps with on-farm data and experiments [8].



Solution Requirements

Service Used: IBM Cognos Analytics.

Project Objectives

By the end of this project, you will:

- Know fundamental concepts and can work on IBM Cognos Analytics.
- Gain a broad understanding of plotting different graphs.
- Able to create meaningful dashboards

Project Flow

- Users create multiple analysis graphs/charts.
- Using the analyzed chart creation of Dashboard is done.
- Saving and Visualizing the final dashboard in the IBM Cognos Analytics.

To accomplish this, we have to complete all the activities and tasks listed below

- IBM Cloud Account
- Login to Cognos Analytics
- Working with the Dataset
  - Understand the Dataset
  - Loading the Dataset
- Data visualization charts
  - Seasons with average productions
  - With years usage of Area and Production
  - Top 10 States with most area
  - State with crop production
  - States with the crop production along with season (Text Table)
- Dashboard Creation
- Export the Analytics

- **IBM Cloud Account**

- Create and login to IBM Account.

- Link: https://cloud.ibm.com/registration

- **IBM Cognos Analytics**

- Create Cognos Analytics Account.

- Link: IBM Cognos Account Creation

Working with the Dataset

Understand the dataset

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

Dataset Link :https://data.gov.in/apy

Let's understand the data we're working with and give a brief overview of what each feature represents or should represent

1. State Name - All the Indian State names.

2. District Name -Different District names.

3. Crop Year- contains the crop years.

4. Season – Different seasons for crop production.

5. Area- Total number of areas covered.

6. Production- production of crops.

Loading the Dataset

Before you can build a view and analyze your data, you must first connect the data to IBM Cognos. Cognos supports connecting to a wide variety of data, stored in a variety of places.
The data might be stored on your computer in a spreadsheet or a text file, or in a big data, relational, or cube (multidimensional) database on a server in your enterprise.
In our case, we will be using a spreadsheet or text file for making our analysis. Click on the link for understanding the connection of dataset in Cognos.

Data Visualization Charts:

Creating the Dashboard

Created views on different tabs in Cognos analytics, pull them into a dashboard for data visualization column graphs and pie charts

Using the Crop production in Indian dataset, created various graphs and charts to highlight the insights and visualizations.

1. **Seasons with Average Productions**

As production of crops depends on different seasons, so plot the graph to visualize the average production based on different seasons.

Figure.1:Visualization plot of the average production based on different seasons.

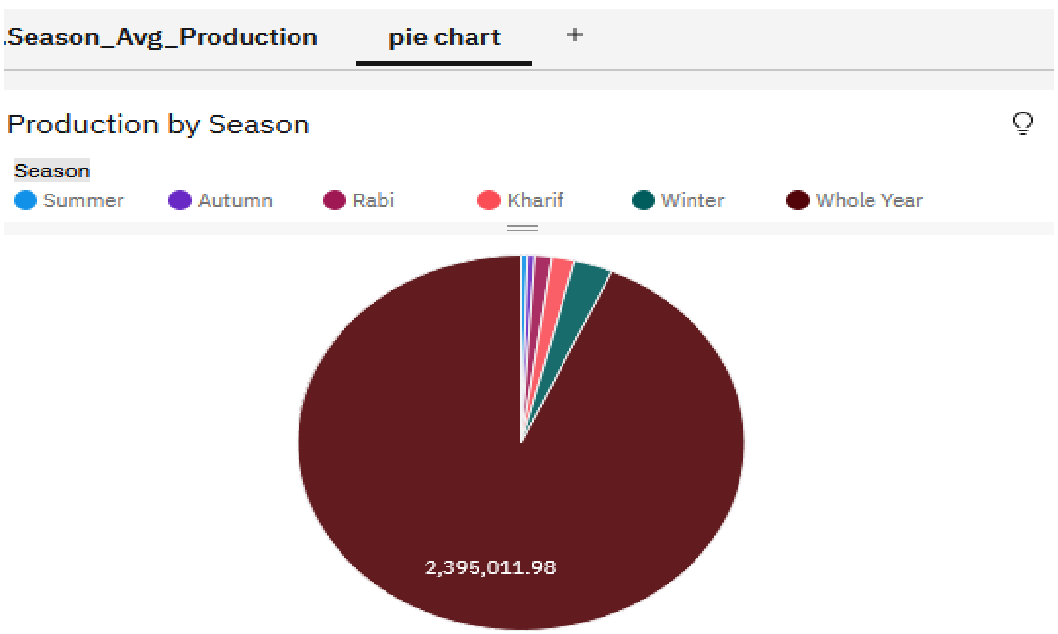


Figure.2:Visualization Pie Chart of the average production based on different seasons.

Table.1:The average production based on different seasons

eSeason	Average Production

Autumn	13065.67
Kharif	42743.34
Rabi	31011
Summer	11522.38
Winter	**71826.42**
Whole Year	2395012

Summary: In winter season maximum 71826.42 and in Rabi season minimum 31011 and whole year 2395012 average crop productions observed.

