



## CS685 Project

Mentor:

Prof. Arnab Bhattacharya  
CSE Department, IIT Kanpur

# Analysing The Agricultural Patterns in India

Abhishek Bhatia(170022)

Harshit Kumar(170293)

Gosai Akash(170278)

---

Tanmay Anand(170751)

# Abstract

- ❑ India ranks second in the world's highest production of agricultural products
- ❑ Agriculture Industry contributes to over 17% of the Indian GDP
- ❑ It is one of the leading source of employment, providing employment to over half the population



# Introduction

- ❑ Agricultural production is an output dependent on multiple climatic and socio-economic variables.
- ❑ A wide variety of factors like rainfall pattern, pH of soil, and even local literacy rate influence the production pattern.
- ❑ Certain crops are more suitable to a given set of initial conditions than others.
- ❑ Recommending the best crops to cultivate based on historical data can help us maximize the production potential with any given initial conditions.

# Objectives

- ❖ Geographical Analysis on Crop Production
- ❖ Nation-wide Analysis of Crops
- ❖ Predictive Modelling
- ❖ Methods to Achieve Higher Production

# Datasets

- ❖ Agriculture production
- ❖ Geographical Data
- ❖ Crop Prices
- ❖ Area under Production and Production Cost
- ❖ Consensus Data

# Methodology

## ❖ Data Pre-Processing

- E.g: Handling of missing values, varying units across datasets, varying crop names, etc.

## ❖ Data Analysis

- E.g: Analyzing the district wise production data, finding trends between literacy rate and crop production/cost, rainfall patterns, soil types, etc.

## ❖ Clustering

- Using k-Means to group states/districts/crops based on production/demographic factors

## ❖ Predictive Modelling

- Used Linear Regression, DTs, Random Forest, etc. to predict crop production based on input parameters

## ❖ Recommendation

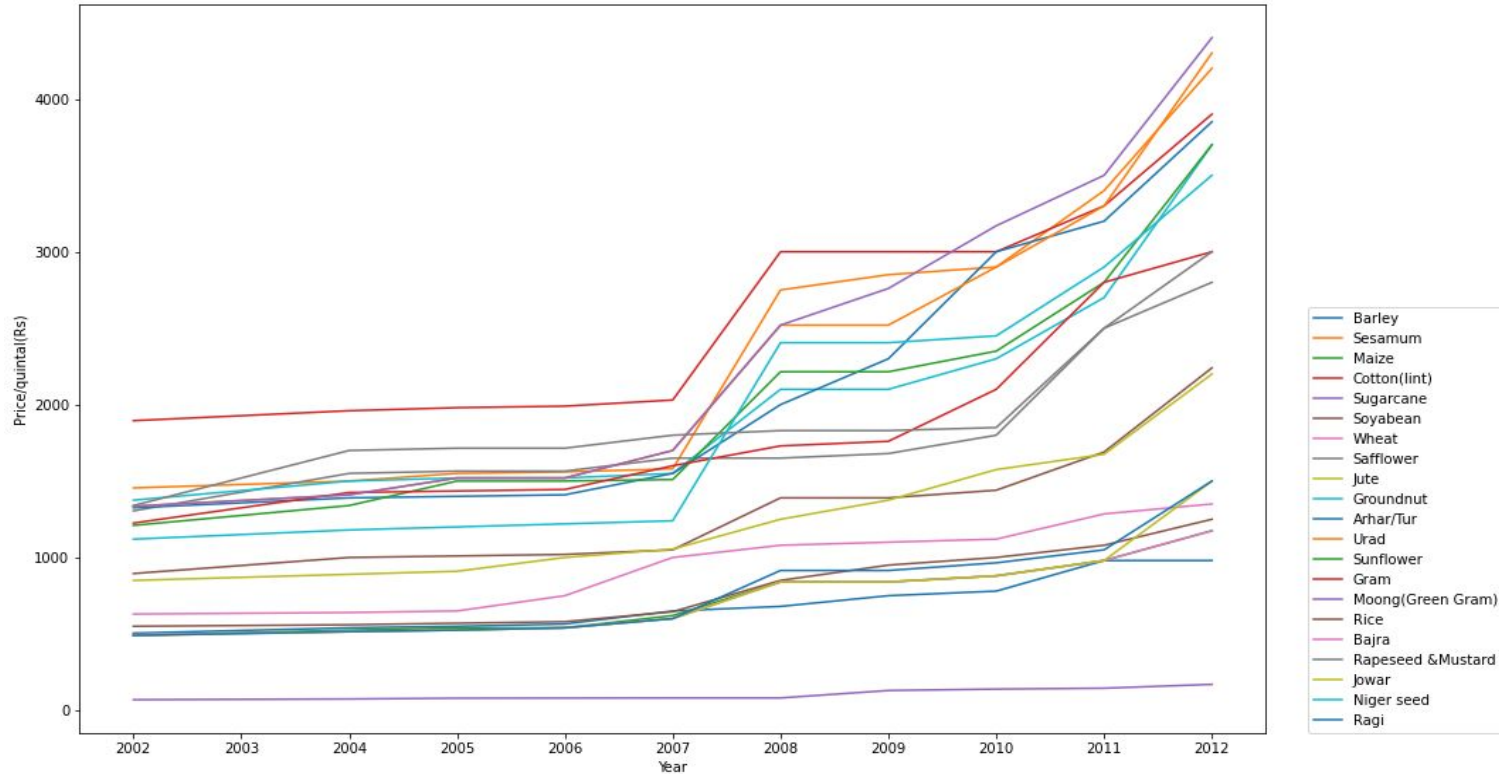
- Using district wise crop production, crop price data, weather and atmospheric factors to find the maximum profitable crops and give recommendations accordingly

# Analysis and Results



- ❖ Crop Price Variation Over Years
- ❖ Crop Production Share
- ❖ Growth
- ❖ Crop-Wise Cultivation Area
- ❖ Crop Yield
- ❖ Crop-Wise Revenue
- ❖ Domestic Earnings
- ❖ Cultivation Cost
- ❖ Effect of Rainfall, Soil Type and Soil pH
- ❖ Effect of Literacy Rate on Production
- ❖ Crop Clusters
- ❖ District Clusters
- ❖ Prediction Models
- ❖ Recommendation System

