ABSTRACT

Agriculture is the major occupation in India where 60% people's life is based on it. It contributes 6.1% in GDP of India where Agriculture rank's 11th place in the Indian economy has many problems to be dealt with. The Burning problem in Agriculture is to predict the subsidy rate for a crop to be sold in the market. Farmer can get the seeds for cultivation in subsidy rates but can't sell the crop in the rate they wish to. The farmers are not getting benefited which leads to suicide of farmer or loss of crop. To address the problem we propose this model using Machine Learning where the inputs for the subsidy rate prediction are directly taken from the farmers and old data from the government of past subsidy rate by crop and region wise respectively. Regression algorithm is trained with these inputs used for rate prediction in terms of quantity of crop and subsidy rate is predicted. This results in higher benefits for the farmer. This not only increases the quantity of crop but also the economy of country and GDP percentage.

Keywords: - Gross Domestic Product (GDP), Predictive analytics, Agriculture, Indian economy

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LIST OF ABBREVIATIONS

BBY	Bhavantar Bhugtan Yojana
CACP	Commission for Agricultural Costs and Prices
GDP	Gross Domestic Product
GUI	Graphical User Interface
FHP	Farm Harvest Price
MSP	Minimum Support Price
PDS	Public Distribution System

LIST OF FIGURES

CHAPTER 1
INTRODUCTION

Technology and innovation are increasing day by day. Data can change everything in the span of little time. Data Analytics and Artificial Intelligence are the keys which changes the perspective of the Computer Science and technology. Data can be easily manipulated to different forms which can be used in different areas of applications. A new data today is old for tomorrow. Every minute some lakhs of data is being generated and among that only 50% of data is useful. So, by using data analytic tools and machine learning techniques many real time problems can be solved. Majorly the real time problems fall in these areas of Agriculture, Human life enhancement, Medical and National Security. Agriculture is main occupation for many people in India where it contributes 6.1% of country's GDP and 60% of people's life are based on it. It has many problems in different stages of crop cultivation. Our Problem falls under the stage where the end crop is to be sold in the market. The rate prediction for agricultural crop plays a vital role in farmer's life. Predictive analytics is used here in which old methodologies and old data output's study is used in finding the input attributes and training data.

1.1 Aim of the Project

The main aim is to predict the rate for the crop and to recommend the location in which a farmer can sell. The old system should be changed such that our project helps them in predicting the rate and to sell in market where there is demand for the particular crop. Area wise study is taken into consideration. According to that, the Crop can also be exported to other areas. This project needs a more backend process where the Machine Learning Algorithm's are trained for various types of inputs for acquiring more accuracy.

1.2 Project Domain

To solve a problem on a computer, we need an algorithm. An algorithm is a sequence of instructions that should be carried out to transform the input to output. For example, one can devise an algorithm for sorting. The input is a set of numbers and the output is their ordered list. For the same task, there may be various algorithms and we may be interested in finding the most efficient one, requiring the least number of instructions or memory or both.

Machine Learning is the way of training the algorithms with different types of data to get more accuracy in the resultant output. In this Project we have used both Supervised Machine Learning techniques in order to get a clear and efficient output. Supervised learning makes training with known output variables with two prominent techniques namely classification and regression.

1.3 Problem Statement

In the Agriculture there are mainly 3 stages of crop development. In Initial stage the selection of Crop to be cultivated and getting enough resources. Second stage is Farming and producing the crop qualitatively and quantitatively succeeded by Selling and earnings based on the produced crop. In all these 3 stages there are several problems to be dealt with. Our Problem of subsidy rate prediction falls under last stage of farming the crop. Farmer can’t fix the rate of the crop which they have cultivated for years to be sold in the market. Government also doesn’t fix some subsidy rate for the crop to be sold. In this way the farmers are getting cheated by the people in markets and selling their crop for lower prices.

CHAPTER 2
LITERATURE REVIEW

[1] Tong Ai-hua, **"Factors influencing prices of Agriculture products and stability counter measures"**,2012, Asian agricultural research**.**

This Paper presents counter measures and suggestions for stabilizing the prices of Agricultural Products based on Supply demand relationship, Factors like Asymmetry of Supply-demand information, Lack of Risk management tools for prices of agricultural products, Decentralized and small-scaled operation of farmer house hold are majorly influencing results in difficulty in sales of Agricultural products. Some Stability counter measures are building long effect mechanism for production and sales of agricultural products, Expand the production and increase the supply, Control and rise in range of production cost, Enhance organization level of farmers, Promote innovation and development of risk management tools for the prices of agricultural products.

[2] E Feng-jie, WANG Er-da, XIE Feng-yuan, **"Crop Area Yield Risk Evaluation and Premium Rates Calculation—Based on Nonparametric Kernel Density Estimation"**, 2009, International Conference on Management Science & Engineering.

This estimation is to evaluate the probability density of yield in 19 provinces of china per acre for the crops like corn, rice, wheat, and bean form 1985-2007. After the estimation is done the results are compared about 56% nonparametric rates are larger than normal rates and in most cases (75%), means of nonparametric rates are significantly different from that of normal rates according to the paired t-test. Yield risk is also estimated on basis of normal density.

[3] Anil KUMAR Rohila, "**Minimum Support Price to Farmers in India"**, 2018, Popular Kheti**.**

This paper mainly focuses on the determination of MSP and major problems in implementing MSP. The major problem is that the Government is fixing the price at the beginning of the sowing season. Government of India is administering 2 prices firstly Minimum Support Price in which floor prices and fixed by the Government in the nature of long-term guarantee for investment decisions of producers along with the assurance that prices of their commodities would not be allowed to fall below the level fixed by the government, even in the case of a bumper crop. Secondly Procurement prices are the prices of Kharif and Rabi cereals at which the grain was to be domestically procured by public agencies for release through Public

Distribution System (PDS). It was announced soon after harvest began. Normally Procurement price was lower than the open market price and higher than the MSP.

