Statistical Data Analysis: Bi-variate Data Analysis Project

Exploring the impact of temperature and precipitation on Crop Net Revenue

Bushra Naeemi

American University of Afghanistan

Instructor: Asadullah Jawid

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Contents

1   Introduction

This Project is about finding the relationship or impact of temperature and rainfall on crop net revenue for the month of April by using correlation, co-variance, statistics, and graphical representations.

2   Methodology

Measures of Central Tendency: Mean
Dispersion: Standard Deviation and Range
Distribution: Skewness and Kurtosis
Data tabulation: Tables for organizing data.
Co-variance
Correlation
Linear Model: Intercept and slope.
Summary: R-squared.
Graphical methods:
........Histogram
........Boxplot
........Density plot
........Scatter plot

3 Results and Discussions

3.1 Descriptive Statistics of Variables

Variables	Mean	S.Deviation	Min	Max	Skewness	Kurtosis
Temperature	4.73	3.00	0.22	11.51	0.26	-1.10
Rainfall	60.02	27.84	28.93	123.62	0.85	-0.68
Income(no.outlier)	78369.58	287632.55	-951500.00	7089500.00	14.15	279.70

3.1.1 Temperature in April:
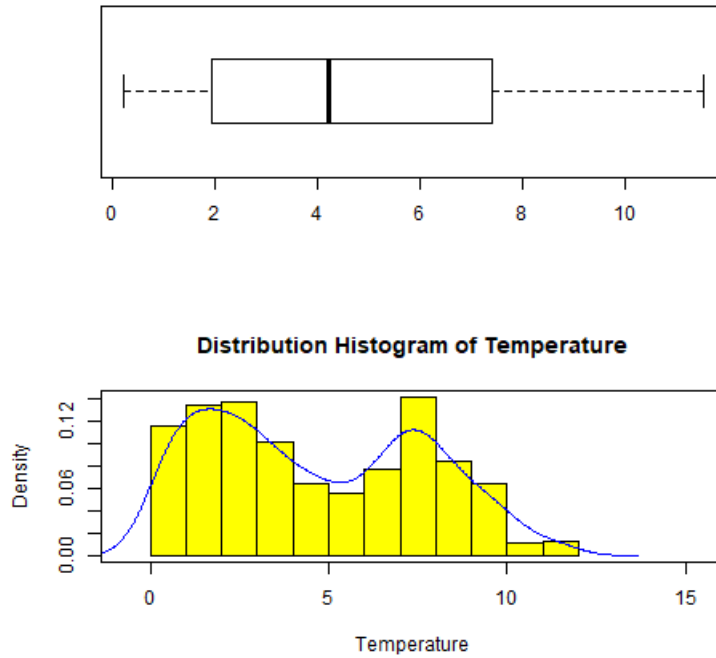

Distribution Histogram of Temperature

Figure 1: Distribution Graphs of Temperature

Conclusion: The average temperature in April ins 4.73 degrees, it's standard deviation is 3.00. which shows the distance of every variable to the mean and shows the distribution of temperature data. It's value is between the range of 0.22 and 11.51. The more the value of skewness departs from zero (in either directions), the more the distribution is getting skewed (to the left (long tail at the left), or right(long tail to the right)). So our data is close to normal and a little skewed to the right side. The value of kurtosis