# Crop Price Variation Over Years

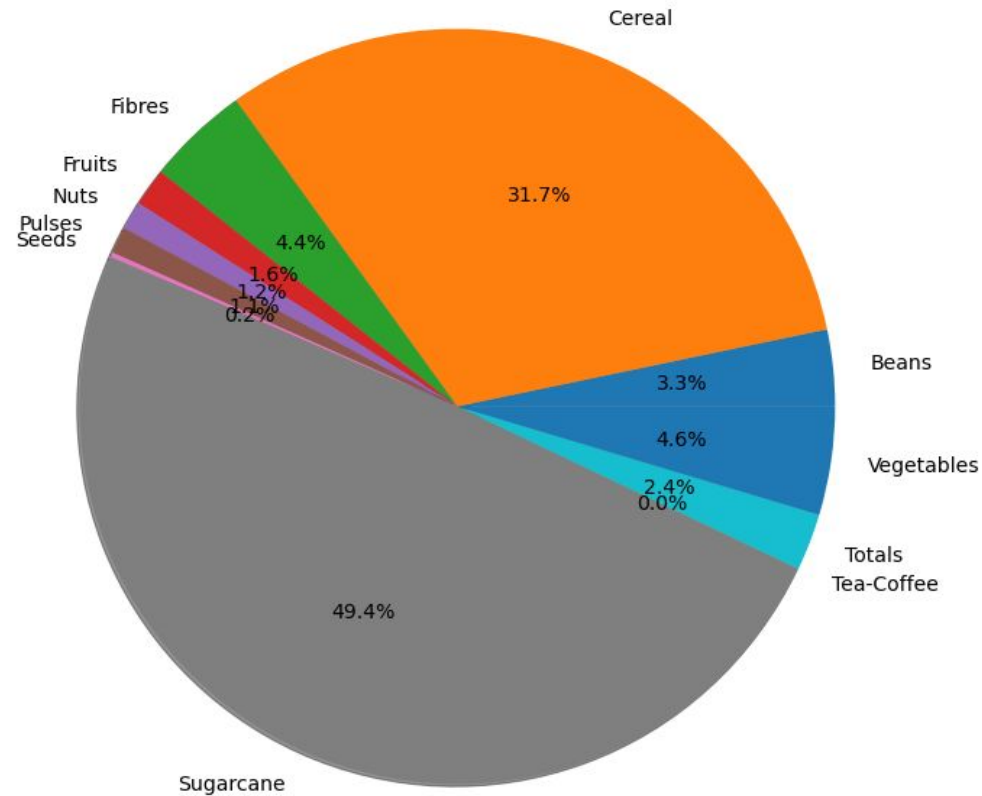


Average price per quintal of crops in India, over the years 2002-2012



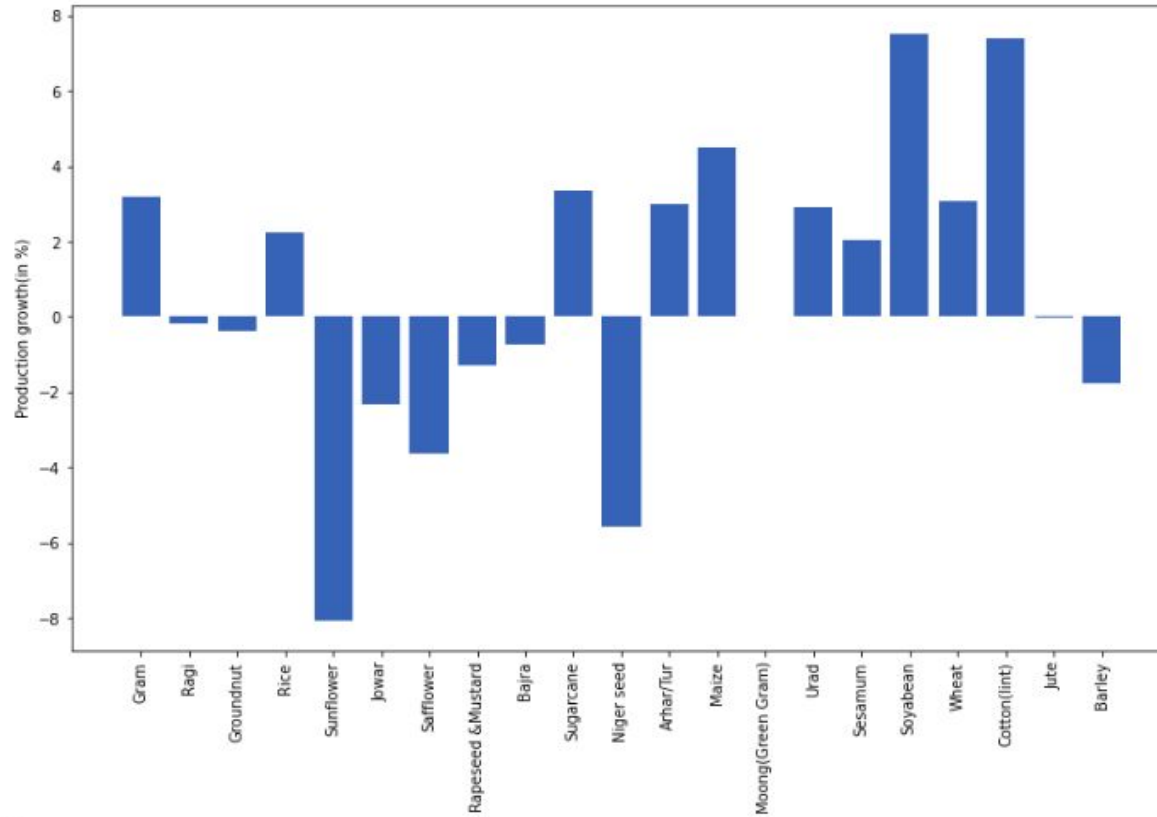
# Crop Production Share

- ❖ Sugarcane and Cereals make up the majority of share.
- ❖ Reason : High Export of sugarcane
- ❖ Cereals are Staple Diet