[4] Development Monitoring and Evaluation Office **"Evaluation report on Efficacy of Minimum Support Prices (MSP) on Farmers"**, 2016, Government of India, NITI Aayog report.

This report is based on the recommendations of the Commission for Agricultural Costs and prices (CACP), Government of India, declares MSP for 22 crops before sowing season. Gross cropped area, Net Cropped area, Leased/Rented Total irrigated area, Area cropped more than once in a year, Fallow land, Share of irrigated area to net cropped area are majorly used in the study of MSP in different states of India. This report conveys the impact of MSP and how it is monitored.

[5] R S Deshpande, **"IMPACT OF MINIMUM SUPPORT PRICES ON AGRICULTURAL ECONOMY"**, 2003, Agricultural Development and Rural Transformation Unit.

This paper is mainly focused on the impact and effectiveness of MSP on Agricultural economy in different states of India. To analyze the Impact on market prices in terms of reduction in seasonal fluctuations and influencing market prices, to ascertain the degree of incentives provided to the producers for increasing investment, use of technology for raising growth in output to examine the impact on use of inputs and land and water resources besides Adoption of socially desirable cropping pattern, to identify regional variations in the degree of implementation of price policy were studied to find the Effectiveness of MSP.

[6] Shayequa Z. Alia, R.S. Sidhub, Kamal Vatta, **"Effectiveness of Minimum Support Price Policy for Paddy in India with a Case Study of Punjab"**, 2012 Agricultural Economics Research Review.

This study helps in understanding the deviations in the Farm Harvest Price (FHP) and Minimum Support Price (MSP). This policy has a strange deviation in the paddy surplus states like Punjab and Andhra Pradesh and paddy deficient states. Most of the times, MSP is not in line with the international price as well as domestic demand and supply situation. The Commission for Agricultural Costs and Prices (CACP) recommends MSP for crops like paddy, wheat, Pulses, oilseeds, grains. The MSP is favoured only in food surplus states. In case of paddy, worked out examples proved the negative deviations in ineffectiveness of MSP.

[7] Dr. Meenu Jain, **"Minimum Support Prices in India"**, 2019, Indian Journal of Applied Sciences.

MSP is a tool which gives guarantee to the farmers, prior to the sowing season, that a fair amount of price is fixed to their upcoming crop to encourage higher investment and production of agricultural commodities. As per 2019 status the Government providing MSP on the 25 crops namely Paddy ,Jowar, Bajra ,Maize, Ragi, Arhar,Moong ,Urad ,Cotton ,Groundnut ,Sunflower seeds ,Soyabean ,Sesamum ,Wheat ,Barley ,Gram , Masur ,Mustard ,safflower ,Torai , Copra, De-husked Coconut , Jute and sugarcane.The need of MSP is that our population is increasing at less than 1 % while food production is growing at more than 3% which leads to fall in prices and income of the farmers.

[8] Riplav Jain, Yash Jain, Manjunath C R, **"Estimating of Minimum Support Price (MSP) of Crops Using Data Analysis"**, 2018, International Journal for Research in Applied Science & Engineering Technology.

This study focuses on the method of estimating MSP based on 2018 budget proposed by the government where MSP is 50% more than the weighted average cost of the production.

CHAPTER 3
PROJECT DESCRIPTION

3.1 Existing System

For prediction of selling price of the crop, Indian Government had taken a step and initially introduced Bhavantar Bhugtan Yojana (BBY) scheme. In this scheme farmers were given a relief amount if the selling price of the crop did not meet their expectation in the market. This scheme was not very successful because the amount was given once in a year and was not implemented in all the states of India. In 1966, another reform in the name of Minimum Support Price (MSP) for the crop was introduced where 22 crops rate was predicted by the government prior to the season of the crop and a rate is fixed for selling the crop in the market. Many factors such as gender, age, investment, climatic conditions etc were taken in determination of MSP but some inputs such as gender, age etc were deviating the selling price of the crop and the MSP failed here.

3.2 Disadvantages

1. The MSP predicted did not meet the requirements of the farmer in getting profits.
2. In some states when the efficiency of MSP was studied there were deviations in the graphs which resulted in getting lower benefits.
3. In Punjab, when deviations were studied between MSP and FHP in case of paddy using simultaneous equation model the MSP was lagged behind the FHP.
4. When it comes to the input factors that were used to predict MSP many are not contributing much and makes deviations too.
5. Rate prediction is prior the cultivation of crop which did not change if the crop is not abundant and vice versa.

3.3 Proposed System

The Subsidy rate system which is proposed is a feasible and an accurate system in predicting the subsidy rate for the farmer. Actually government is providing seeds for the farmer in subsidy rate i.e., price at which farmer can afford for harvesting and cultivation of the crop but farmers cannot sell the crop in the market for the same subsidy rate i.e., price which farmer can get his investment back with 50% of profit.

In this system the supervised learning algorithm namely regression algorithm is used for predicting the subsidy rate for the crop because when it comes to the prediction analytics regression algorithm gives the more accurate results and the location at which farmer can sell his crop for higher profits.

3.4 Advantages

1. This system makes easier in predicting the subsidy rate without much deviations.
2. Rate is predicted after the crop is cultivated.
3. Makes the procedure of predicting the rate easier by taking main input factors into consideration.
4. Analytic approach gives a better and accurate result than other approaches.