2. **With years usage of Area and Production**

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

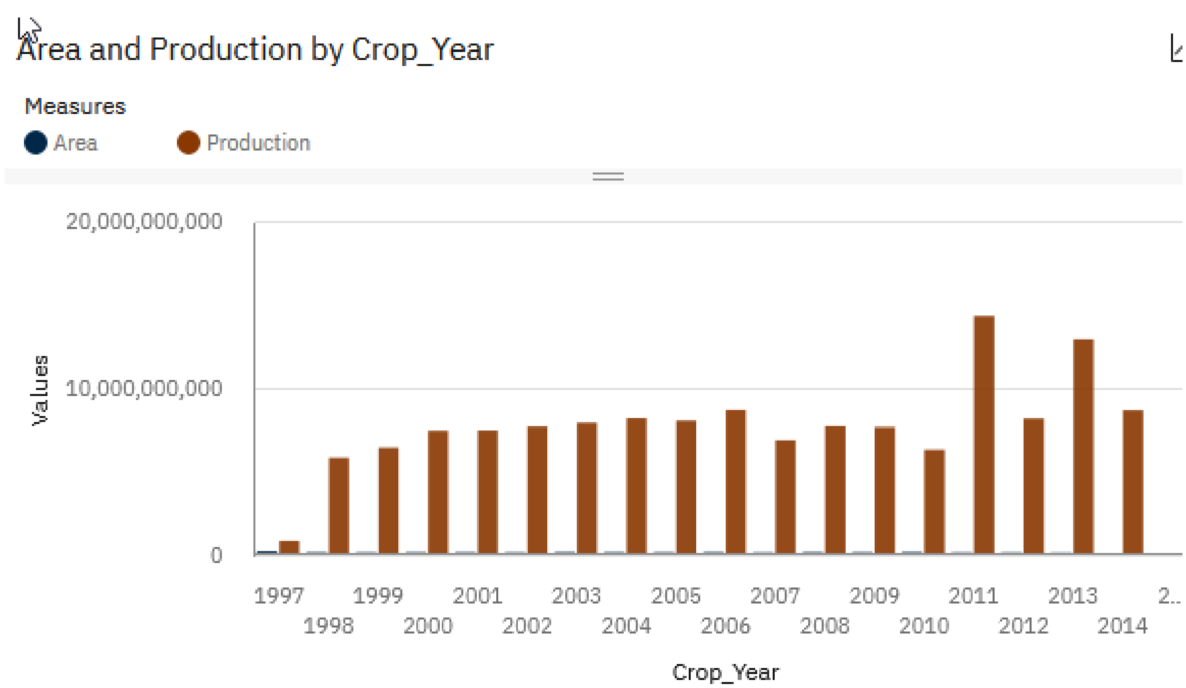
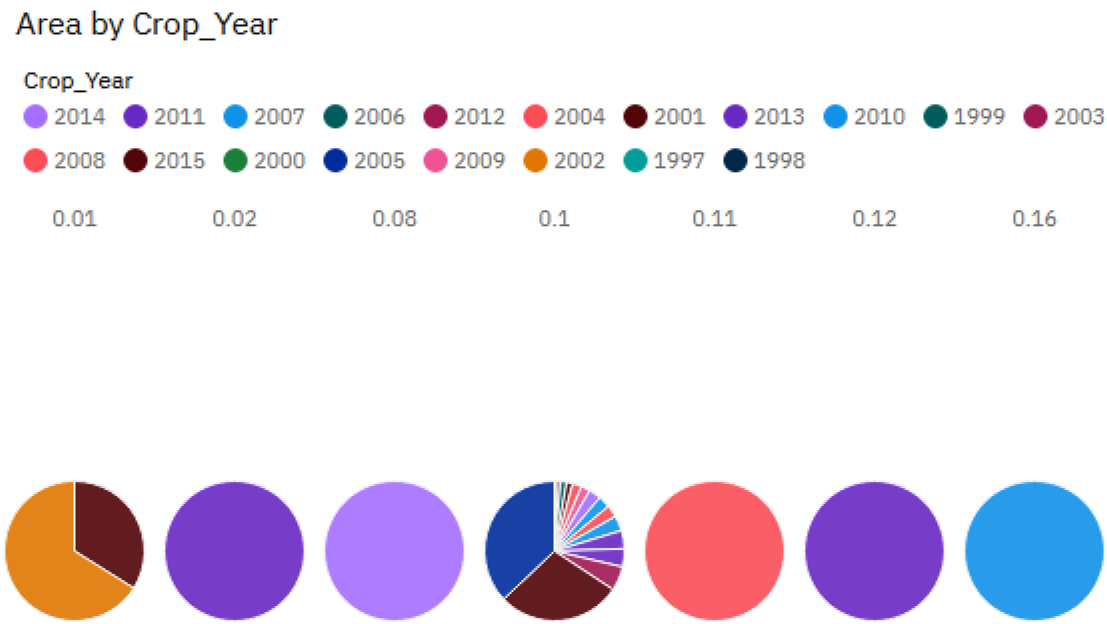
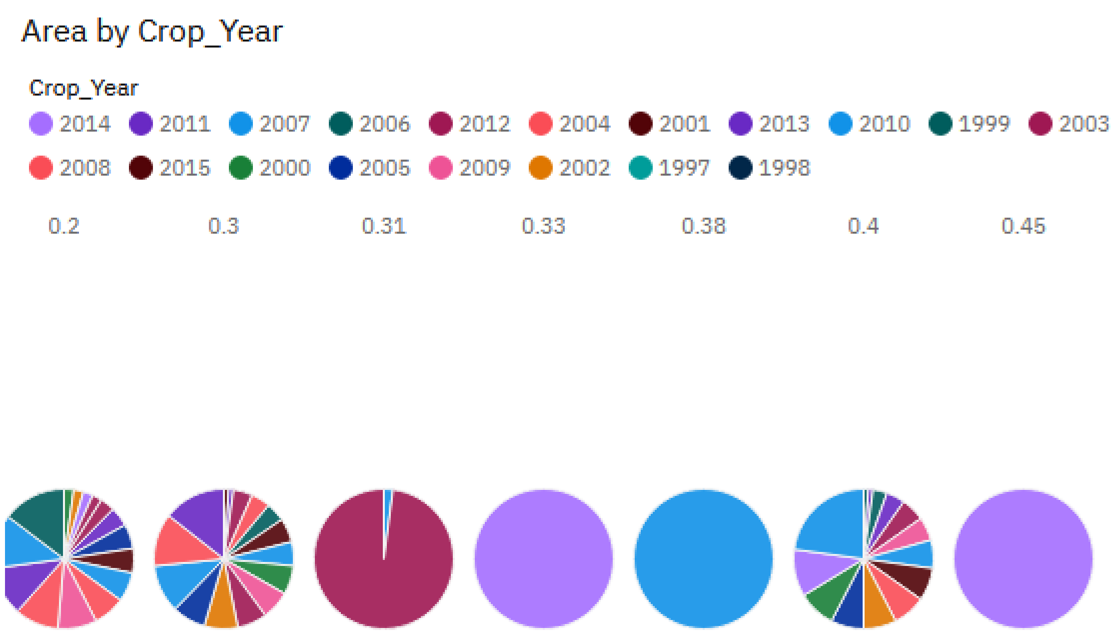


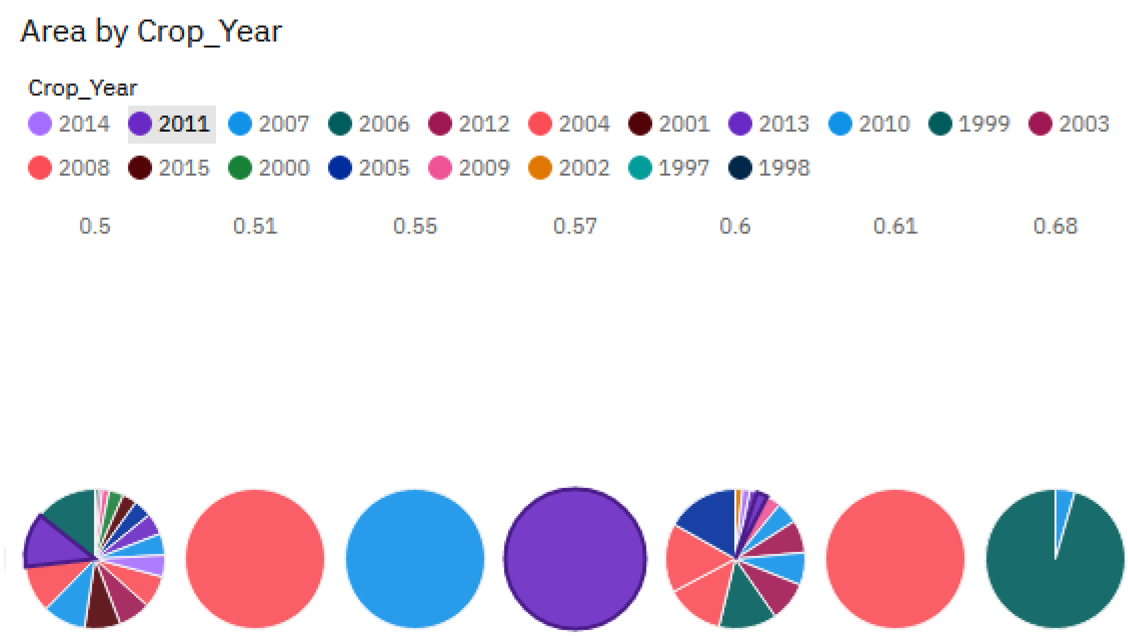
Figure.3:Visualization Plot of the Area, average production based on Crop year.
Table2:The Area Values, roduction measured values based on Crop year.

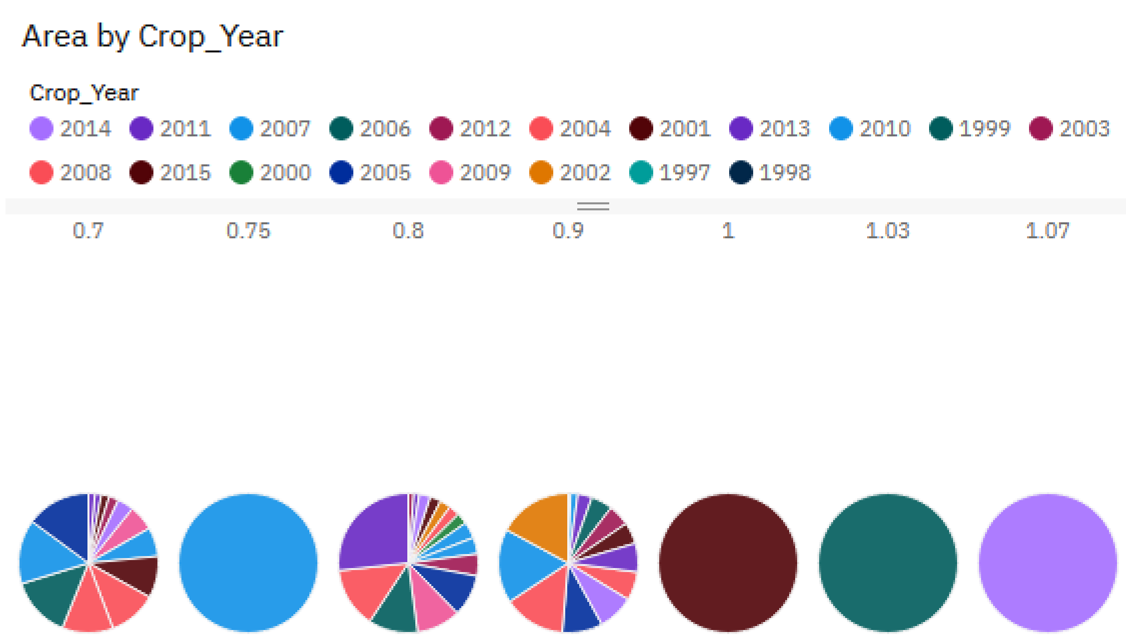
Crop_Year	Values	Measures group
1997	231715046	Area
1997	851232906	Production
1998	166988082	Area
1998	5825320640	Production
1999	158666106	Area
1999	6434665985	Production
2000	165297477	Area
2000	7449709127	Production
2001	165295604.7	Area
2001	7465540840	Production
2002	157769017.2	Area
2002	7696955163	Production
2003	172088098.5	Area
2003	7917973505	Production
2004	167878424.7	Area
2004	8189461695	Production
2005	163136376.3	Area
2005	8043757330	Production
2006	170699101.7	Area
2006	8681913124	Production
2007	152724165.3	Area
2007	6879442339	Production
2008	171232070	Area
2008	7717018402	Production
2009	165694709	Area
2009	7660494025	Production
2010	176619202	Area
2010	6307608525	Production
2011	153629160.9	Area
2011	14308904087	Production
2012	152469799	Area
2012	8171054746	Production
2013	141524909.3	Area
2013	12903588633	Production
2014	115757541.6	Area
2014	8664540631	Production
2015	4601298	Area
2015	6935064.7	Production