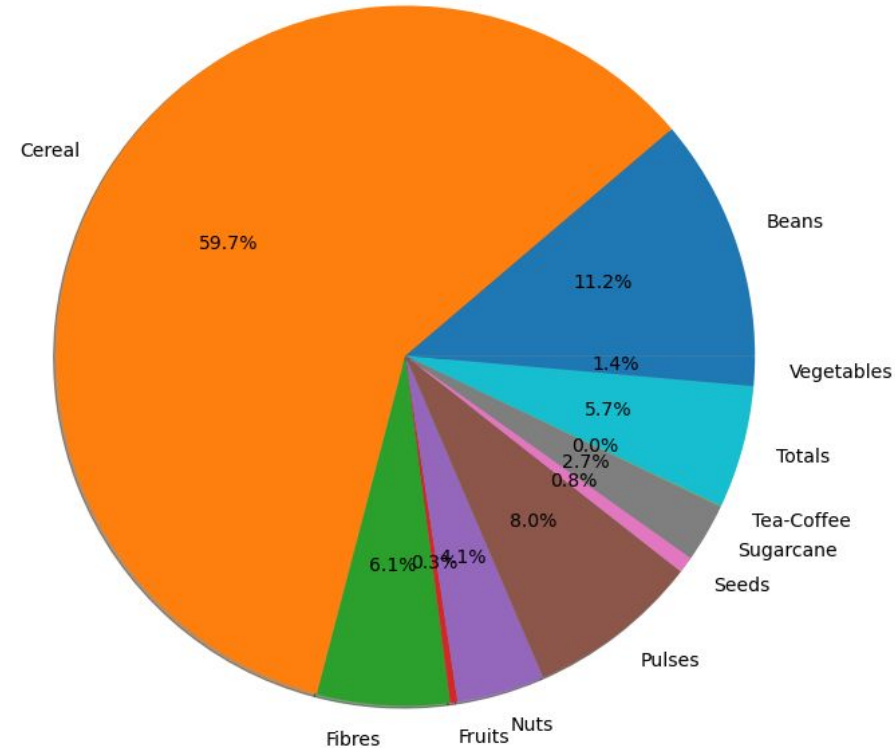
The percentage of crops produced in India averaged over years 2002-2012

# Growth



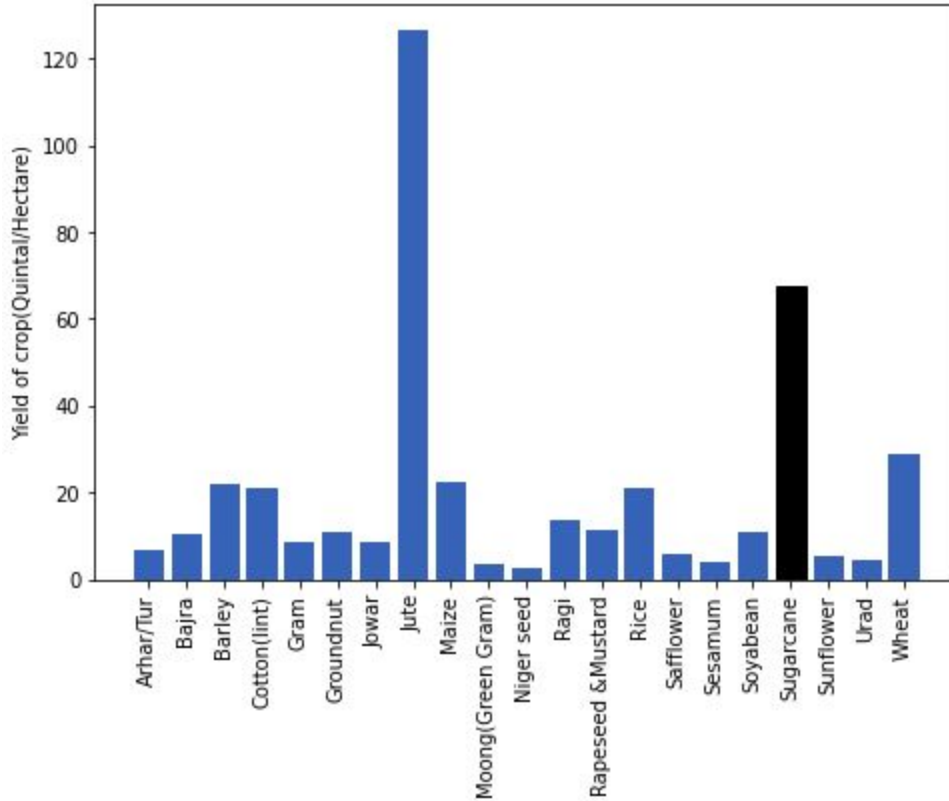
# Crop-Wise Cultivation Area

- ❖ Cereals cover the most area for production in India
- ❖ Beans second largest in terms of production area



Percentage share of various crops in the cultivation area averaged over 2002-2012