-1.10, indicates lighter tails than normal (thinner than normal) (See Figure 1)
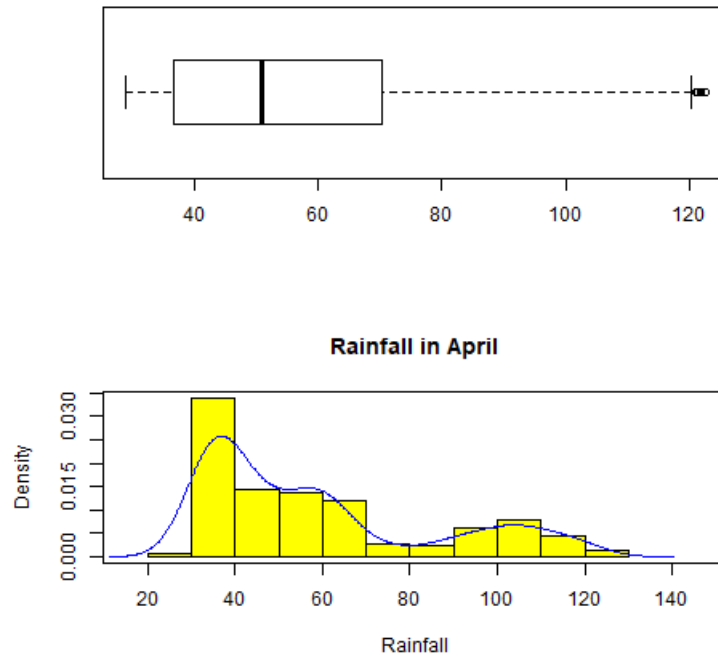
3.1.2 Rainfall in April:

Figure 2: Distribution Graphs of Rainfall

Conclusion: The average rainfall in April is 60.02, standard deviation is 27.84. It's rage is between 28.93 and 123.62. the skewness value 0.85 shows that the graph is skewed to the right side, the kurtosis value -0.68 shows that it is lighter tail than normal.(See Figure 2)

3.1.3 Crop Net Income of Farms in April:

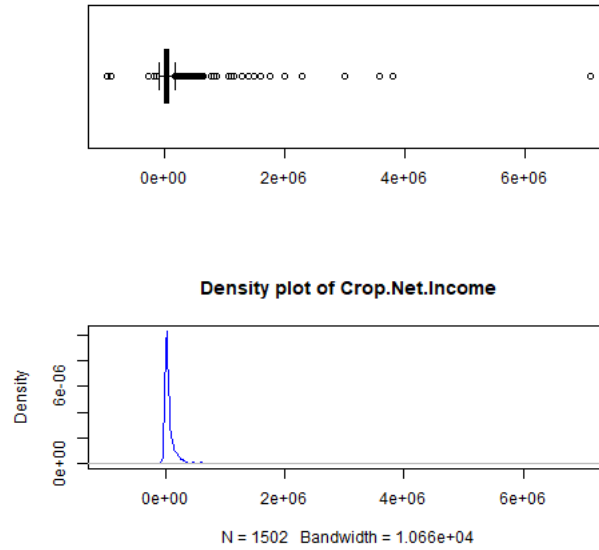**Density plot of Crop.Net.Income**

Figure 3: Distribution of crop net income with outliers

Note: The Crop Net Income has a large number of outliers that should be removed from the data, to make effective conclusions.
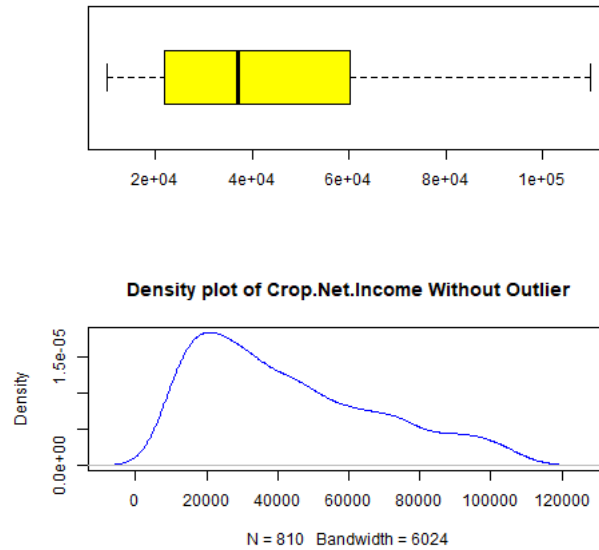
Density plot of Crop.Net.Income Without Outlier