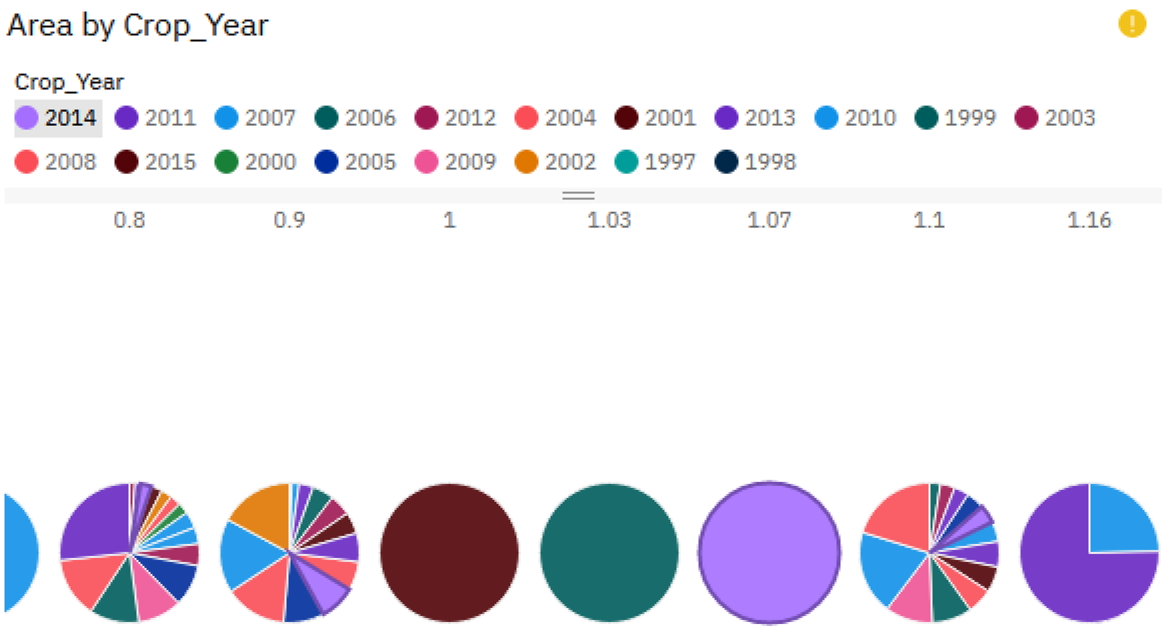
In 2011 minimum and in the year of 2011 maximum crop average production observed.






Area by Crop_Year
Crop_Year
2014 2011 2007 2006 2012 2004 2001 2013 2010 1999 2003
2008 2015 2000 2005 2009 2002 1997 1998
0.5 0.51 0.55 0.57 0.6 0.61 0.68


Area by Crop_Year
Crop_Year
2014 2011 2007 2006 2012 2004 2001 2013 2010 1999 2003
2008 2015 2000 2005 2009 2002 1997 1998
0.7 0.75 0.8 0.9 1 1.03 1.07