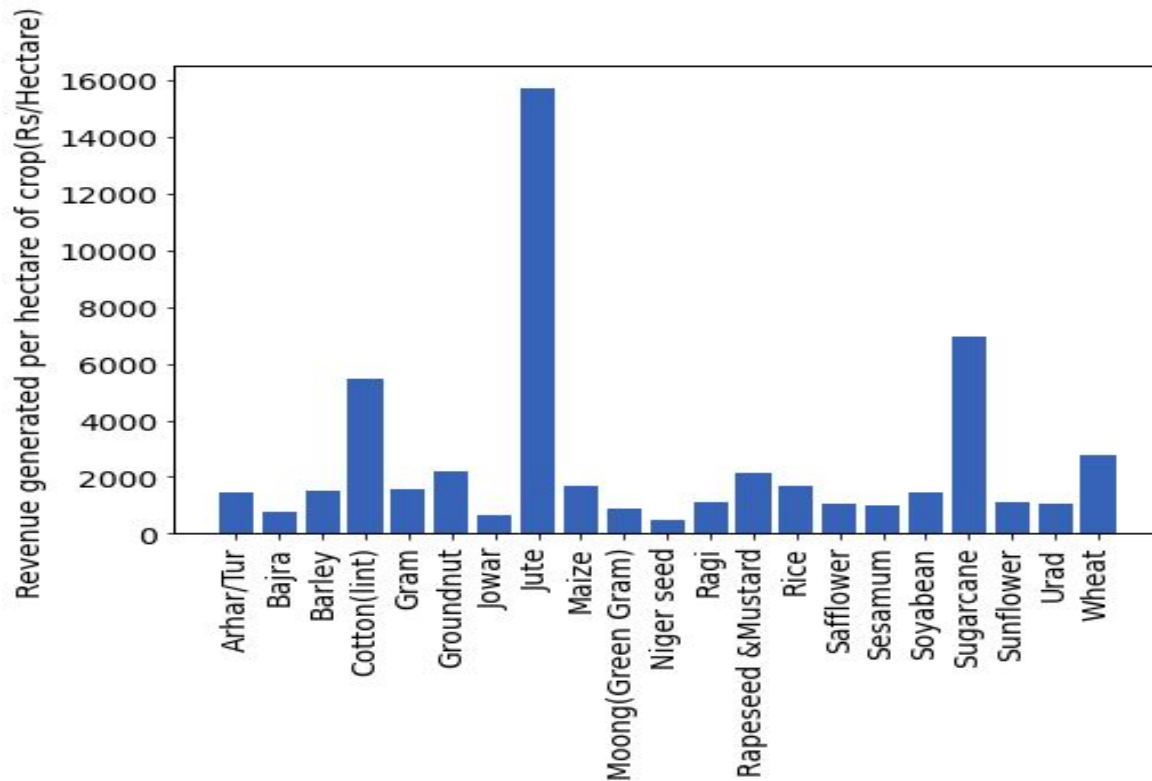
# Crop Yield



- ❖ Yields of Jute and Sugarcane are the highest
- ❖ Reason: Excessive use of fertilizers and Manual labour in their production

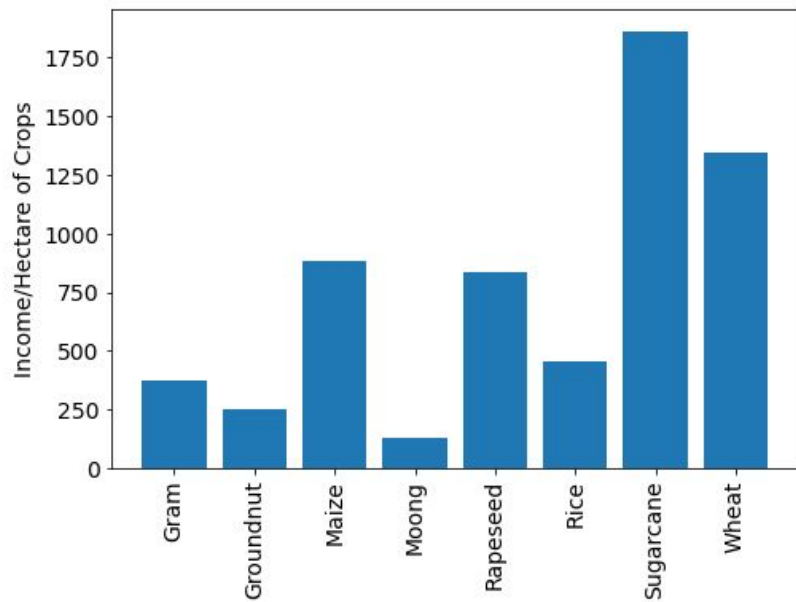
Yield (Production per unit area) for various crops averaged over 2002-2012. Note that yield of crops shown in black bars are divided by ten for better visualization

# Crop-Wise Revenue

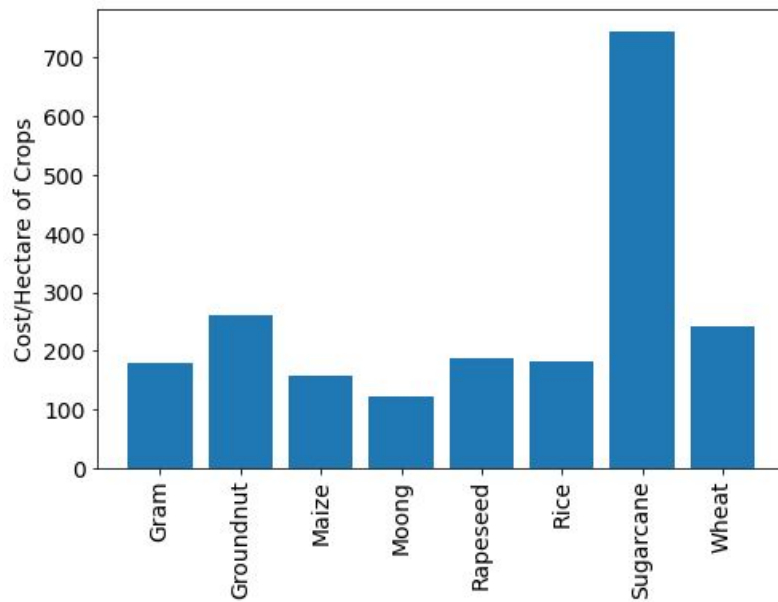


Domestic Revenue per unit area averaged over the years 2002-2012

# Earnings and Cultivation Cost

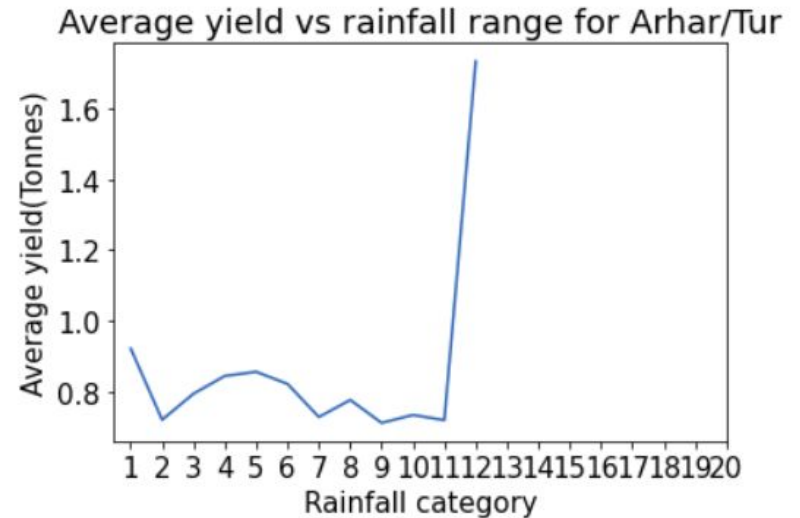
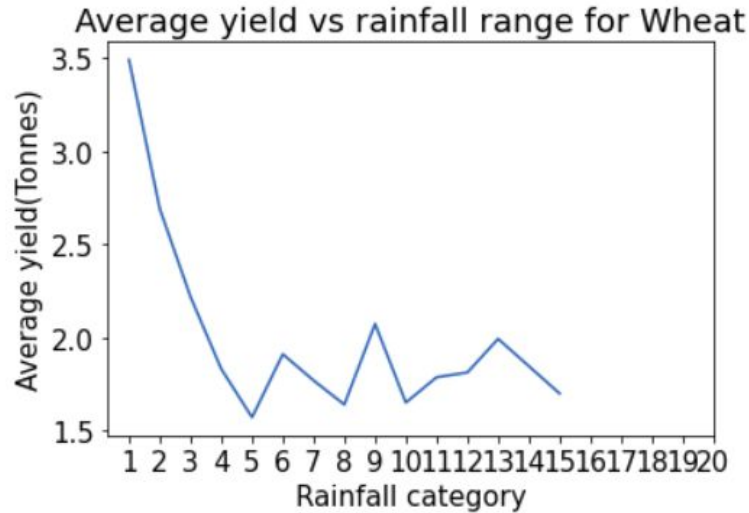