3.5 Feasibility Study

The feasibility of the project is analyzed in this phase and business proposal is put forth with a very general plan for the project and some cost estimates. During system analysis the feasibility study of the proposed system is to be carried out. This is to ensure that the proposed system is not a burden to the company. For feasibility analysis, some understanding of the major requirements for the system is essential. Three key considerations involved in the feasibility analysis are:

1. Economic Feasibility
2. Technical Feasibility
3. Social Feasibility

3.5.1 Economic Feasibility

This study is carried out to check the economic impact that the system will have on the organization. The amount of fund that the company can pour into the research and development of the system is limited. The expenditures must be justified. Thus the developed system as well within the budget and this was achieved because most of the technologies used are freely available. Only the customized products had to be purchased. The economic feasibility of the project is so high such that it costs less for developing the project but it helps farmers to get higher profits in the market.

3.5.2 Technical Feasibility

This study is carried out to check the technical feasibility, that is, the technical requirements of the system. Any system developed must not have a high demand on the available technical resources. This will lead to high demands on the available technical resources. This will lead to high demands being placed on the client. The developed system must have a modest requirement, as only minimal or null changes are required for implementing this system.

3.5.3 Social Feasibility

The aspect of study is to check the level of acceptance of the system by the user. This includes the process of training the user to use the system efficiently. The user must not feel.

3.6 System Specification

Hardware Specification

1. Processor - Core i5 or i7 @1.70GHz 2.40GHz
2. RAM - 8 GB
3. Hard Disk - 10 GB
4. Key Board - Standard Windows Keyboard
5. Mouse - Two Button Mouse

Software Specification

1. Operating System - Windows 7,8,10
2. Coding Environment - Python using Anaconda

CHAPTER 4
MODULE DESCRIPTION

4.1 General Architecture

Initially the data is collected from the government websites for each and every input attribute. In pre-processing stage the missing values and undefined values of the tables are cleaned and data is made legible for the algorithm to be used. If we have any missing values in the data then the average of all the data entries of that particular attribute is taken and filled. This process is done until all the missing values are filled.

Evaluation of data is done by training the Linear Regression algorithm with the data available after Data collection and pre-processing. In the evaluation 80% of data is taken for the training and 20% of the data is taken for the testing of the algorithm. In Linear Regression algorithm a graph is plotted such that all the values of the attributes are taken then, average of data's of each attribute is taken and a line is drawn in the graph. While training the algorithm, for each attribute slope value is calculated and Intercept is also calculated. Using these values we test the algorithm. In this project, the tables have the attributes namely type of crop, State, cultivation cost1, cultivation cost 2, yield, cost of production, rainfall and predicted price for different types of crops in the different states of India.

Regression algorithm is one of the finest algorithms used in supervised learning and gives results more accurate in the case of predictive analytics. In the project in training of the data Linear Regression function is used to plot the graph of predicted prices of the crop. The Subsidy rate of the crop is predicted and location is also selected for selling crop with more profit than in their same location of cultivation. Fig 4.1 explains the general architecture of the project.

The area for selling the crop is predicted here using the study based upon the same crop produced in different states of India. This area wise study helps us in finding the maximum profitable rate using the logic of comparison of same crop price. The rate prediction varies based upon the data feed. As the data have many regions for the same crop then more accurate and high profitable rate can be obtained.