3. **Top 10 States with Most Area**

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

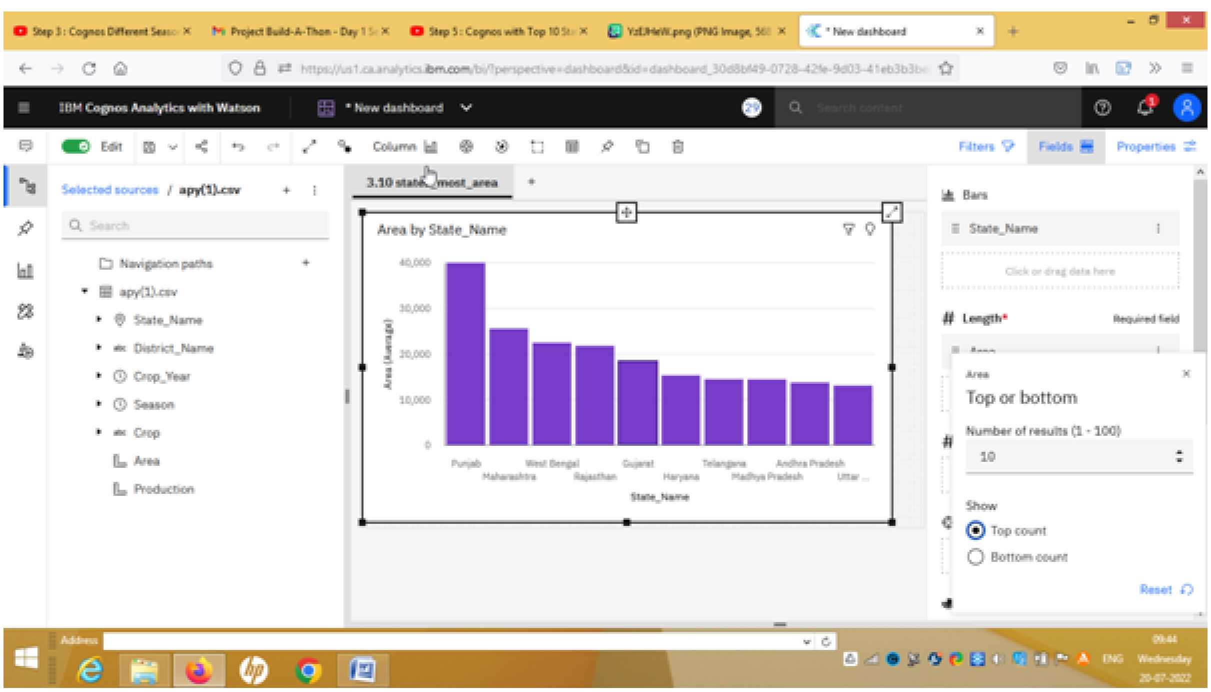


Figure.4.a:Visuvalization graph of top 10 states with most area

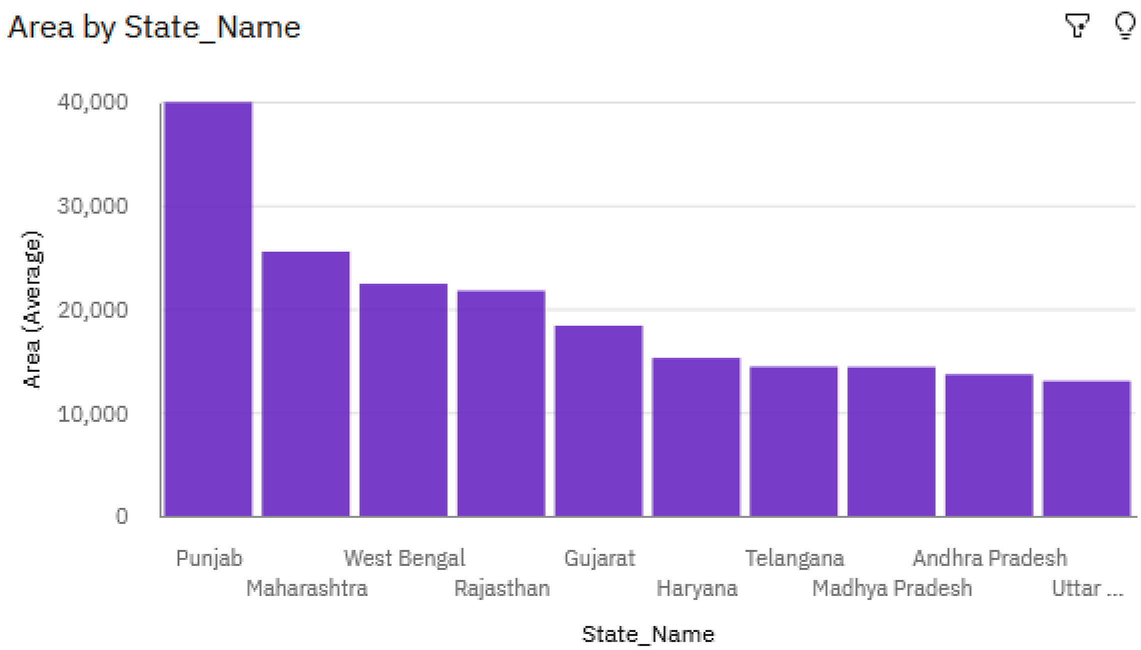


Figure.4.b:Visuvalization groph of top 10 states with most area

Table.3: Top 10 states with most area Values

SNo.	State Name	Area(Average) Value
1	Punjab	39938.73
2	Maharashtra	25515.22
3	West Bengal	22407.7
4	Rajasthan	21737.65
5	Gujarat	18367
6	Haryana	15250.61
7	Telangana	14402.66
8	Madhya Pradesh	14375.33
9	Andhra Pradesh	13662.84
10	Uttar Pradesh	13019.62

In Punjab most area in top 10 states and Uttar Pradesh is the least one observed.