Domestic income per unit area averaged over the years  
2008-2014

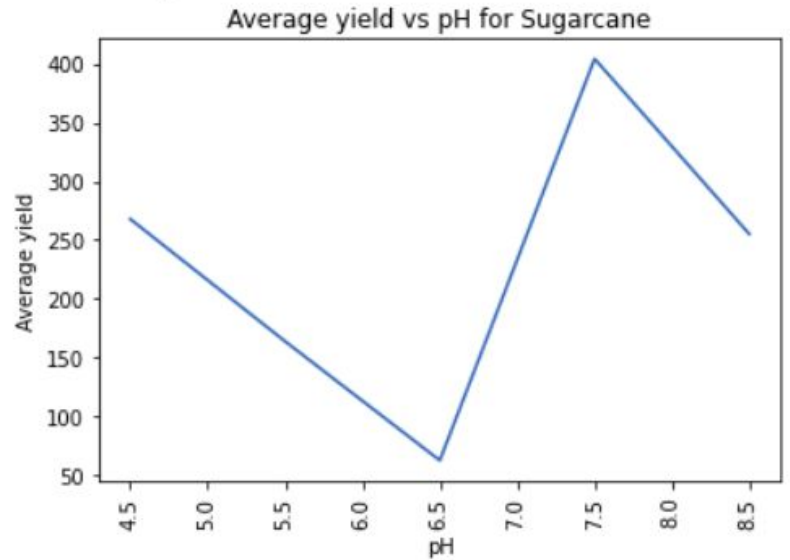
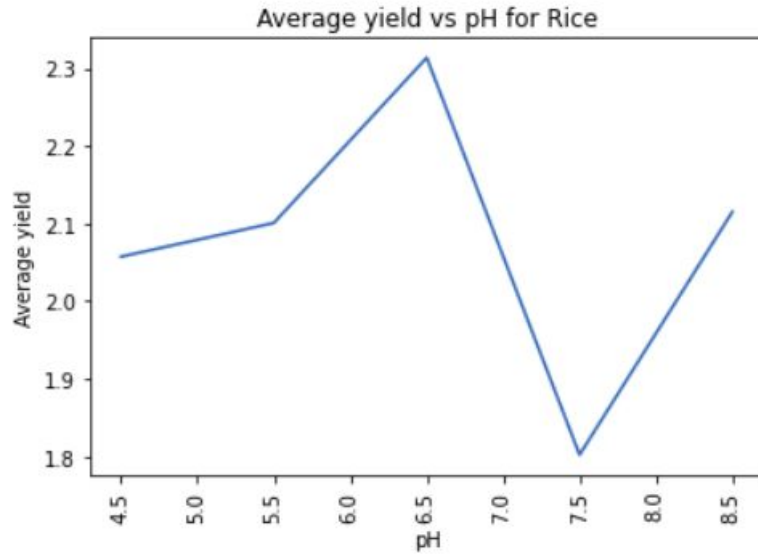


Cultivation cost per unit area averaged over the years  
2008-2014

# Optimum Rainfall for various crops

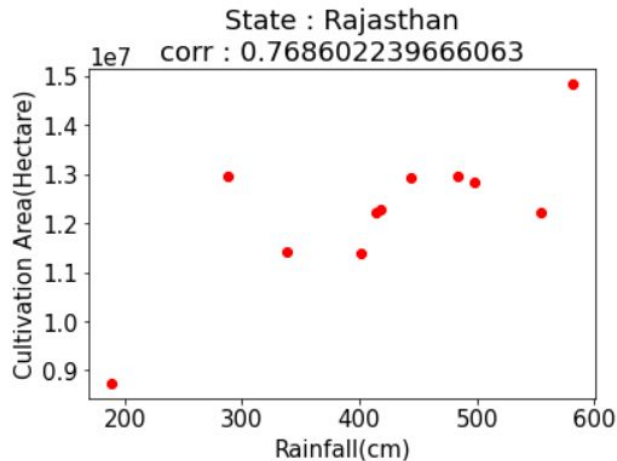
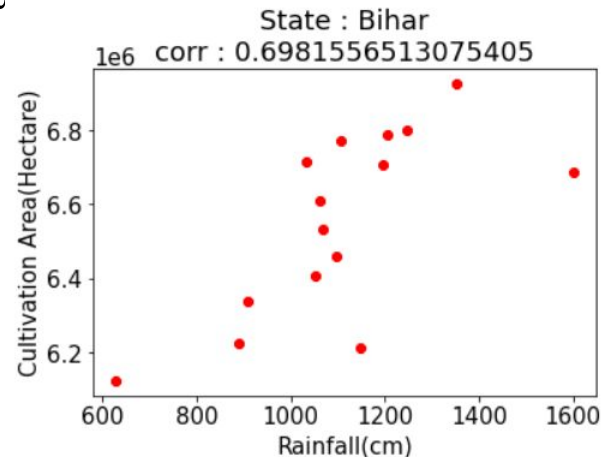
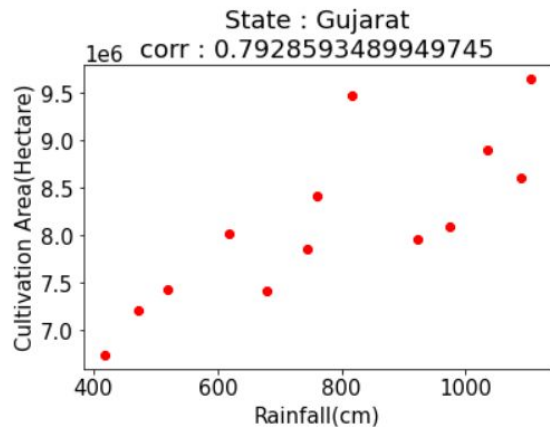
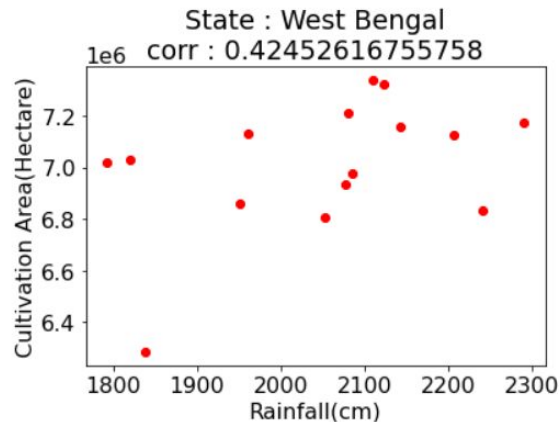


