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A STUDY OF THE IMPACT OF CLIMATE CHANGE ON RUBBER PRODUCTION IN OGAN KOMERING ULU REGENCY

by
Paulus Wisma Hadi[1], Yetty Oktarina[2], Yunita Sari[3], Fifian Permata Sari[4], Dadang Kurnia[5]
[1]Student of Agricultural Economic Study Program University of Baturaja
[2, 3,4,5]Lecturer of Agricultural Economic Study Program University of Baturaja
Email: [1]wismo7347@gmail.com, [4]fifianpermatasari@gmail.com

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ABSTRACT
This study examines the impact of climate change, especially rainfall on rubber production in OKU Regency. The research method used in this study is the library method using rainfall data for 2010-2020 and rubber production data for OKU Regency. This research was conducted intentionally in OKU Regency considering that the majority of OKU people cultivate rubber as their main livelihood. The study was conducted in March 2022. The research data were analyzed using multiple regression analysis to analyze the impact of climate to rubber production in OKU Regency. Based on the results of the study with the regression analysis shows that each climate element has a significant effect on rubber production. By looking at this conclusion, the authors made observations in the field to prove the test results in the regression analysis carried out. Based on observations in the field, an increase in rainy days with low intensity can cause the loss of tapping days which is influenced by wet tapping paths so that tapping is not possible.

Corresponding Author:
Paulus Wisma Hadi
Agricultural Economic Study Program, Post Graduate Program
University of Baturaja
Ki Ratu Penghulu Street Baturaja City of OKU District
Email: wismo7347@gmail.com

1. INTRODUCTION

One of the impacts of climate change is the delay in the start of the rainy season and the lengthening of the dry season. Shifts in rainfall patterns greatly affect agricultural resources and infrastructure, shifts in park time, seasons and cropping patterns, and land degradation. There is a tendency to shorten the rainy season and increase rainfall in the southern part (Java and Bali) resulting in changes in the beginning and duration of the rainy season. This condition makes it difficult to increase the planting index (IP) if it is not followed by the development of early maturing varieties, rehabilitation, and development of irrigation networks. The delay in the start of the rainy season for 30 days can reduce rice production in West Java and Central Java by 6.5% and in Bali by 11% from normal conditions. On the other hand, in the northern part (Sumatra and Kalimantan) there is a tendency to extend the rainy season with a lower intensity, resulting in a lengthening of the growing season and an increase in IP. However, land productivity in Sumatra and Kalimantan is not as good as in Java.

With the decline in agricultural productivity, research on the impact of climate change on the agricultural sector, especially in South Sumatra is considered very important, it is based on the South Sumatra region which is an area that has potential in the agricultural sector, especially in the plantation sub-sector. One of the areas with a fairly large number of plantations is the one in Ogan Komering Ulu Regency with an area of 99,100 Ha or 27.39% which are smallholder plantations, large plantations and smallholder plantations with superior commodities such as oil palm, rubber, coffee and annual crops. Judging from the trend of rainfall in Ogan Komering Ulu Regency which is up and down, of course it will have an impact on agricultural productivity. In general, Ogan Komering Ulu Regency has a tropical and wet climate with temperatures varying between 22ºC to 34ºC. The further north, the higher the air temperature (the hotter). Ogan Komering Ulu Regency is an area with high rainfall > 3,500 mm/year. Basically,

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climate change in Ogan Komering Ulu (OKU) Regency cannot be seen significantly through the 10-year climate change data, namely 2011-2021 with temperatures between 22-34oC, the changes that occur can be seen from the decreased and uneven rainfall.
Average rainfall in OKU Regency can be seen in Figure 1 below:

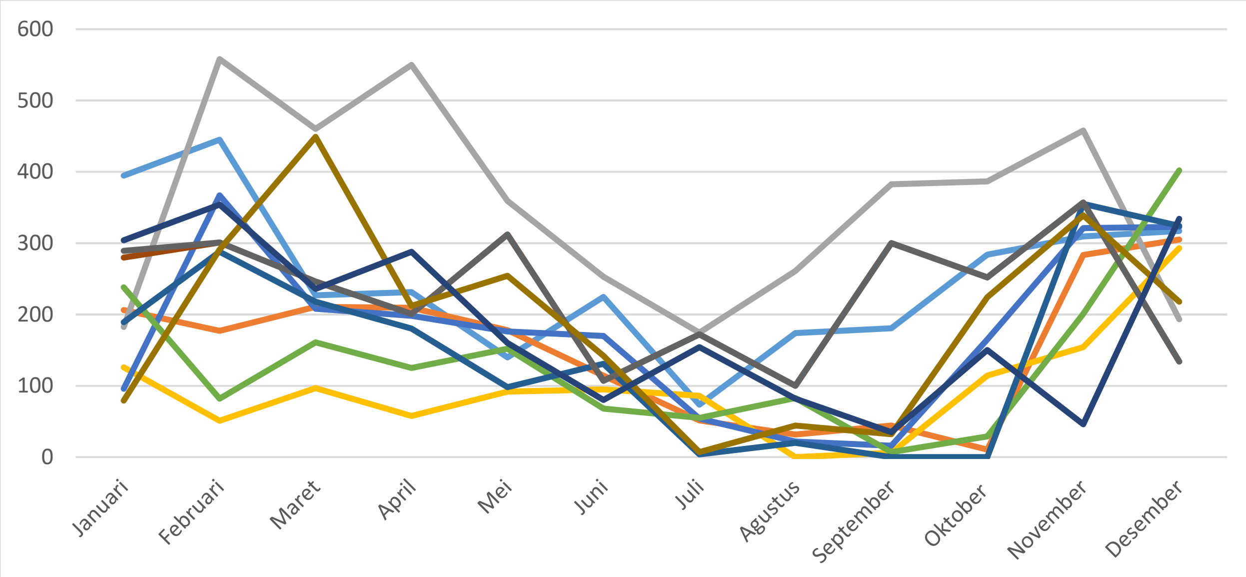

Figure 1. Average rainfall in OKU Regency (2011-2021).

Climate change causes an increase in temperature, which will eventually have an impact on the agricultural sector as well as on humans themselves. The vulnerability of the agricultural sector to climate change can be defined as the level of powerlessness of a farming system in maintaining and saving its productivity level optimally in the face of climate change stress. Basically, vulnerability is dynamic in line with technological reliability, socio-economic conditions, natural resources and the environment. Vulnerability is influenced by the level of exposure (exposure) to hazards and adaptive capacity as well as the dynamics of the climate itself. Impact is the level of loss conditions, both physically, product, and socially and economically caused by the stress of climate change.

Technically, vulnerability is closely related to land use systems and soil properties, cropping patterns, soil, water and plant management technology, and plant varieties (Las., et al, 2008b). The three main factors related to global climate change, which have an impact on the agricultural sector are: (1) changes in rainfall patterns and extreme climates (floods and droughts), (2) rising air temperatures, and (3) rising sea levels. Extreme climatic events, among others, cause: (a) crop and crop failure, a decrease in IP which leads to a decrease in productivity and production; (b) damage to agricultural land resources; (c) increased frequency, area, and weight/intensity of drought; (d) increased humidity; and (e) an increase in the intensity of disturbance of plant pest organisms (OPT) (Las, et al., 2008).

One of the important agricultural commodities for the Indonesian economy and is strongly influenced by climate conditions and rainfall is rubber. In general, the agro-climate in Indonesia is very suitable for the growth of rubber plants, so it is widely cultivated and managed in almost all parts of Indonesia. Rubber plant is a tropical rain forest plant originating from the Amazone basin (South America). The area of origin of the rubber plant is located at 150 equators, with a wet climate characterization, rainfall of 2000 – 4000 mm per year which is distributed in 100 – 150 rainy days per year. The average temperature is around 280C, with a maximum daily variation of 7oC and the duration of sunlight is around 2000 hours per year, or 6 hours per day in all seasons. The impact of climate change, especially La Nina, is the disruption of flowering so that seed production will decrease. Rubber seed source gardens use seeds as rootstock so that production capacity will be reduced..

The most prominent production of smallholder plantations in OKU Regency is rubber. Rubber plantations are a source of livelihood for most of the people in OKU Regency and are OKU's main commodity to date. Rubber production in OKU Regency has decreased from 132,380 tons in 2019 to 71,042 tons in 2020. The decline in rubber production numbers indicates problems including a decrease in the amount of rubber latex due to high rainfall in

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2020. Climate change includes increasing temperatures, rainfall and drought. can inhibit the growth of rubber plants, extend the period of immature plants (TBM), reduce yields, and increase the potential for dry tapping grooves (KAS). Weather anomalies can also cause excessive rainfall which can disrupt harvesting activities, cause yield losses and increase leaf and root disease attacks. Another threat is the evolution of weeds to become more aggressive and difficult to control.

In a study conducted on the impact of climate change on the productivity of rubber plants in India, which was stated by Siregar in his book Cultivation and Rubber Technology in 2012, showing the effect of climate change. expressed in the results obtained based on multiple regression calculations between rubber crop production and factors Climate change factors which include temperature, humidity, duration of irradiation and rainfall. The high rainfall and climate change as well as marked by a decrease in rubber production in OKU Regency are of course an interesting thing to study further. This study examines the impact of climate change, especially rainfall on rubber production in OKU Regency.

2. RESEARCH METHOD

The research method used in this study is the library method using rainfall data for 2010-2020 and rubber production data for OKU Regency. This research was conducted intentionally in OKU Regency considering that the majority of OKU people cultivate rubber as their main livelihood. The study was conducted in March 2022. The research data were analyzed using multiple regression analysis to analyze the impact of climate to rubber production in OKU Regency.