Figure 4: Distribution of crop Net Income Without Outliers

6

Conclusion: This is the graphs of crop net income without outliers, now the mean can be considered as central point for this graph. The average of crop net income in April is 78369.58, with standard deviation of 287632.55. It's range is between -951500.00 to 7089500.00. the skewness value 14.15 shows that the data has been skewed to the right side, and the kurtosis of 279.70 shows that the graph has heavier tails than normal or it is flatter than normal. (See figure 4)

3.2 Bi-Variate Statistical Data Analysis

3.2.1 Association of Temperature and Crop Net Income in April

Table 1: Results of Temperature and Crop Net Income in April

Variables	Co-variance	Correlation	Linear Model Intercept/Slope	R-Squared
Temperature/C.income	1001.831	0.0128	42494.7 /106.6	0.0001637

Co-variance: Co-variance of temperature and crop net income is 1001.831, the positiveness of co-variance shows the positive linear relationship. When one variable increases/decreases the second variable does too.

Correlation: The correlation of temperature and crop net income is 0.0128, so their relationship is weak, and don't have so much impact on each other.

Linear Model:

The positive slope of 106.6 shows that crop net income is dependent upon temperature. For every unit of increase in temperature, crop net income is expected to increase by 106.6 units.

R-Squared: The value of 0.0001637 means that 0.01% of the crop net income(dependent variable) is explained or effected by temperature(independent variable).
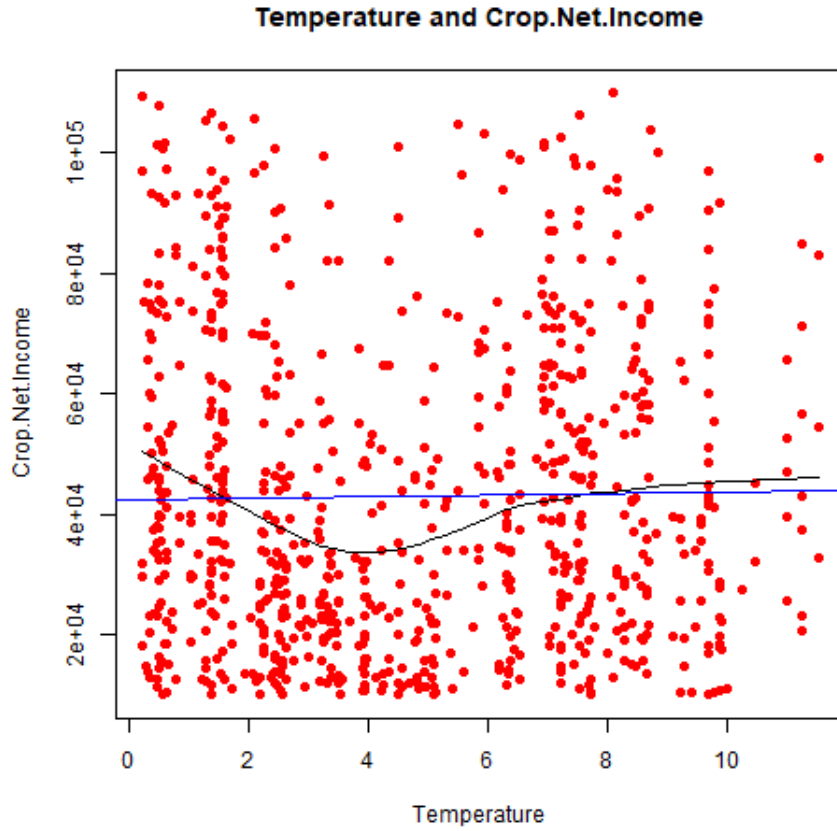
Figure 5: Association of Temperature and Crop Net Income in April

Conclusion: We can see from scatter plot that both temperature, and crop net income increases in relation to on another, which is positive slightly rising linear line in our graph.The correlation of 0.0128 shows a weak positive relationship between temperature and crop net income. (See figure 5)

3.2.2 Association of Rainfall and Crop Net Income in April

Table 2: Association of Rainfall and Crop Net Income

Variables	Co-variance	Correlation	Linear Model Intercept/Slope	R-Squared
Rainfall/Income	-197568.1	-0.291143	59404/-280	0.08476

Co-variance: Co-variance of rainfall and crop net income is -197568.1, the negativeness of co-variance shows the negative linear relationship. When one variable increases the second variable decreases and vice versa.

