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Influence of Climatic Factors on Rainfed Rice Productivity in Sekotong Barat Village

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ABSTRACT: Rainfed rice productivity in Sekotong Barat Village tends to be low and has not shown significant improvement in recent years. This condition is suspected to be influenced by changes in climatic elements such as air temperature, rainfall, humidity, and solar radiation. This study aims to determine: 1) The productivity of rainfed rice in Sekotong Barat Village, 2) The climatic conditions in Sekotong Barat Village, and 3) The climatic factors that affect rainfed rice productivity in the village. The study utilized secondary climate data from 2020 to 2023 and primary productivity data from 30 farmers. The analysis was conducted descriptively and quantitatively using multiple linear regression. The results showed that: 1) Rainfed rice productivity during the 2020-2023 period fluctuated, with a sharp decline in 2023, 2) Climatic conditions consisting of temperature (°C), rainfall (mm), air humidity (%), and solar radiation (%) experienced significant variations during the same period, 3) Statistically, none of the climatic factors had a significant effect-either simultaneously or partially-on rainfed rice productivity; however, temperature showed the most consistent influence in 2021 and 2022. These findings indicate that the rainfed rice farming system in this region is highly vulnerable to climate fluctuations. Therefore, appropriate climate-based adaptation strategies are needed, such as adjusting planting schedules, using climate forecasts, and adopting stress-tolerant rice varieties.

Keywords: Climate, Rice Productivity, Rainfed Rice, West Sekotong

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INTRODUCTION

Climate is one of the main factors influencing the success of the agricultural sector, particularly food crops like rice. Climatic factors such as temperature, rainfall, humidity, and sunlight significantly determine plant growth, pest development, and water availability on agricultural land (Suprapto, 2022), explains that each region has different climate characteristics, which can impact cropping patterns and agricultural productivity. Therefore, understanding the influence of climate on crop yields is crucial for improving agricultural efficiency.

Rice productivity is highly dependent on stable climatic conditions. The optimal temperature for rice growth ranges from 22°C to 30°C. If temperatures are too high, plants can experience heat stress, which inhibits growth and panicle formation. Conversely, temperatures that are too low can also slow down the physiological processes of rice plants (Mirza et al., 2022) Rice productivity, which relies heavily on rainfall as a water source, is becoming more vulnerable to climate variability. In West Sekotong Village, an agricultural region, climate change poses significant challenges for farmers. Phenomena such as irregular rainfall, prolonged dry periods, and rising temperatures beyond the optimal threshold for rice plants can affect the plant's growth phase, from tillering to grain filling (Hidayati & Suryanto, 2015).

Based on data from (BPS NTB 2024) National rice production decreased by 5.1% in 2020 compared to the previous year, largely due to climate anomalies. The Meteorology, Climatology, and Geophysics Agency (BMKG) noted that uneven rainfall and rising air temperatures in several agricultural areas resulted in reduced harvested land area and decreased dry grain yields. On Lombok Island, including West Lombok Regency, the average annual temperature has increased by 0.8°C over the past two decades, contributing to increased evaporation and reduced water availability for plants. Meanwhile, unstable rainfall has caused a 10–15% decrease in rice productivity compared to areas with more stable climate conditions (Tarisa & Dinar Melani, 2022).

According to data from the Central Statistics Agency of West Nusa Tenggara Province, the area of rice fields in West Nusa Tenggara (NTB) reaches approximately 217,000 hectares, with most relying on rain-fed farming. Because water availability depends on rainfall, rice production in this region is heavily influenced by annual climatic conditions. In 2021, rice productivity in NTB was recorded at around 5.2 tons per hectare, but decreased to 4.8 tons per hectare in 2022 due to a longer dry season and erratic rainfall (Ummah, 2022).