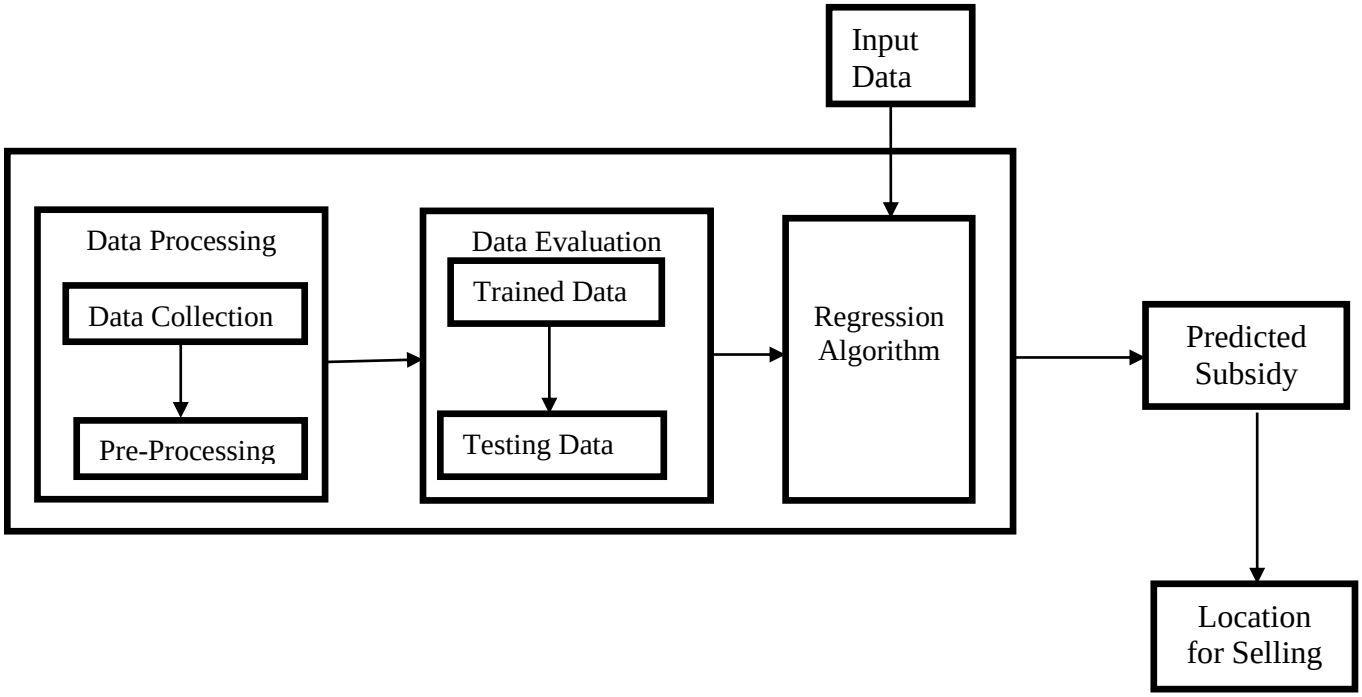

Fig 4.1: Architecture Diagram

4.2 Data flow Diagram

In the Data Flow Diagram 3 databases are taken such that the Input database contains the data which is preprocessed. The training data is given to the algorithm initially. Regression algorithm is one of the finest algorithms used in supervised learning and gives results more accurate in the case of predictive analytics. In the project in training of the data Linear Regression function is used to plot the graph of predicted prices of the crop. The Subsidy rate of the crop is predicted and location is also selected for selling crop with more profit than in their same location of cultivation. In this project, the data bases have the attributes namely type of crop, State, cultivation cost1, cultivation cost 2, yield, cost of production, rainfall.

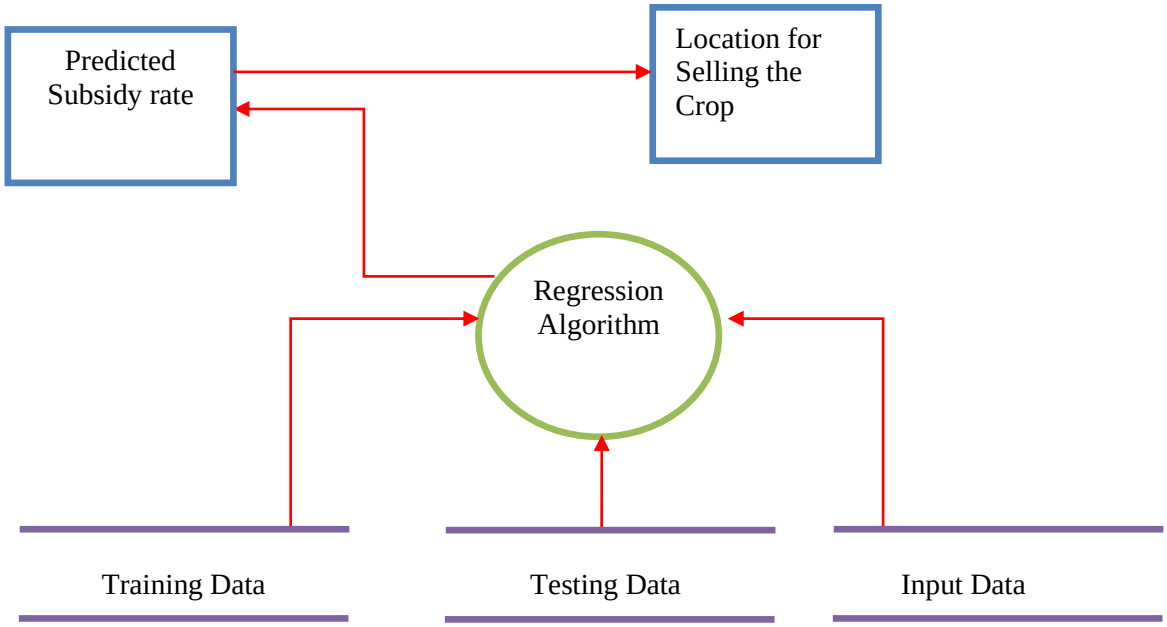

Fig 4.2: Data Flow Diagram

4.3 ER Diagram

Entity Relationship diagram explains about hr relation between different tables and attributes in them. In the first data set consist of attributes like type of the crop, State, cultivation cost 1,cultivation cost 2, yield, cost of production, rainfall and predicted price for different types of crops in the different states of India and these are trained using regression algorithm. The Subsidy rate of the crop is predicted and location is also selected for selling crop with more profit than in their same location of cultivation.

4.3.1 Attributes

State - States of India.

Types of Crop - All the commercial and non-commercial crops like Paddy, Ground nut, Cotton, Wheat etc.

Cultivation cost 1- It is amount of money invested for cultivation of the crop in Northern part of a state.

Cultivation cost 2- It is amount of money invested for cultivation of the crop in Southern part of a state.

Cost of production – The amount of money invested in production of the crop.

Yield – Quantity of the crop cultivated per hectare.

Rainfall – Annual rainfall in millimeters.

Predicted Price – The selling price predicted for the crop.