# Yield vs pH

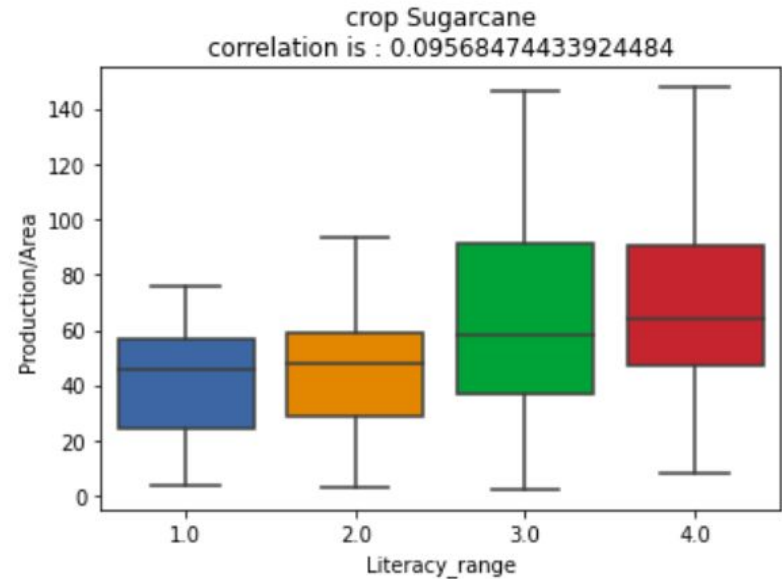
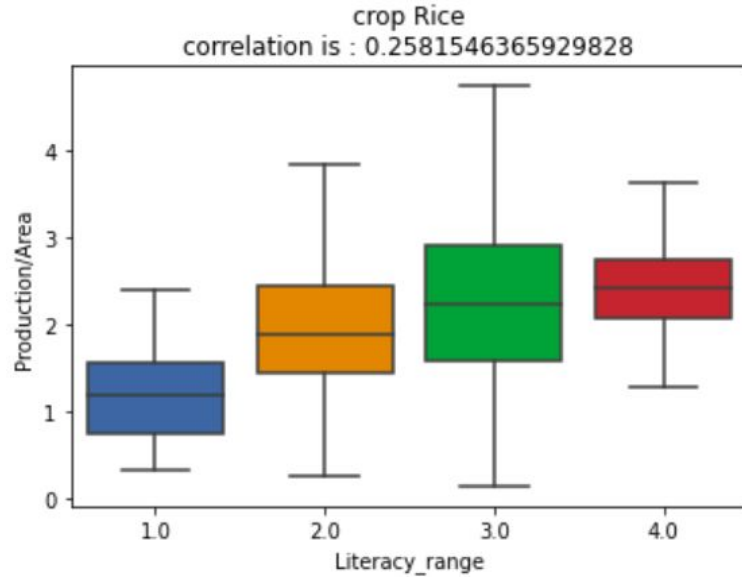




# Rainfall and Cultivation Area



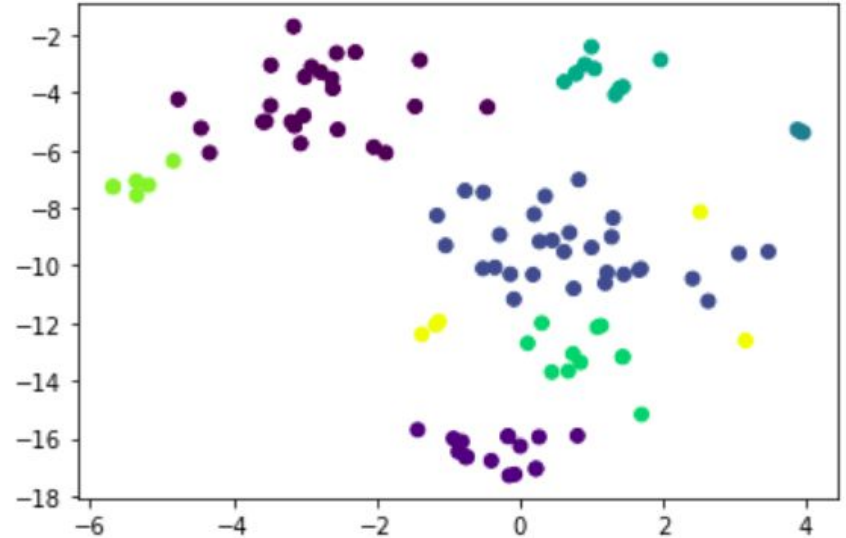
# Effect of Literacy Rate with Production