Sekotong Barat Village, located in West Lombok Regency, relies on agriculture as one of its primary sources of livelihood. Most farmers in this area rely on rainfall as the primary source of irrigation for their rice fields. However, the region's climate often experiences variations in rainfall and air temperature, which impact rice productivity. During prolonged dry seasons, water availability decreases, disrupting rice growth. Meanwhile, during heavy rainy seasons, rice fields can become waterlogged, negatively impacting plant growth (Ummah, 2019).

In the West Sekotong region, the climate's impact on rice productivity is increasingly evident with increasing incidence of drought. Data from the West Lombok Regency Agriculture Office shows that approximately 106 hectares of rice fields in Sekotong District were affected by crop failure due to insufficient water supply during the 2022 planting season. This was exacerbated by rising air temperatures, averaging 33°C during the day, which accelerated water evaporation and reduced soil moisture, stressing rice plants and reducing yields. These conditions indicate that farmers in West Sekotong face significant challenges in maintaining rice productivity amidst constantly changing climate conditions (Central Statistics Agency of West Lombok, 2024).

Furthermore, humidity also plays a role in determining the success of a rice harvest. High humidity can increase the risk of pests and plant diseases, such as fungi and bacteria that thrive in damp environments (Butarbutar, 2015). This presents a challenge for farmers in West Sekotong Village in maintaining optimal harvest yields. Therefore, understanding the impact of climate on agriculture is crucial to supporting rain-fed rice productivity in the region.

This study aims to determine: 1) Rainfed rice productivity in West Sekotong Village, 2) Determine the climate conditions in West Sekotong Village, and 3) Determine the climate factors that influence rainfed rice productivity in West Sekotong Village. This study is expected to provide recommendations for farmers and local governments in developing more adaptive agricultural strategies. Steps such as the implementation of more efficient irrigation technology, selection of rice varieties suitable for climatic conditions, and ecologically based pest and disease management can be solutions to increase agricultural productivity in the region.

LITERATURE REVIEW

Climate Change

Climate change is the change in the physical condition of the Earth's atmosphere, including temperature and rainfall distribution, which has a broad impact on various sectors of human life (Ministry of Environment, 2001 in LAPAN). According to Law No. 31 of 2009 concerning Meteorology, Climatology and Geophysics, Climate Change is a change in climate caused, directly or indirectly, by human activities that cause changes in the composition of the atmosphere globally and changes in natural climate variability observed over comparable periods of time (Putri, 2015).

Climate change is a change in the pattern and intensity of climate elements over a comparable time period (usually to a 30-year average). Climate change can be a change in average weather conditions or a change in the distribution of weather events relative to the average conditions (Mitigation & Climate, nd).

According to the 2018 BMKG temperature projection for Indonesia from 2020 – 2030, based on the results of multi-model climate projection simulations using economic growth assumptions with the implementation of emission control and green technology (RCP4.5 scenario), the climate in the 2020-2030 period indicates that:

1) The average surface temperature of land areas in Indonesia will be 0.2 - 0.3°C hotter compared to the average air temperature in the period 2005-2015.

2) The areas projected to experience the highest temperature increases are parts of South Sumatra, central Papua and parts of West Papua.

The climate elements that have a major influence on rice growth and production can be explained as follows:

a. Temperature

Air temperature is a crucial environmental factor because it influences the growth process of all plants. Each plant species has different maximum, optimum, and minimum temperature limits for each stage of growth. Air temperature can also be a determining factor in crop production centers, for example, potatoes in low-temperature areas and rice in high-temperature areas (Cahyaningtyas et al., 2018).

Increasing Air temperature in rice plants causes disruption of physiological processes (photosynthesis) and respiration) in plants. The effect of temperature on growth occurs in the plant's respiration process. During respiration, the products of photosynthesis are converted into $CO2$ and $H2O$, so the greater the respiration rate, the lower the plant's growth rate. Therefore, increasing temperature must be controlled (Hosang et al., 2015).

b. Rainfall

Rain is a crucial weather component for the life of organisms on Earth. Rainfall is a climate element that can be used as an indicator in food crop production. Rainfall has a significant impact and is a climate element with high fluctuations. The total rainfall amount is crucial in determining yields, especially as increasing temperatures can reduce yields (Cahyaningtyas et al., 2018).