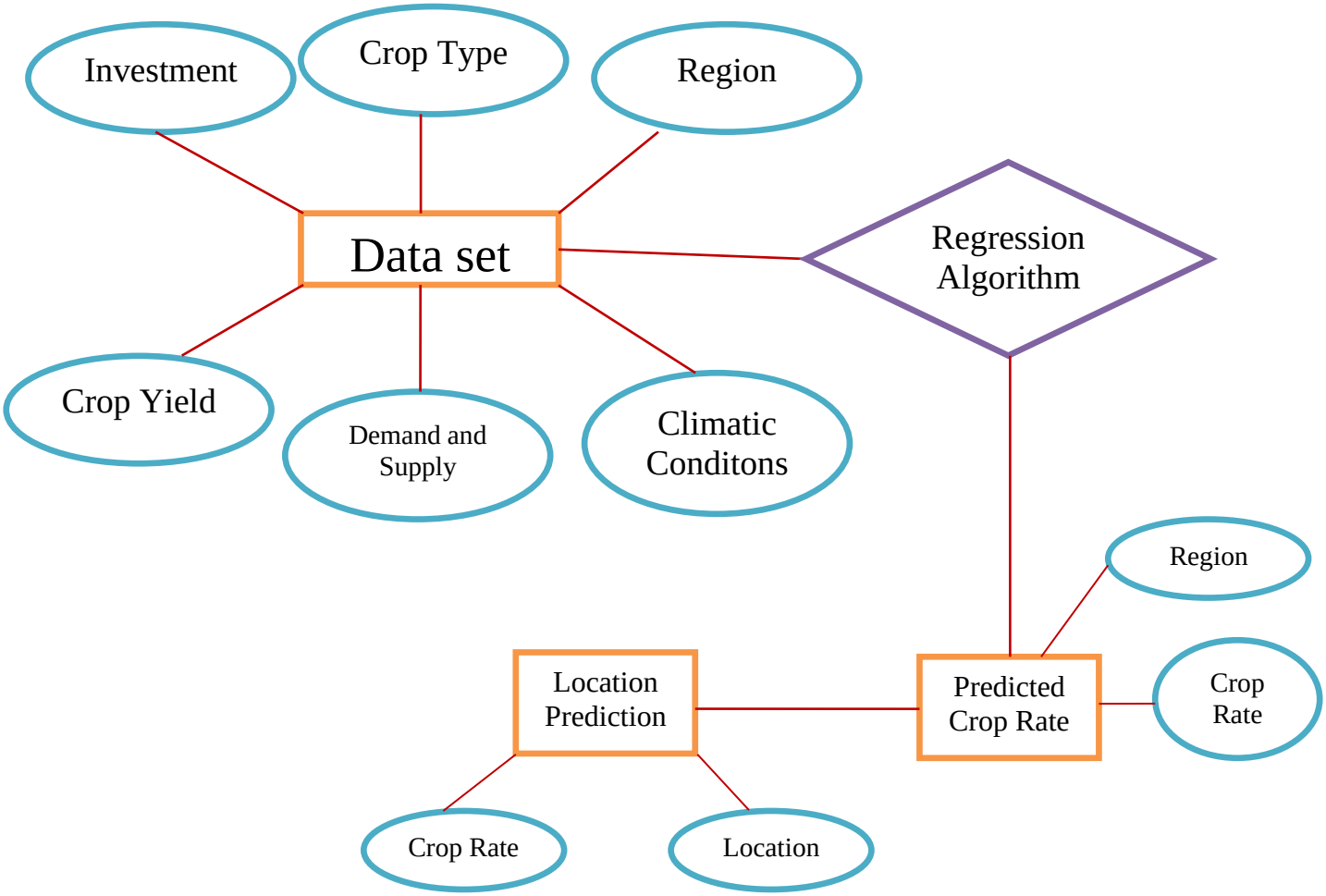

Fig 4.3: ER Diagram

CHAPTER 5
IMPLEMENTATION & TESTING

Project implementation is the phase where visions and plans become reality. This is the logical conclusion, after evaluating, deciding, visioning, planning, applying for funds and finding the financial resources of a project. Technical implementation is one part of executing a project.

Testing is the process of evaluating a system is the intent to find whether it satisfies the specified requirements or not. In simple words, testing is executing a system in order to identify any gaps, errors, or missing requirements in contrary to the actual requirements.

5.1 Input

The main input to the project is data table which consists of attributes like cultivation cost1, cultivation cost2, yield, production rate, rainfall and predicted price for different types of crops in the different states of India which are trained using Regression algorithm in Spyder console of Python version 3.7.

A1 State

	A	B	C	D	E	F	G	H	I
1	State	Crop	CostCultivation	CostCultivation2	Production	Yield	Temperature	RainFall Annual	Price
2	Uttar Pradesh	ARHAR	9794.05	9800.25	1941.55	9.83	28.96	3373.2	19589.1
3	Karnataka	ARHAR	10593.15	10594.15	2172.46	7.47	29.22	3520.7	21187.3
4	Gujarat	ARHAR	13468.82	13469.82	1898.3	9.59	28.47	2957.4	26938.64
5	Andhra Pradesh	ARHAR	17051.66	17052.66	3670.54	6.42	28.49	3079.6	34104.32
6	Maharashtra	ARHAR	17130.55	17131.55	2775.8	8.72	28.3	2566.7	34262.1
7	Maharashtra	COTTON	23711.44	23712.44	2539.47	12.69	28.73	2534.4	47423.88
8	Punjab	COTTON	29047.1	29048.1	2003.76	24.39	28.65	3347.9	58095.2
9	Andhra Pradesh	COTTON	29140.77	29141.77	2509.99	17.83	28.83	3576.4	58282.54
10	Gujarat	COTTON	29616.09	29617.09	2179.26	19.05	28.38	2899.4	59233.18
11	Haryana	COTTON	29918.97	29919.97	2127.35	19.9	28.53	2687.2	59838.94
12	Rajasthan	GRAM	8552.69	8553.69	1691.66	6.83	28.62	2960.5	17106.38
13	Madhya Pradesh	GRAM	9803.89	9804.89	1551.94	10.29	28.95	2365.8	19608.78
14	Uttar Pradesh	GRAM	12833.04	12834.04	1882.68	10.93	28.67	2957.8	25667.08
15	Maharashtra	GRAM	12985.95	12986.95	2277.68	8.05	28.66	2741.3	25972.9
16	Andhra Pradesh	GRAM	14421.98	14422.98	1559.04	16.69	28.94	2937.5	28844.96
17	Karnataka	GROUNDNUT	13647.1	13648.1	3484.01	4.71	28.82	2612.4	27295.2
18	Andhra Pradesh	GROUNDNUT	21229.01	21230.01	2554.91	11.97	28.11	3275	42459.02
19	Tamil Nadu	GROUNDNUT	22507.86	22508.86	2358	11.98	28.66	2352.1	45016.72
20	Gujarat	GROUNDNUT	22951.28	22952.28	1918.92	13.45	28.66	2943.2	45903.56
21	Maharashtra	GROUNDNUT	26078.66	26079.66	3207.35	9.33	28.76	2606.4	52158.32
22	Bihar	MAIZE	13513.92	13514.92	404.43	42.95	28.86	3554.2	27028.84
23	Karnataka	MAIZE	13792.85	13793.85	581.69	31.1	28.8	2357.7	27586.7
24	Rajasthan	MAIZE	14421.46	14422.46	658.77	23.56	28.74	2442.9	28843.92
25	Uttar Pradesh	MAIZE	15635.43	15636.43	1387.36	13.7	28.8	2480.5	31271.86
26	Andhra Pradesh	MAIZE	25687.09	25688.09	840.58	42.68	28.67	3282.2	51375.18
27	Orissa	MOONG	5483.54	5484.54	2614.14	3.01	28.7	2442.9	10968.08
28	Rajasthan	MOONG	6204.23	6205.23	2068.67	4.05	28.59	2998.3	12409.46
29	Karnataka	MOONG	6440.64	6441.64	5777.48	1.32	28.98	2926.6	12882.28