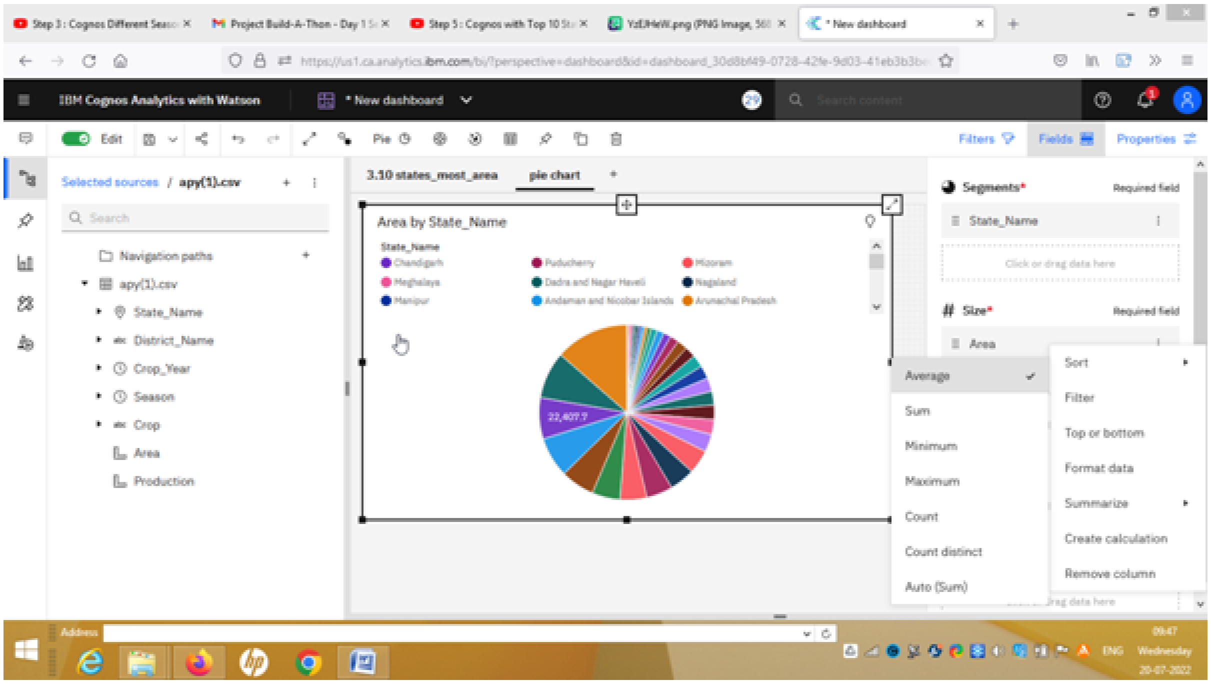


Figure.5.a:Pie Chart of Top 10 states with most area

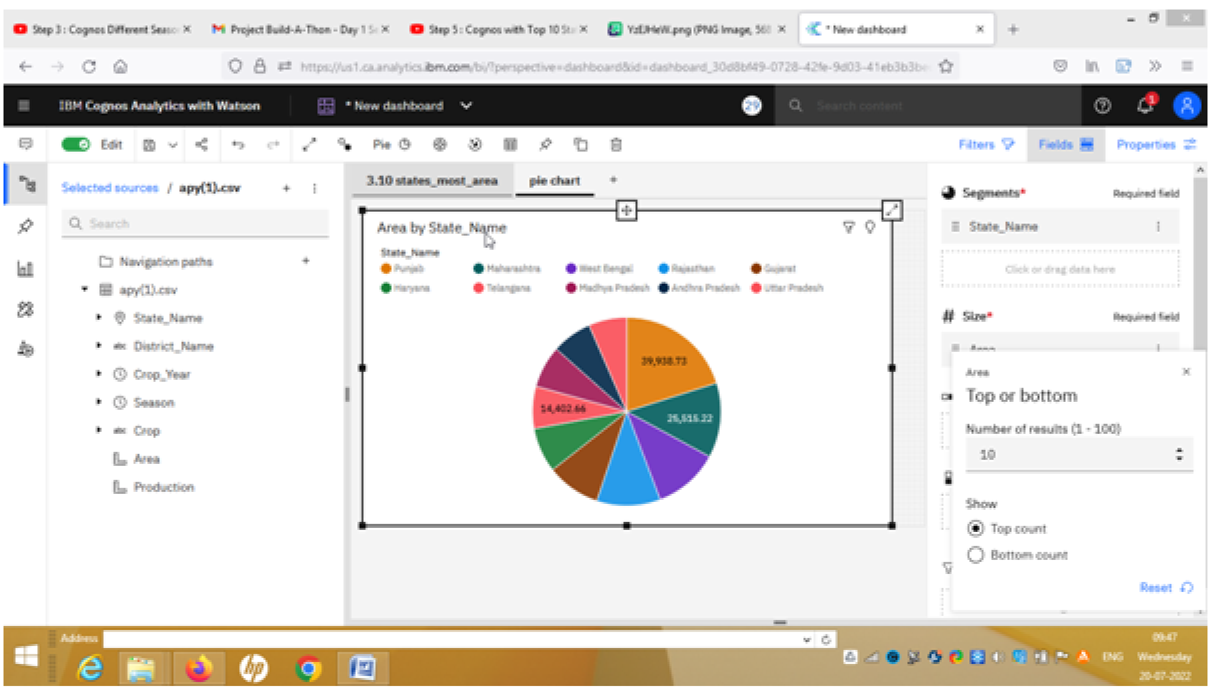


Figure.5.b:Pie Chart of Top 10 states with most area

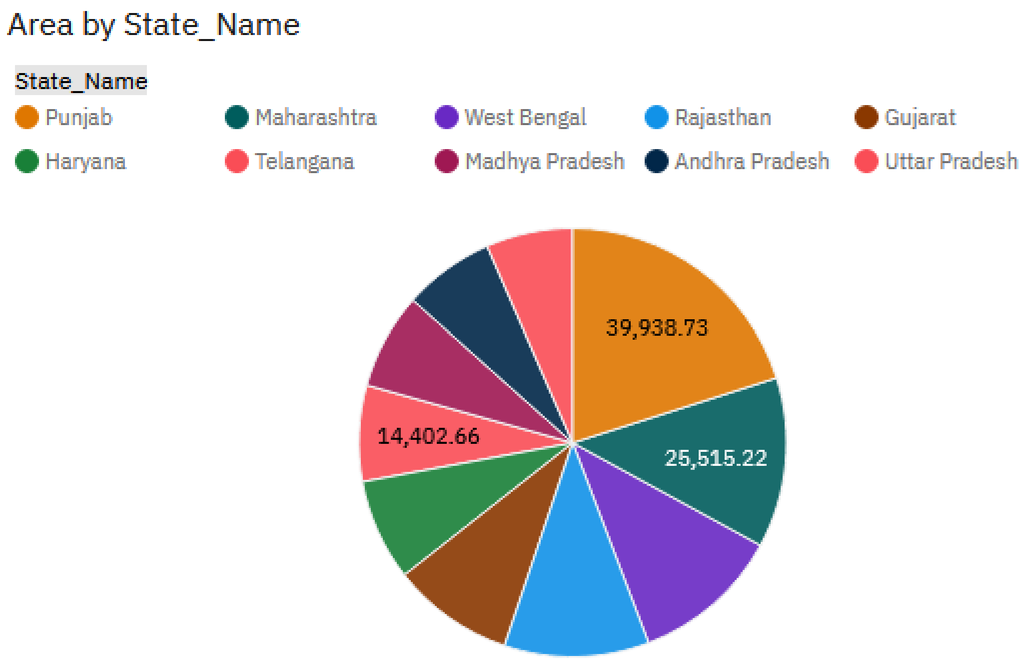


Figure.5.c:Pie Chart of Top 10 states with most area

4.**State with Crop Production**

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

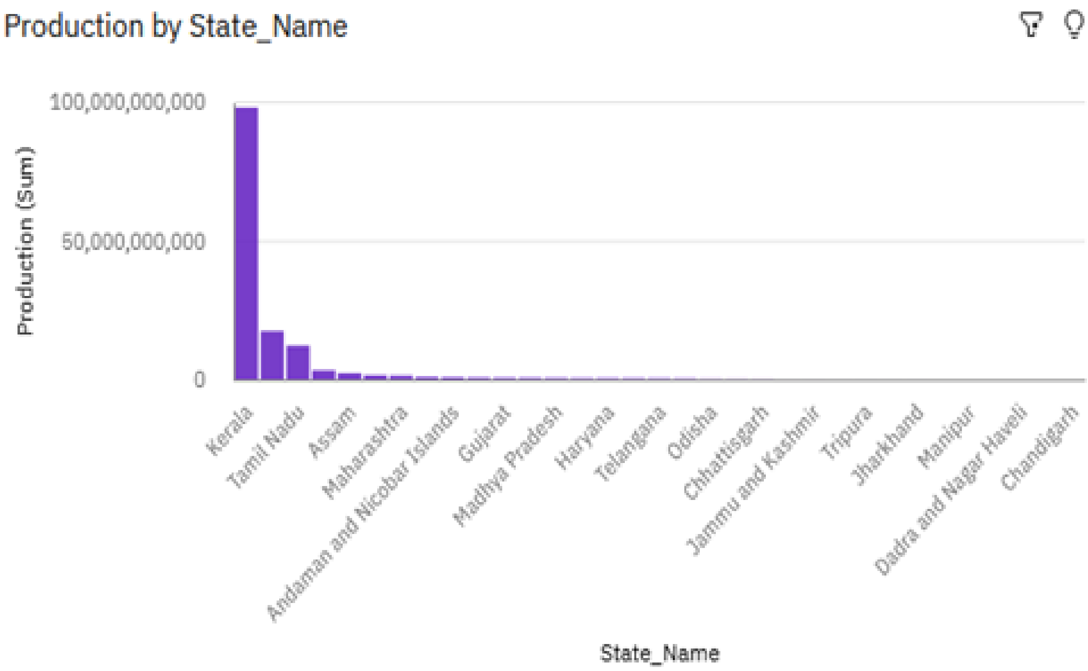
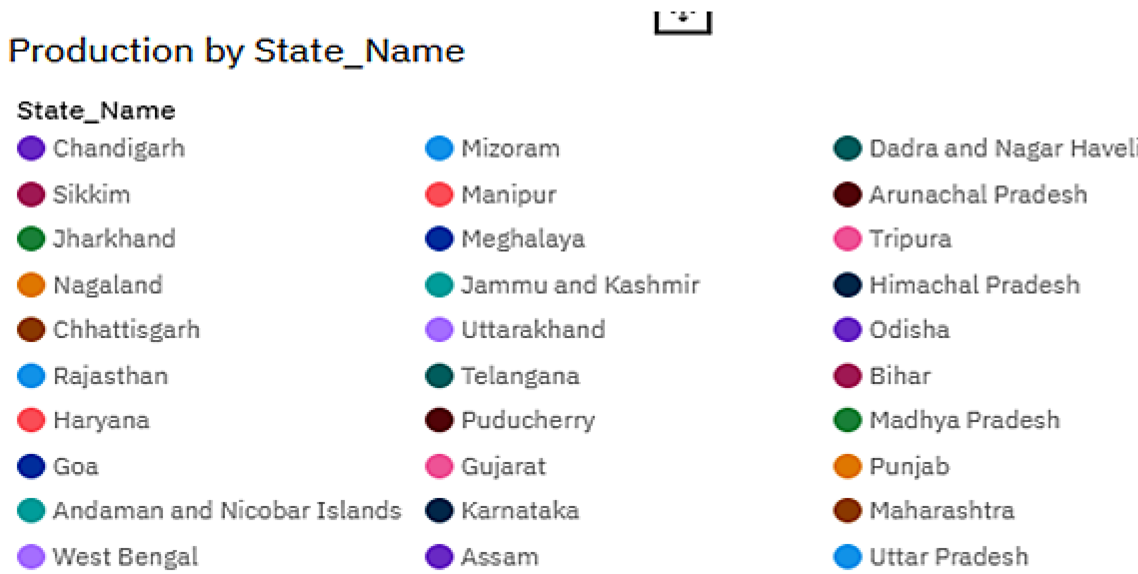