Rainfall and temperature are crucial climatic elements for life on Earth. A rainfall of 1 mm represents the depth of rainwater that would cover a surface of 1 mm if the water did not soak into the ground or evaporate into the atmosphere (Indrawan et al., 2017). Rice requires 200 mm of rainfall per month. This rainfall is necessary to provide water, especially during the ripening phase. Decreased rainfall will impact rice production at harvest, just as it does with sugarcane. Rainfall affects the water content in the sugarcane stalks, which can reduce yield. Rainfall also significantly impacts sugarcane yield (Rochimah et al., 2015).

c. Humidity

Air humidity is a weather component that plays a crucial role in the stability of life on Earth and other weather elements. Air humidity is often defined as the amount of water vapor in the atmosphere over a specific period of time. The amount of water vapor in the atmosphere remains relatively constant. The higher the humidity, the more water vapor there is in the air, and the clouds will appear overcast (Cahyaningtyas et al., 2018).

Humidity affects evapotranspiration and water availability. Humidity is closely related to temperature, rainfall, and wind. The relationship between air temperature and rainfall provides the basis for climate and plant distribution (Sukartini & Achmad, 2015).

d. Sunshine Duration

The duration of sunshine is the length of time the sun shines on the earth's surface in a period of one day. The period of one day is called the length of the day (the length of time the sun is above the horizon measured in hours). The length of time the sun shines in the daily period varies from month to month (Yuliatmaja, 2015).

Measuring sunshine duration is the oldest type of radiation measurement, but despite this, solar radiation remains a valuable parameter of a location's climate. For example, in agriculture and plantations, sunshine duration influences plant growth. Data on sunshine duration can be used to derive the total flux of solar radiation falling on a horizontal surface at a location (Yuliatmaja, 2015).

Impact of Climate Change on Rice Productivity

(Sukartini & Achmad, 2015) A study aimed to determine the factors influencing rice productivity and to examine whether climate change affects agricultural yields and farmers' decisions to seek new employment. The study found that land area statistically significantly positively influenced rice productivity. Other findings suggest that declining agricultural yields due to climate change may increase the likelihood of farmers wanting to change jobs (Hidayati & Suryanto, 2015).

Previous research on knowledge, attitudes, and skills in the application of agribusiness systems to rice production explains that knowledge, attitudes, and skills have a significant impact on rice production. Research on farmer behavior in rice farming in the Lebak Swamp Land (Suryani et al., 2015) which explains that the behavior of farmers in cultivating swamp rice is at a high level.

Research on the behavior of subak member farmers towards the land optimization program (OPLA) in rice cultivation (Sudiana et al., 2016) which explains the knowledge, attitudes and application of the Land Optimization Program (OPLA) in rice cultivation.

The impacts of climate change on agriculture are not only physiological but also socio-economic. Research by Hidayati & Suryanto (2015) shows that declining crop yields due to climate change can encourage farmers to switch professions, especially if they lack access to adaptation technologies. On the other hand, non-climatic factors such as farmer knowledge, land area, and the implementation of agricultural innovations also determine the resilience of the agricultural sector to climate change.

Thus, climate change has become a serious challenge to food security, particularly in rice cultivation. Adaptation strategies such as developing drought-tolerant rice varieties, efficient irrigation systems, and farmer training need to be strengthened to minimize its negative impacts. Further research is also needed to monitor climate change trends and formulate sustainable agricultural policies.