Fig 5.1: Input table of subsidy rate

Code:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
def estimate_coef(x, y):
    # number of observations/points
    n = np.size(x)
    # mean of x and y vector
    m_x, m_y = np.mean(x), np.mean(y)
     # calculating cross-deviation and deviation about x
    SS_xy = np.sum(y*x) - n*m_y*m_x
    SS_xx = np.sum(x*x) - n*m_x*m_x
    # calculating regression coefficients
    b_1 = SS_xy / SS_xx
    b_0 = m_y - b_1*m_x
    return(b_0, b_1)
def plot_regression_line(x, y, b):
    # plotting the actual points as scatter plot
    plt.scatter(x, y, color = "m", marker = "o", s = 30)
    # predicted response vector
    y_pred = b[0] + b[1]*x
   # plotting the regression line
    plt.plot(x, y_pred, color = "g")
    # putting labels
    plt.xlabel('x')
    plt.ylabel('y')
    # function to show plot
    plt.show()

def main():

    #Training Part
    df = pd.read_csv('Subsidy.csv')
    X = df['State'].values
    Y = df['Price'].values
```

```
    print(X)
    print(Y)
    #End

    # observations
    x = np.array(X)
    y = np.array(Y)

    # estimating coefficients
    b = estimate_coef(x, y)
    print(b[0], b[1])

    # plotting regression line
    plot_regression_line(x, y, b)

if __name__ == "__main__":
    main()
```

5.2 Output

The tables are trained using Regression algorithm in Spyder console of Python version 3.7. A Graphical User Interface is also made such that the output subsidy rates with the crop area of cultivation and price and recommended area for selling the crops are shown.

For determining the Subsidy rate the Linear regression mode is used such that the mean function is calculated for the attributes and temperature attribute is neglected because in calculating subsidy price it is not contributing and not so helpful.

```python
import pandas as pd
import numpy as np
from sklearn import linear_model

df = pd.read_csv("Subsidy.csv")
print(df)
reg = linear_model.LinearRegression()
reg.fit(df[['CostCultivation','CostCultivation2','Production','Yield','RainFall Annual']],df.Price)
Coff = reg.coef_

Inter = reg.intercept_
M1 = Coff[0]
M2 = Coff[1]
M3 = Coff[2]
M4 = Coff[3]