Figure.6:Visuvaliztion plot of crop prodction with all the states



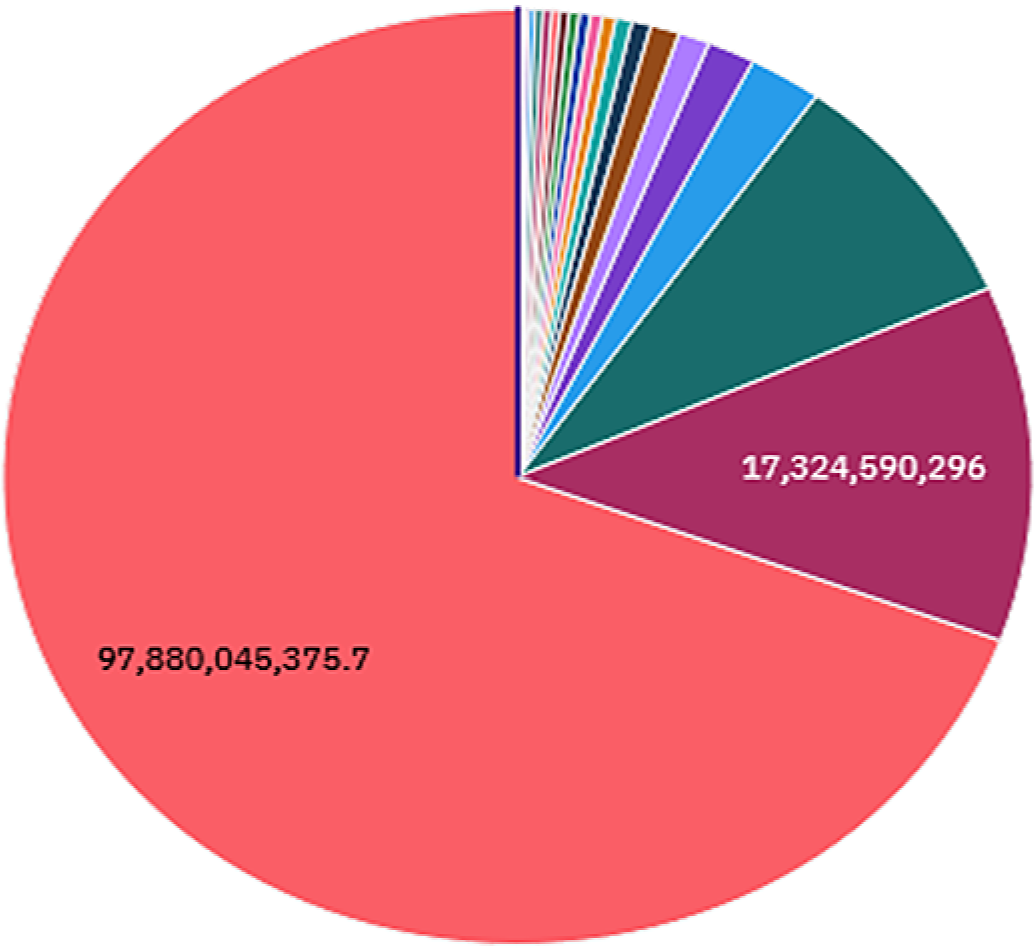


Figure.7:Visuvaliztion Pie chart of crop prodction with all the states

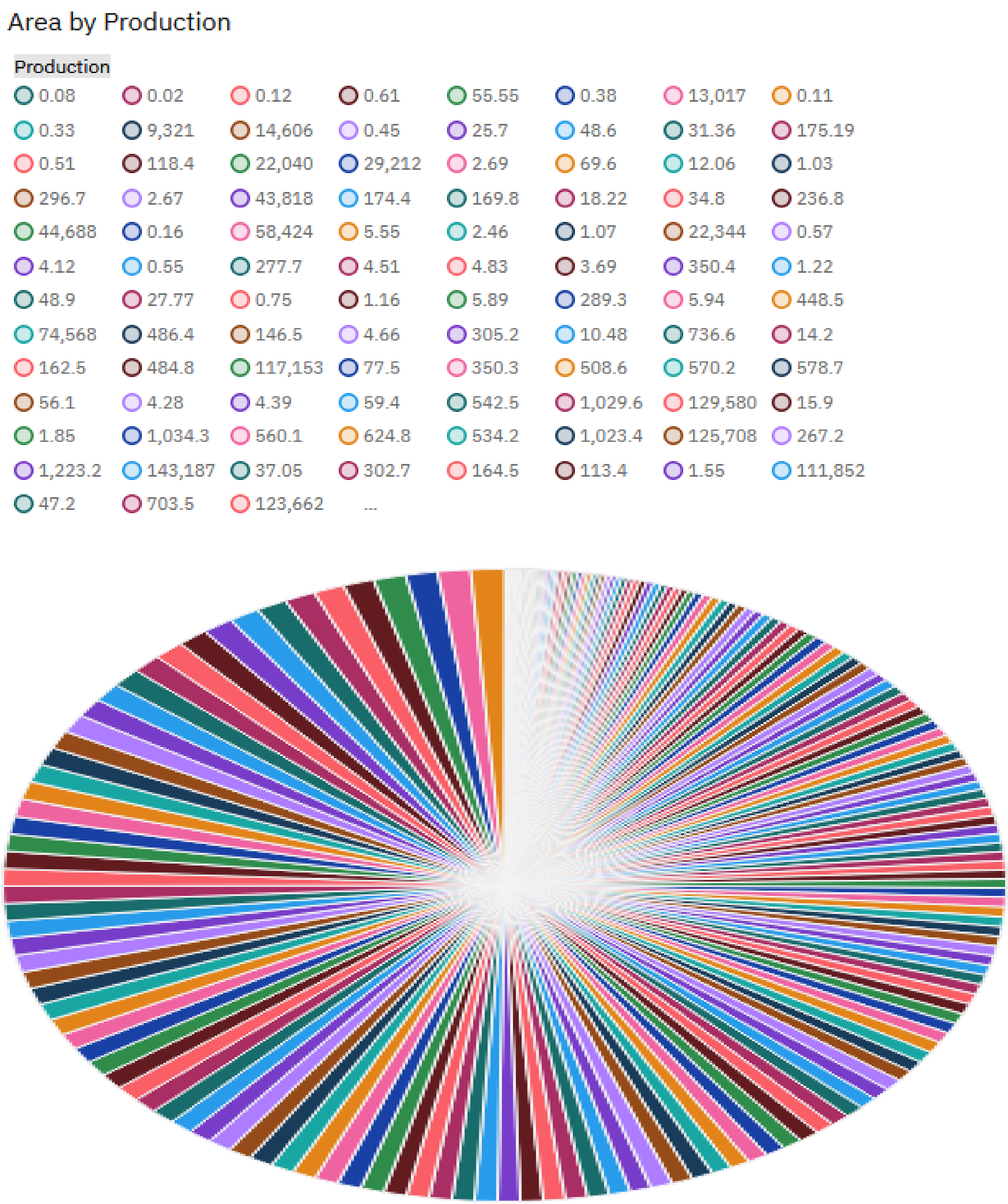


Figure.8:Pie chart visuvalization of Area by Crop Production

Table.4:All states with Average crop production

State_Name	Production
Kerala	24451673
Andaman and Nicobar Islands	3573250
Goa	2443265
Andhra Pradesh	1812006
Tamil Nadu	910330.4
Puducherry	441197.8
Punjab	186568.6
West Bengal	145660.6
Assam	144422.9
Maharashtra	101123.6
Uttar Pradesh	97456.77
Haryana	83981.03
Gujarat	62676.79
Telangana	59944.18
Karnataka	40961.61
Uttarakhand	27394.27
Rajasthan	23315.12
Madhya Pradesh	19856.7
Bihar	19417.38
Odisha	11897.67
Chhattisgarh	9736.87
Tripura	8868.92
Jharkhand	8513.22
Jammu and Kashmir	8144
Himachal Pradesh	7249.66
Dadra and Nagar Haveli	7026.13
Meghalaya	4224.8
Manipur	4131.85
Sikkim	3411.39
Nagaland	3269.97
Arunachal Pradesh	2681.3
Mizoram	1741.66
Chandigarh	718.61

Kerala is the top average crop production with value of 24451673 and Chandigarh with least value

718.61

5.States with the crop production along with season (Text Table)