Correlation: The correlation of temperature and crop net income is -0.291143, so their relationship is weak because it's between the range of -0.5 and 0.5. And have 29% impact on each other.

Linear Model:

The negative slope of -280 shows that crop net income is dependent upon rainfall. For every unit of increase in rainfall, crop net income is expected to decrease by -280 units.

R-Squared: The value of 0.08476 means that 8.4% of the crop net income is explained by rainfall.
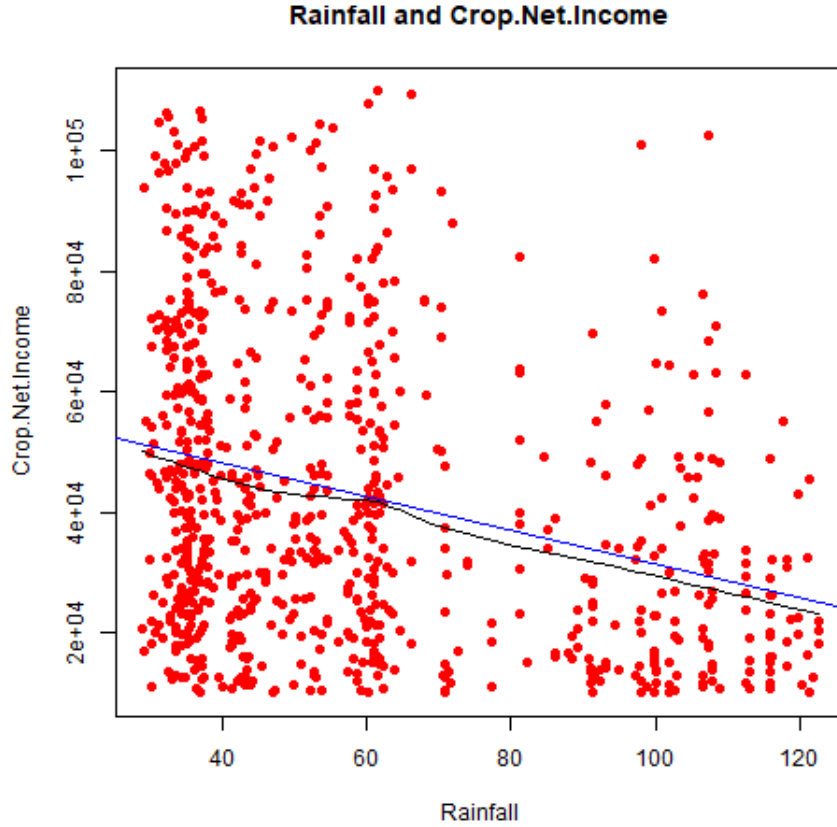
Rainfall and Crop.Net.Income

Figure 6: Association of Rainfall and Crop Net Income

Conclusion: The negative correlation of -0.291143 shows a weak negative linear relationship among rainfall and crop net income. Means that 0.29% of variation in crop net income is explained by rainfall. By increase of rainfall crop net income decreases.(See figure 6)

4 Summary

Summary:
Our data is about finding the relationship between temperature, rainfall, and crop net income. As we can see temperature and crop net income have direct linear relation, by increasing in the value of temperature, the crop net income increases too. It means the more the temperature the more revenue farmers make. But the impact of temperature is very less on income. But

the relationship of rainfall and crop net income is indirect. The more the rainfall the less the income of farm. But still it doesn't have a lot of impact on income. 0.29% of variation in crop net income is explained by rainfall.