gg = ((M1*171.55)+(M2*170.66)+(M3*36.54)+(M4*0.42)+Inter)
print(gg)
```

Fig 5.2: Logic for linear regression

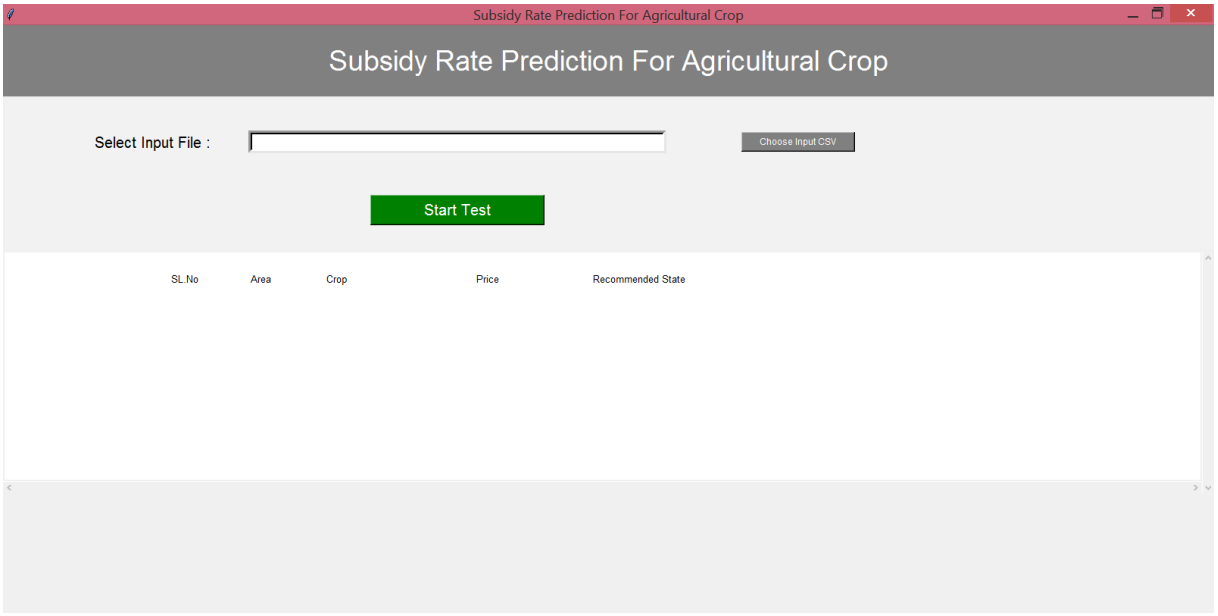

Fig 5.3: GUI of the project

A1 State

	A	B	C	D	E	F	G	H
1	State	Crop	CostCultivation	CostCultivation2	Production	Yield	Temperature	RainFall Annual
2	Uttar Pradesh	ARHAR	17650	17665	3550	9.83	28.96	2687
3	Karnataka	ARHAR	755	754	251	0.19	29.22	1050.55
4	Gujarat	ARHAR	13468.82	13469.82	1898.3	9.59	28.47	2957.4
5	Andhra Pradesh	ARHAR	17051.66	17052.66	3670.54	6.42	28.49	3079.6
6	Maharashtra	ARHAR	17130.55	17131.55	2775.8	8.72	28.3	2566.7
7	Maharashtra	COTTON	23711.44	23712.44	2539.47	12.69	28.73	2534.4
8	Punjab	COTTON	29047.1	29048.1	2003.76	24.39	28.65	3347.9
9	Andhra Pradesh	COTTON	29140.77	29141.77	2509.99	17.83	28.83	3576.4
10	Gujarat	COTTON	29616.09	29617.09	2179.26	19.05	28.38	2899.4
11	Haryana	COTTON	29918.97	29919.97	2127.35	19.9	28.53	2687.2
12	Rajasthan	GRAM	8552.69	8553.69	1691.66	6.83	28.62	2960.5
13	Madhya Pradesh	GRAM	9803.89	9804.89	1551.94	10.29	28.95	2365.8
14	Uttar Pradesh	GRAM	12833.04	12834.04	1882.68	10.93	28.67	2957.8
15	Maharashtra	GRAM	12985.95	12986.95	2277.68	8.05	28.66	2741.3
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17	Karnataka	GROUNDNUT	13647.1	13648.1	3484.01	4.71	28.82	2612.4
18	Andhra Pradesh	GROUNDNUT	21229.01	21230.01	2554.91	11.97	28.11	3275
19	Tamil Nadu	GROUNDNUT	22507.86	22508.86	2358	11.98	28.66	2352.1
20	Gujarat	GROUNDNUT	22951.28	22952.28	1918.92	13.45	28.66	2943.2
21	Maharashtra	GROUNDNUT	26078.66	26079.66	3207.35	9.33	28.76	2606.4
22	Bihar	MAIZE	13513.92	13514.92	404.43	42.95	28.86	3554.2
23	Karnataka	MAIZE	13792.85	13793.85	581.69	31.1	28.8	2357.7
24	Rajasthan	MAIZE	14421.46	14422.46	658.77	23.56	28.74	2442.9
25	Uttar Pradesh	MAIZE	15635.43	15636.43	1387.36	13.7	28.8	2480.5
26	Andhra Pradesh	MAIZE	25687.09	25688.09	840.58	42.68	28.67	3282.2
27	Orissa	MOONG	5483.54	5484.54	2614.14	3.01	28.7	2442.9
28	Rajasthan	MOONG	6204.23	6205.23	2068.67	4.05	28.59	2998.3
29	Karnataka	MOONG	6440.64	6441.64	5777.48	1.32	28.98	2926.6

Test2

Fig 5.4: Test data table.

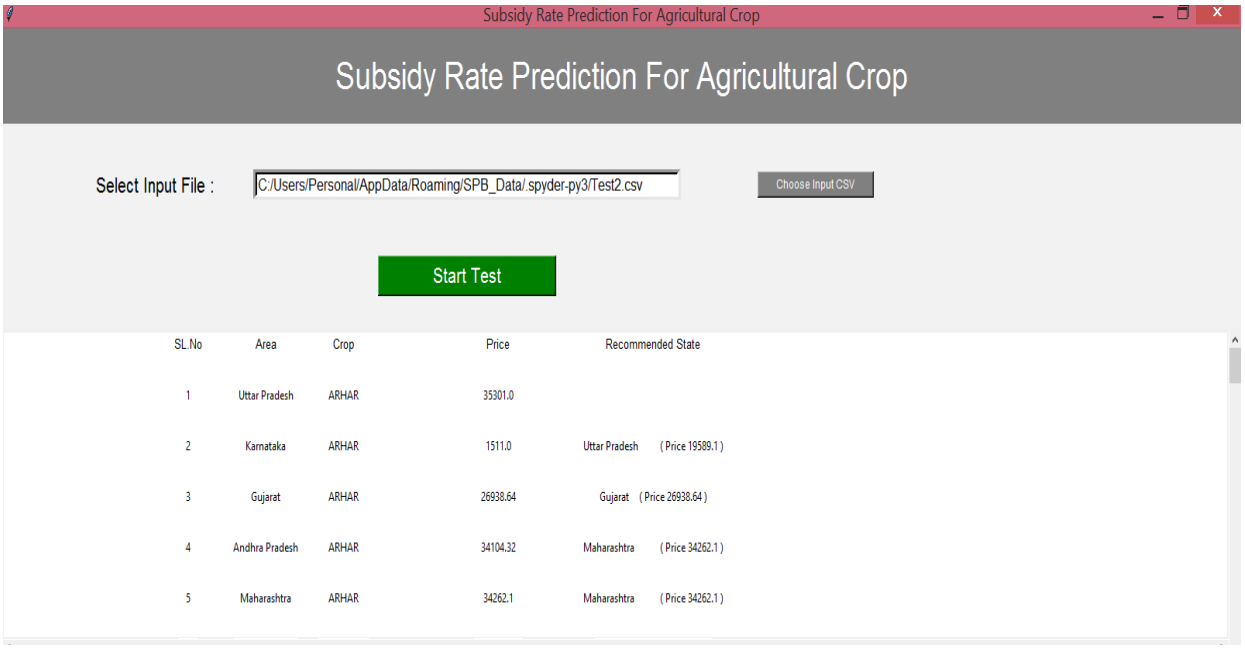

Fig 5.5: Final Output.

5.3 Testing

The purpose of testing is to discover errors. Testing is the process of trying to discover every conceivable fault or weakness in a work product. It provides a way to check the functionality of components, sub-assemblies, assemblies and/or a finished product.

It is the process of exercising software with the intent of ensuring that the Software system meets its requirements and user expectations and does not fail in an unacceptable manner. There are various types of test. Each test type addresses a specific testing requirement.

5.3.1 Unit Testing

Unit testing is a level of software testing where individual units/components of software are tested. The purpose is to validate each unit's performance in the software. In this Project the data components of the project like State, cultivation cost 1,cultivation cost 2, yield, cost of production, rainfall are tested such that no random and noise values are present.

5.3.2 Integration Testing

Integration testing is a level of software testing where individual units are combined & tested as a group. The purpose of this level is to expose faults in the interaction between integrated units.