3. RESULTS AND ANALYSIS

3.1. Impact of Climate Change on Rubber Plants

To analyze the impact of climate change in Ogan Komering Ulu Regency on rubber plants, the first step is to determine the dependent and independent variables. The dependent variable, here in after referred to as the Y variable, is the production of rubber plants in Ogan Komering Ulu Regency. While the independent variable in this study is the variable X which is divided into X1 (temperature), X2 (humidity), X3 (rainfall), X4 (number of rainy days), X4 (wind speed), X5 (length of irradiation).

Table 1. Dependent and undependent variable in analysis

Year	Temperature (ºC)	Humidity (%)	Rainfall (mm)	Number of rainy days (day)	Wind speed (km/hour)	Length of irradiation (%)	Production (ton)
	X1	X2	X3	X4	X5	X6	Y
2011	27,20	84,75	2592,8	217	2,6	648	64240,94
2012	27,40	82,57	3083	194	3	690	70135,55
2013	27,00	84,5	3380	238	4	582	67468,00
2014	27,20	87	1651	187	4,3	534	52447,47
2015	27,70	79	2032,5	169	3,5	510	52382,67
2016	27,80	83	3490,3	201	2,8	473	52447,00
2017	27,50	83,7	2684,4	214	3,5	623,5	43315,50
2018	27,46	87,57	2532,7	207	3,73	567,62	43320,00
2019	27,80	85,9	2915	175	3,9	557	132380,00
2020	29,10	79	2628,6	239	1,59	525	71042,00
2021	29,10	78,5	2598,2	239	2,9	430	73378,00

Source: Primary Data (2022)

3.2. Multiple Regression Analysis

a. Simultaneous Test (Effect of all variables)

The climate elements studied were temperature (X_1), humidity (X_2), rainfall (X_3), number of rainy days (X_4), wind speed (X_5), duration of irradiation (X6). The effect of climate elements on rubber production in Ogan Komering Ulu Regency obtained the equation

$Y= - 1.50 + 45503.29\ X_1 + 2380.76\ X_2 + 22.37\ X_3 -4\ 61.50\ X_4 + 17159.79\ X_5 + 165.52\ X_6$.

Based on the results of the analysis, it was also obtained that the calculated F value was smaller than F table (0.660 < 5.05), and had a significance greater than (0.691 > 0.050), so H1 was accepted. This means that simultaneously, the independent variables, namely temperature (X_1), humidity (X_2), rainfall (X_3), number of rainy days (X_4), wind speed (X_5), duration of irradiation (X_6) significantly affect the Y variable (production).

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The magnitude of the contribution of the independent variable simultaneously to the dependent variable, based on the results of calculations carried out with a determination value (R square) of 0.498. These results explain the contribution or contribution of the independent variables of temperature (X_1), humidity (X_2), rainfall (X_3), number of rainy days (X_4), wind speed (X_5), duration of irradiation (X_6) which are included in the regression equation. the Y variable (production) is 49.8% while the other 50.2% is contributed by other variables that are not included in the equation.

b. Partial Test Analysis (Influence of Each)

Based on the results of the analysis, it was found that:

• Variable X_1 (temperature) has a significant effect on variable Y (production). It can be seen from the statistical t test with tcount < ttable (0.167 < 2.57058) and the significant value of t is greater than (0.167 > 0.050). This test shows that the decision that H_1 is accepted is that there is a real influence between temperature and production.

• Variable X_2 (humidity) has a significant effect on variable Y (production). It can be seen from the statistical t test with tcount < ttable (0.558 < 2.57058) and the significant value of t is greater than (0.606 > 0.050). This test shows that the decision that H_1 is accepted is that there is a real effect between humidity on production.

• Variable X_3 (rainfall) has a significant effect on variable Y (production). It can be seen from the statistical t test with tcount < ttable (1,238 < 2,57058) and the significant value of t is greater than (0.283 > 0.050). This test shows the decision that H_1 is accepted, that is, there is a real influence between rainfall on production.

• Variable X_4 (number of rainy days) has a significant effect on variable Y (production). It can be seen from the statistical t test with tcount < ttable (1.086 < 2.57058) and the significant value of t is greater than (0.339 > 0.050). This test shows the decision that H_1 is accepted, that is, there is a real influence between the number of rainy days on production.

• Variable X_5 (wind speed) has a significant effect on variable Y (production). It can be seen from the statistical t test with t count < t table (0.861 < 2.57058) and the significant value of t is greater than (0.438 > 0.050). This test shows that the decision that H_1 is accepted is that there is a real influence between wind speed on production.

• Variable X_6 (length of irradiation) has a significant effect on variable Y (production). It can be seen from the statistical t test with tcount < t table (0.932 < 2.57058) and the significant value of t is greater than (0.404 > 0.050). This test shows that the decision that H_1 is accepted is that there is a real effect between the length of irradiation on production.

4. CONCLUSION

Based on the results of the study with the regression analysis shows that each climate element has a significant effect on rubber production. By looking at this conclusion, the authors made observations in the field to prove the test results in the regression analysis carried out. Based on observations in the field, an increase in rainy days with low intensity can cause the loss of tapping days which is influenced by wet tapping paths so that tapping is not possible.

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