# Crop Clusters

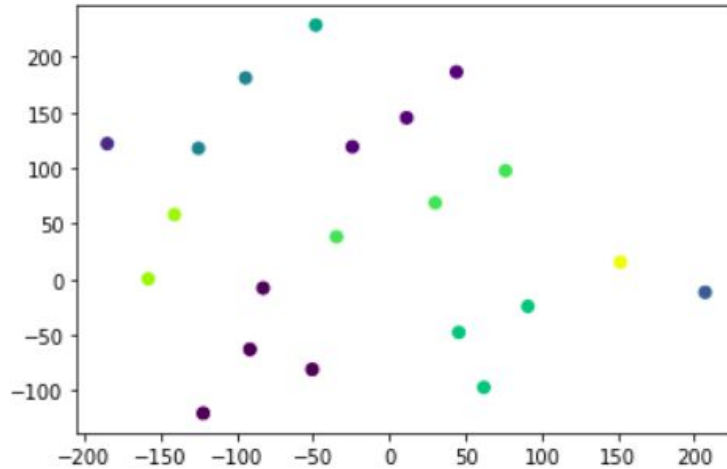
Considered Factors:

- ❑ Season(Kharif, Rabi, Summer)
- ❑ Soil type(Alluvial, Red, Black,etc.)
- ❑ Soil pH
- ❑ Rainfall
- ❑ Temperature

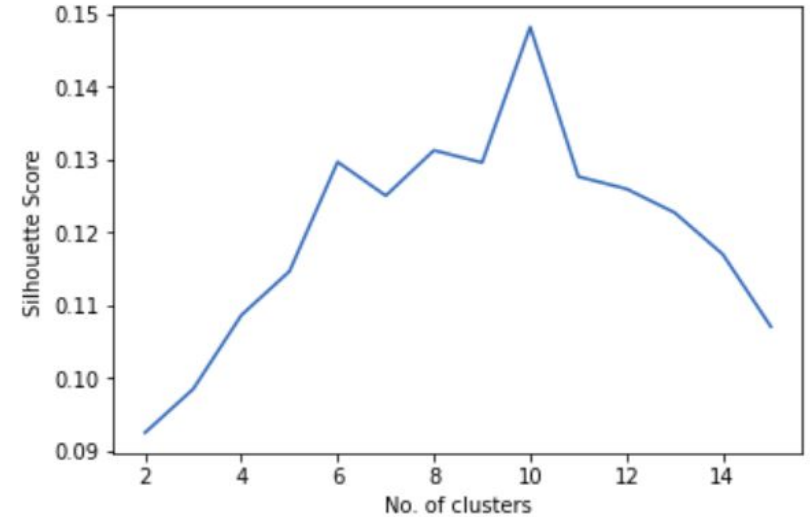


Clusters of similar crops i.e crops that can be grown in similar environmental conditions