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

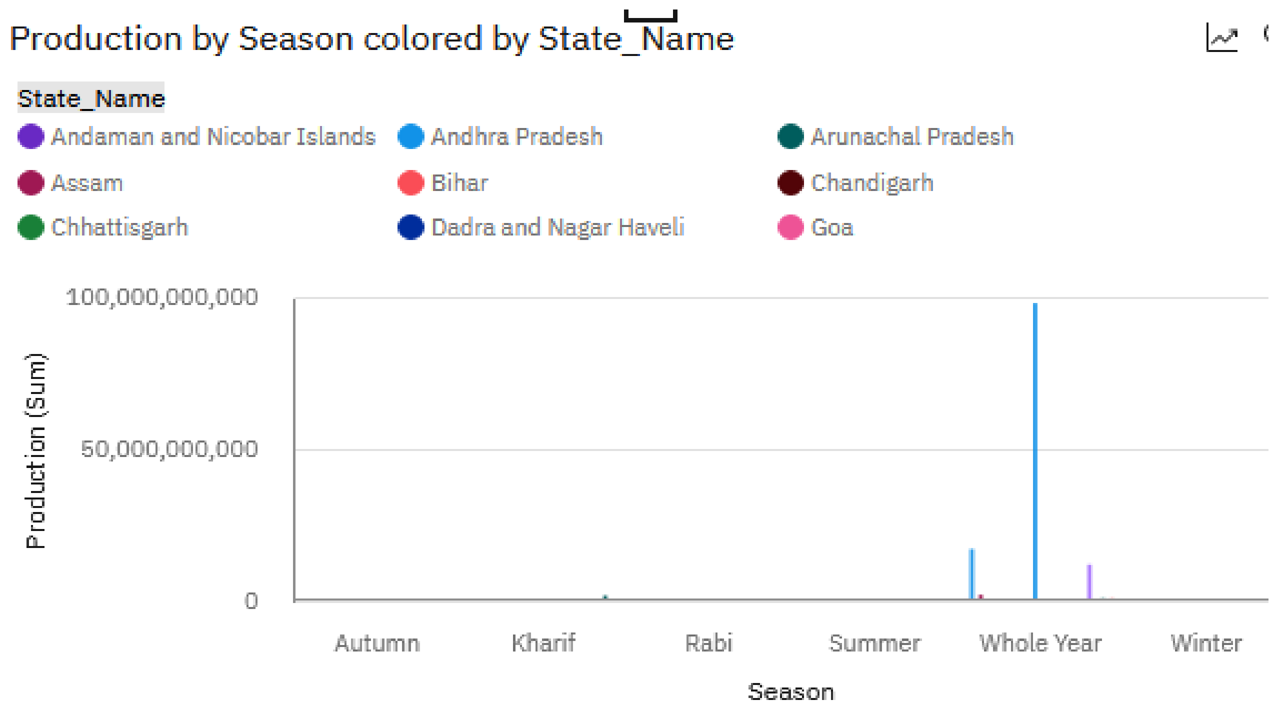


Figure.9:Visuvalization Graph of crop production with states with seasons

Table.5: Crop production with states and seasons

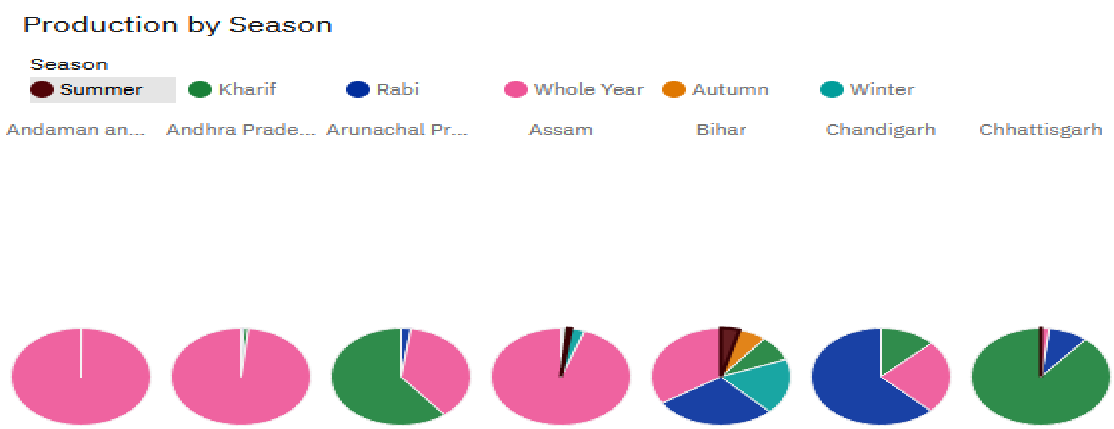
Season	Production	State_Name
Autumn	4208.16	Andaman and Nicobar Islands
Autumn	14644.48	Assam
Autumn	27500.51	Bihar
Autumn	6565.49	Jharkhand
Autumn	15576.69	Kerala
Autumn	2813.57	Maharashtra
Autumn	3757.38	Manipur
Autumn	6483.2	Meghalaya
Autumn	6570.99	Odisha
Autumn	5422.5	Puducherry

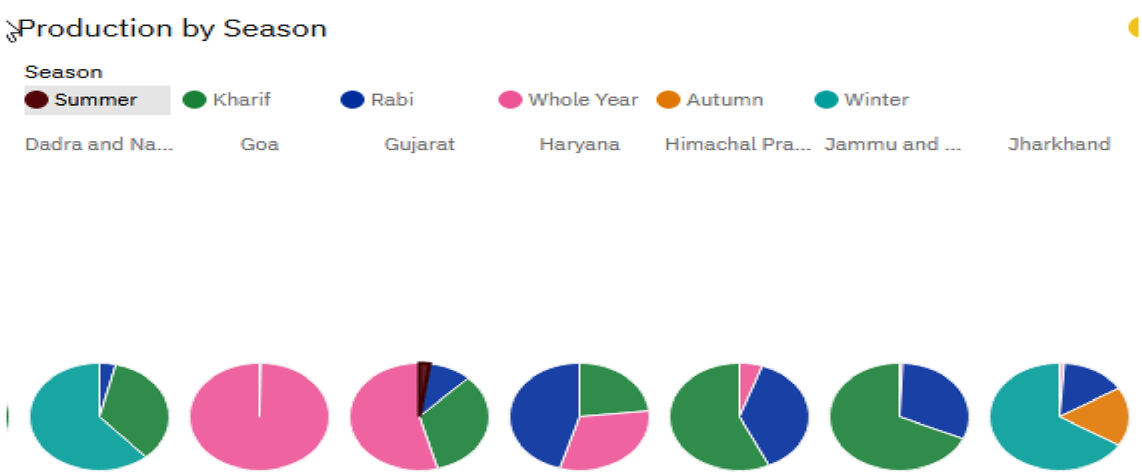
Autumn	18496.77	West Bengal
Kharif	9738.14	Andaman and Nicobar Islands
Kharif	47631.02	Andhra Pradesh
Kharif	4652.84	Arunachal Pradesh
Kharif	3748.01	Assam
Kharif	5277.15	Bihar
Kharif	228.44	Chandigarh
Kharif	20196.9	Chhattisgarh
Kharif	4107.88	Dadra and Nagar Haveli
Kharif	14767.25	Goa
Kharif	41949.89	Gujarat
Kharif	43470.8	Haryana
Kharif	7301.3	Himachal Pradesh
Kharif	11688.46	Jammu and Kashmir
Kharif	2013.76	Jharkhand
Kharif	21734.52	Karnataka
Kharif	469.54	Kerala
Kharif	18220.47	Madhya Pradesh
Kharif	74498.52	Maharashtra
Kharif	9402.06	Manipur
Kharif	4550.75	Meghalaya
Kharif	2278.75	Mizoram
Kharif	3999.98	Nagaland
Kharif	9702.42	Odisha
Kharif	10692.42	Puducherry
Kharif	134388.09	Punjab
Kharif	18996.94	Rajasthan
Kharif	4577.29	Sikkim
Kharif	28023.69	Tamil Nadu
Kharif	51775.26	Telangana
Kharif	14995.76	Tripura
Kharif	119106.04	Uttar Pradesh
Kharif	9227.02	Uttarakhand
Kharif	64378.68	West Bengal
Rabi	322.19	Andaman and Nicobar Islands
Rabi	28181.51	Andhra Pradesh
Rabi	598.04	Arunachal Pradesh
Rabi	2024.24	Assam
Rabi	15999.1	Bihar

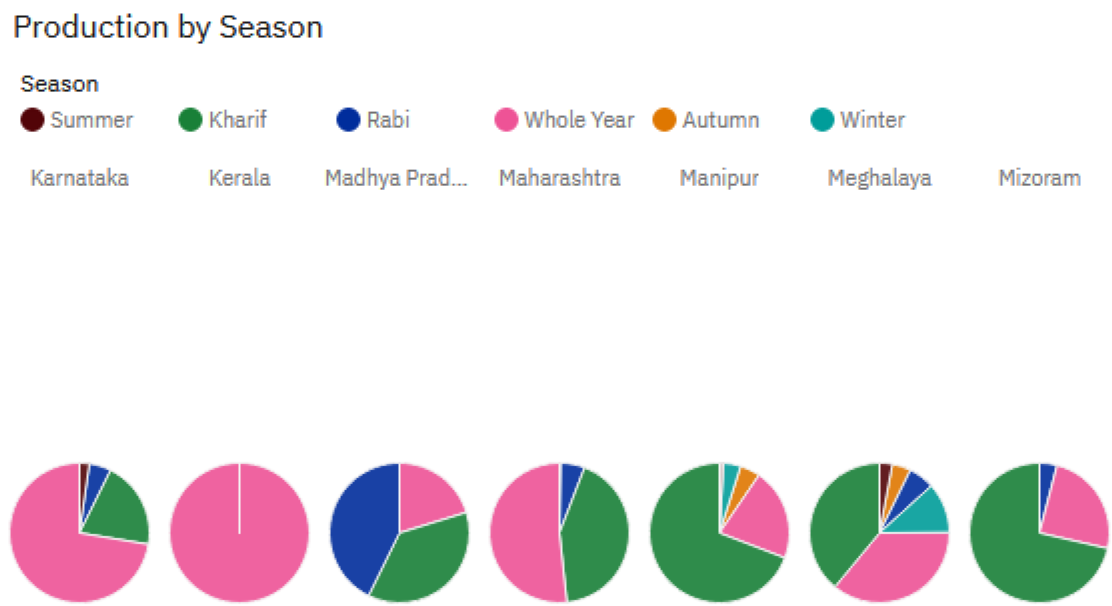
Rabi	1483.46	Chandigarh
Rabi	2971.33	Chhattisgarh
Rabi	2115.61	Dadra and Nagar Haveli
Rabi	9536.71	Goa
Rabi	31760.22	Gujarat
Rabi	126660.89	Haryana
Rabi	8543.68	Himachal Pradesh
Rabi	6287.27	Jammu and Kashmir
Rabi	2172.53	Jharkhand
Rabi	7877.23	Karnataka
Rabi	35261.92	Madhya Pradesh
Rabi	18824.56	Maharashtra
Rabi	350.19	Manipur
Rabi	1121.18	Meghalaya
Rabi	264.34	Mizoram
Rabi	1108.33	Nagaland
Rabi	950	Odisha
Rabi	1468.23	Puducherry
Rabi	224466.22	Punjab
Rabi	52060.81	Rajasthan
Rabi	864.33	Sikkim
Rabi	5972.14	Tamil Nadu
Rabi	21591.15	Telangana
Rabi	154.52	Tripura
Rabi	54076.41	Uttar Pradesh
Rabi	8598.76	Uttarakhand
Rabi	41865.48	West Bengal
Summer	32582.59	Assam
Summer	9942.77	Bihar
Summer	498	Chhattisgarh
Summer	13847.29	Gujarat
Summer	7836.68	Karnataka
Summer	8909.75	Kerala
Summer	2928.53	Maharashtra
Summer	953.33	Manipur
Summer	8144.36	Meghalaya
Summer	5215.62	Odisha
Summer	1169.9	Puducherry
Summer	1006.08	Uttar Pradesh