There are two types of approaches in the integrated testing i.e., Top down and bottom Up

Top down

It is an approach to integration testing where top level units are tested first. Firstly datasets pre-processing along with the training model then it is checked with the help of the given code. After that the predictions are made based on the data values and predicted rate for the crop is checked with the ground level and previous rates for checking the correctness.

Bottom up

Bottom up is an approach to integration testing where bottom levels units are tested first and upper level of units step by step after that. Firstly the testing data is used for processing the given query and then the training model is verified with the help of code based on the query results. Then according to the results, pre-processing can be done.

5.3.3 Functional Testing

It is type of software testing where by the system is tested against the functional requirements/specifications.

Functions are tested by feeding them input and examining the output. Functional testing ensures that the requirements of data attributes like State, cultivation cost 1,cultivation cost 2, yield, cost of production, rainfall are properly satisfied by the application. This type of testing is not concerned with the attributes but rather checks with the results of processing. So, it tries to execute the test cases and compare the predicted rates with the old values and check the accuracy.

5.3.4 Black box Testing

Black box testing is also known as behavioral testing, is a software testing method in which the internal structure of item being tested is known to the tester. In this project the main logic of Linear Regression plot is checked for the training data.

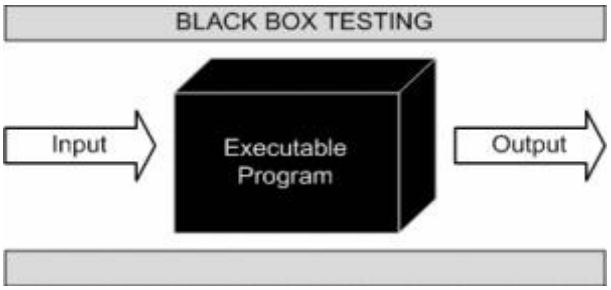

Figure 5.6: Black box testing

5.3.5 White box Testing

White box testing is a software testing method in which the internal structure of the item is known to the tester. The tester chooses input attributes which contribute more in case of prediction of rate and expel the values like temperature which is not suitable to exercise paths through the code and determines the predicted rate accurately.

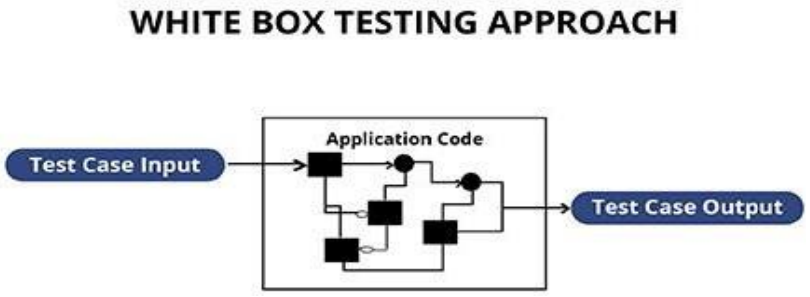

Figure 5.7: White box testing

CHAPTER 6
CONCLUSION AND FUTURE ENHANCEMENT

6.1 Conclusion

According to the survey in the year 2018, the average death rate of farmers is more than 10 suicides per day. The main reason for suicide is that the government is not providing subsidy rate for the farmers. This project helps in predicting the subsidy rate for the crop which results in getting higher profits for farmers. The project predicts the price of the crop with minimum profit of 50% which is very much useful. The high income results in giving a comfortable and a happy life to the farmer which intern develops the National Integrity.

6.2 Future Enhancement

This project also can be developed into an app such that easily available to all the farmers. The efficiency and accuracy of the result can be increased using the attributes in input data like demand supply rate, Market statistical analysis, Stock exchange etc. Which are dynamic data changes on daily basis. There can be developed a cloud server such that the data modifications are done on the basis of need.

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