# District Clusters



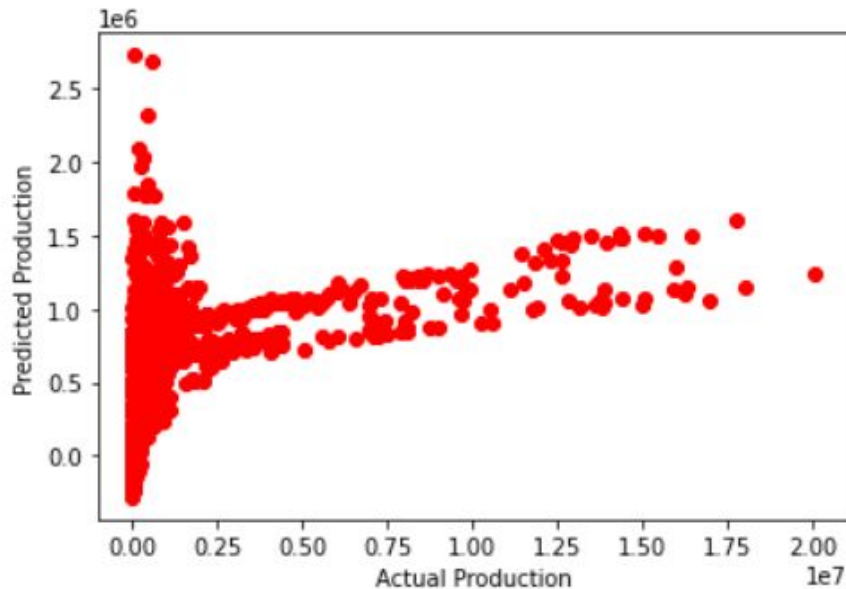
Cluster of similar districts



Silhouette Value v/s No. of Clusters

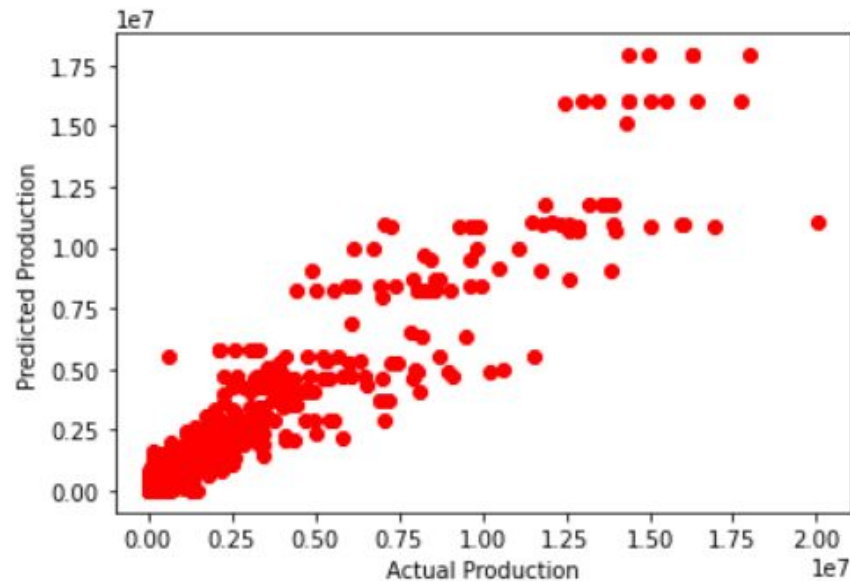
# Prediction Models

0.18861044131768456



Linear Regression Model

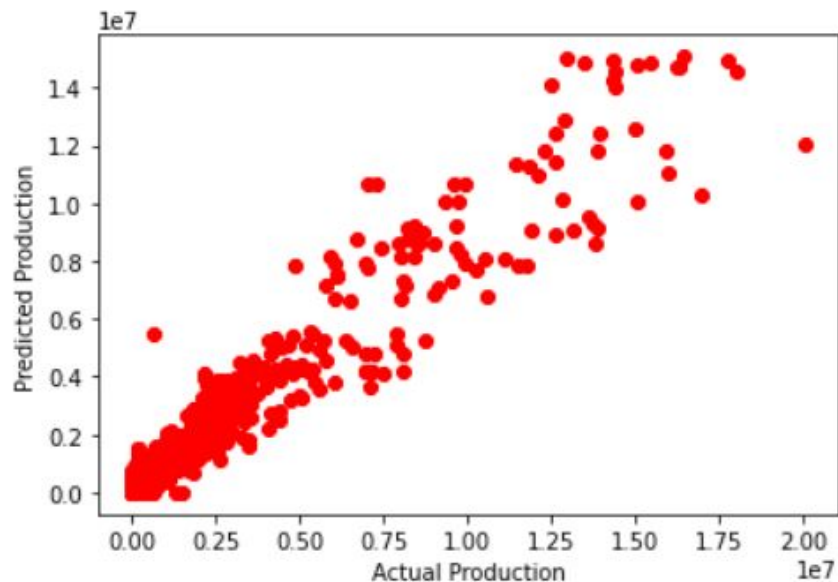
0.915732502444797



Decision Tree Model

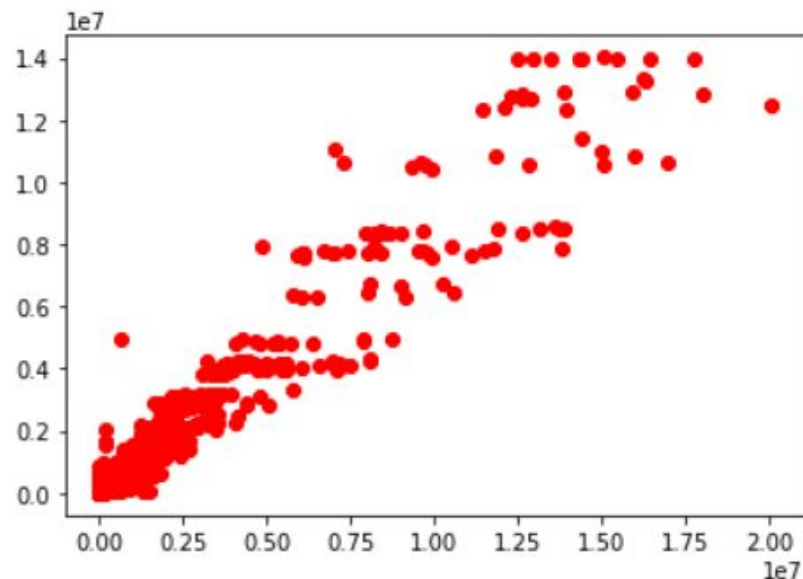
# Prediction Models

0.9386151498209708



Random Forest Model

0.9307684807435922



XGBoost Model

# Recommendations

State	Crop1	Crop2	Crop3	Crop4	Crop5	Crop6	Crop7	Crop8	Crop9	Crop10	Crop11	Crop12
Haryana	Sugarcane	Sweet potato	Turmeric	Banana	Wheat	Cotton(lint)	Onion	Garlic	Potato	Barley	Other Vegetables	Rice
Punjab	Sugarcane	Sweet potato	Turmeric	Banana	Wheat	Cotton(lint)	Onion	Garlic	Potato	Barley	Other Vegetables	Rice
Rajasthan	Sugarcane	Sweet potato	Turmeric	Banana	Wheat	Cotton(lint)	Onion	Garlic	Potato	Barley	Other Vegetables	Rice
Uttar Pradesh	Sugarcane	Sweet potato	Turmeric	Banana	Wheat	Cotton(lint)	Onion	Garlic	Potato	Barley	Other Vegetables	Rice
Jharkhand	Tapioca	Cabbage	Onion	Arhar/Tur	Potato	Maize	Sugarcane	Sweet potato	Banana	Coconut	Jute	
Odisha	Tapioca	Cabbage	Onion	Arhar/Tur	Potato	Maize	Sugarcane	Sweet potato	Banana	Coconut	Jute	
Tamil Nadu	Tapioca	Cabbage	Onion	Arhar/Tur	Potato	Maize	Sugarcane	Sweet potato	Banana	Coconut	Jute	
Maharashtra	Tomato	Maize	Sugarcane	Banana	Mango	Wheat	Cotton(lint)	Onion	Grapes	Rice		
Kerala	Sugarcane	Sweet potato	Banana	Pineapple	Mango	Tapioca	Coconut	Papaya	Garlic	Potato		
Bihar	Papaya	Onion	Sugarcane	Sweet potato	Banana	Jute	Potato	Grapes	Coconut			
Telangana	Papaya	Onion	Sugarcane	Sweet potato	Banana	Jute	Potato	Grapes	Coconut			
Uttarakhand	Sugarcane	Turmeric	Ginger	Wheat	Onion	Dry ginger	Tobacco	Potato	Total foodgrain	Rice		
Karnataka	Sugarcane	Banana	Citrus Fruit	Grapes	Coconut	Dry ginger	Jute	Potato	Mesta	Jute	mesta	
Tripura	Sugarcane	Banana	Citrus Fruit	Grapes	Coconut	Dry ginger	Jute	Potato	Mesta	Jute	mesta	
West Bengal	Sugarcane	Banana	Citrus Fruit	Grapes	Coconut	Dry ginger	Jute	Potato	Mesta	Jute	mesta	
Chhattisgarh	Sugarcane	Sweet potato	Banana	Ginger	Papaya	Onion	Dry ginger	Potato				
Himachal Pradesh	Sugarcane	Sweet potato	Banana	Ginger	Papaya	Onion	Dry ginger	Potato				
Madhya Pradesh	Sugarcane	Sweet potato	Banana	Ginger	Papaya	Onion	Dry ginger	Potato				
Andhra Pradesh	Wheat	Papaya	Onion	Garlic	Potato	Sugarcane	Banana	Pome Fruit	Coconut	Grapes		
Gujarat	Wheat	Papaya	Onion	Garlic	Potato	Sugarcane	Banana	Pome Fruit	Coconut	Grapes		
Arunachal Pradesh	Maize	Sugarcane	Turmeric	Soyabean	Wheat	Dry chillies	Pulses total	Dry ginger	Potato	Rice		



Thanks for listening!

---

Suggestions are Welcome!!