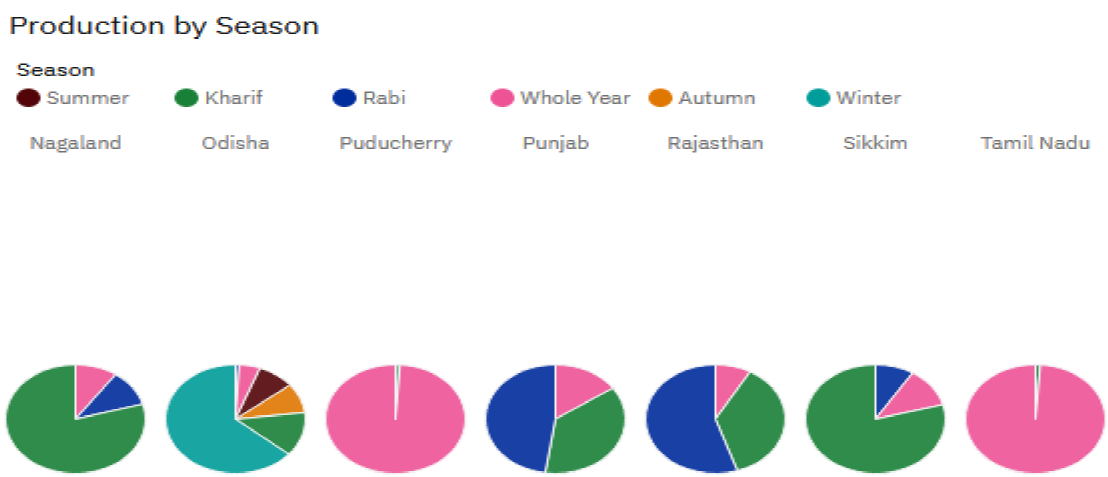
Summer	5417.58	Uttarakhand
Summer	73105.78	West Bengal
Whole Year	5240672.7	Andaman and Nicobar Islands
Whole Year	9095137.9	Andhra Pradesh
Whole Year	1815.24	Arunachal Pradesh
Whole Year	433304.53	Assam
Whole Year	35393.49	Bihar
Whole Year	603.04	Chandigarh
Whole Year	691.62	Chhattisgarh
Whole Year	6002080.5	Goa
Whole Year	172416.43	Gujarat
Whole Year	105298.33	Haryana
Whole Year	3370.42	Himachal Pradesh
Whole Year	481.62	Jammu and Kashmir
Whole Year	4568.49	Jharkhand
Whole Year	125929.65	Karnataka
Whole Year	32140995	Kerala
Whole Year	11304.99	Madhya Pradesh
Whole Year	1278448.5	Maharashtra
Whole Year	1629.32	Manipur
Whole Year	4537.02	Meghalaya
Whole Year	2285.99	Mizoram
Whole Year	10026.15	Nagaland
Whole Year	5980.71	Odisha
Whole Year	2138685.6	Puducherry
Whole Year	317624.73	Punjab
Whole Year	6337.69	Rajasthan
Whole Year	7004.2	Sikkim
Whole Year	1504369.7	Tamil Nadu
Whole Year	156149.1	Telangana
Whole Year	10621.03	Tripura
Whole Year	314287.67	Uttar Pradesh
Whole Year	123421.8	Uttarakhand
Whole Year	475865.47	West Bengal
Winter	116540.48	Assam
Winter	119868.3	Bihar
Winter	15367.92	Dadra and Nagar Haveli
Winter	36329.68	Jharkhand
Winter	20641.66	Kerala

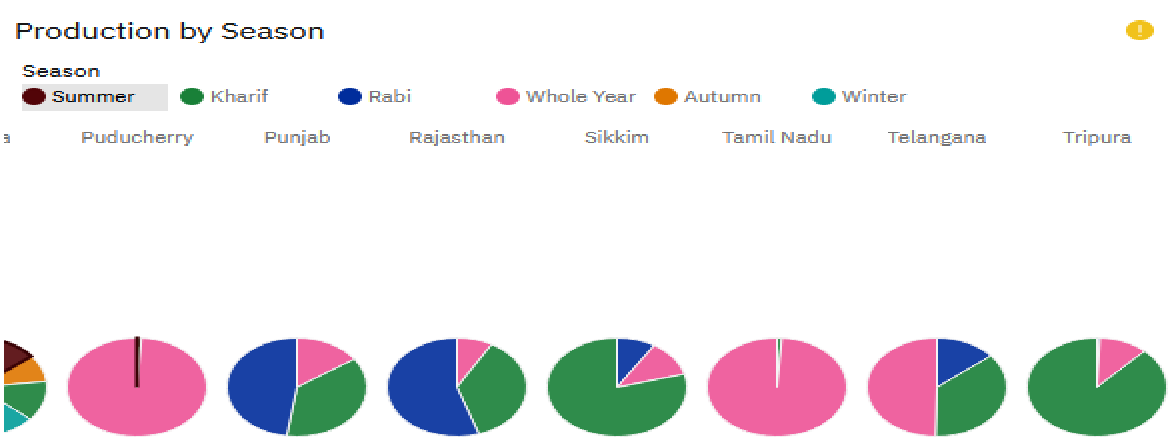
Winter	4163.8	Manipur
Winter	15235.8	Meghalaya
Winter	27016.43	Odisha
Winter	8928	Puducherry
Winter	400743.81	West Bengal






Production by Season
Season
Summer
Kharif
Rabi
Whole Year
Autumn
Winter
Karnataka
Kerala
Madhya Prad...
Maharashtra
Manipur
Meghalaya
Mizoram


Production by Season
Season
Summer
Kharif
Rabi
Whole Year
Autumn
Winter
Nagaland
Odisha
Puducherry
Punjab
Rajasthan
Sikkim
Tamil Nadu


Production by Season
Season
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Rabi
Whole Year
Autumn
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Puducherry
Punjab
Rajasthan
Sikkim
Tamil Nadu
Telangana
Tripura

CONCLUSION

Crop production in India is one of the important sources of income and India is one of the top countries to produce crops. As per this project would be analyzed some important visualization, creating a dashboard and by gone through these got the most of the insights of Crop production in India. As production of crops depends on different seasons, plotted visualization graph and pie chart t of the average production based on different seasons and observed that in winter season maximum 71826.42 and in Rabi season minimum 31011 and whole year 2395012 average crop productions observed. In crop production and area graphs showed the changes in both data with respect to increase in years. In 2011 minimum and in the year of 2011 maximum crop average production observed. And plotting graphs to visualization on the top 10 Indian states with the most area. In Punjab most area in top 10 states and Uttar Pradesh is the least one observed. There are so many different crops produced in Indian and most of us don't know which crop is belongs to which state so we will be plotting and highlight the states in map according to different crops. Kerala is the top average crop production with value of 24451673 and Chandigarh with least value 718.61

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. The challenges and opportunities in the field of Data analytics in agriculture has been discussed. The remote sensing technology for identification and measurement of the causes of yield gaps and their impact on final crop yield is presented in [8]. 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.

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