METHODOLOGY

This research was conducted in 2024 using quantitative data with a survey method. The research location was determined by purposive sampling, namely in Sekotong Barat Village, Sekotong District, West Lombok Regency, as a rain-fed area. This study used two types of data sources, namely primary data and secondary data. Primary data were obtained through interviews conducted in Sekotong Barat Village with 30 respondents selected based on the consideration that they had been farming for at least five years, with a period spanning 2020 to 2023. Interviews were conducted using a structured questionnaire. Secondary data were obtained from the BMKG of NTB Province, which included data on temperature, rainfall, humidity, and solar radiation. This secondary data was used as the X variable and primary data as the Y variable used in multiple linear regression analysis. To determine the effect of climate change on rain-fed rice productivity during the study, it was calculated using the multiple linear regression analysis formula:

$$Y = a + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4X4 + \epsilon$$

Where: Y = Rice productivity (Ton/Ha),
a = Constant,
X1 = Temperature (°C),
X2 = Rainfall (mm),
X3 = Air humidity (%),
X4 = Sunlight (%),
β1, β2, β3, β4 = Regression coefficients for each independent variable
andϵ\epsilonϵ = Error

Next, the results of multiple regression are interpreted through the F Test, to evaluate the influence of independent variables together on the dependent variable, then the t Test, to evaluate the influence of each independent variable partially, after that the Coefficient of Determination (R^2), to measure how much variation in production efficiency can be explained by variations in climate variables.

RESULTS AND DISCUSSION

Rainfed Rice Productivity

Rainfed rice is a rice cultivation system that relies heavily on rainfall for water supply, without the support of a technical irrigation system. This system is common in dry or marginal areas, such as West Sekotong Village, which presents unique challenges in maintaining stable production (Fitriana, 2015) Rainfed rice productivity tends to fluctuate and is generally lower than that of irrigated land, due to its direct impact on climatic conditions, particularly rainfall, temperature, humidity, and sunlight. Unpredictable climatic factors due to global climate change further exacerbate this situation. According to research, (Aditya et al., 2021) Unevenly distributed rainfall, rising temperatures, and a longer dry season can cause rice plants to experience water stress, stunted growth, and reduced yields. Conversely, high rainfall in a short period of time can also cause waterlogging and damage to crops.

Low rainfed rice productivity not only impacts food security but also impacts the welfare of farmers who are highly dependent on harvests. Therefore, understanding the dynamics of rainfed rice productivity and its relationship to climate factors is crucial as a basis for decision-making for developing sustainable agricultural systems. Based on this, the following section presents data on rainfed rice productivity in West Sekotong Village during the 2020–2023 period as a basis for further analysis of the relationship between climate factors and dryland rice production.

Table 1. Productivity of Huajan-fed Rice in 2020-2023

No.	Year	Average production tons/Ha
1	2020	1.04
2	2021	1.04
3	2022	1.01
4	2023	0.61
Average		0.93

Source: Primary data (processed), 2024

Based on Table 1. Rainfed Rice Productivity in 2020-2023 above, Data from the West Sekotong Village data show that rain-fed rice productivity in West Sekotong Village remained relatively stable from 2020 to 2022, but experienced a significant decline in 2023 to 0.61 tons/ha. Average productivity reached only 0.93 tons/ha, far below the NTB average of 4.8–5.2 tons/ha. This sharp decline indicates disruptions in the agricultural system due to external factors, particularly climate change.

In this study, the decline in productivity in 2023 was associated with climate anomalies such as high temperatures and reduced rainfall after March. This decline is in line with the findings of (Estiningtyas & Syakir, 2017), which states that rain-fed rice productivity in Indonesia is highly sensitive to climate change, particularly erratic rainfall. Furthermore, (Hidayatullah & Saitama, 2023) also stated that climate fluctuations directly contributed to low crop yields in Malang Regency.

(Wihardjaka et al., 2020) In their study on increasing rain-fed rice productivity, they demonstrated that adaptive technologies, such as selecting superior varieties and adjusting planting times, are important strategies for addressing climate challenges. This strategy is also relevant for West Sekotong to mitigate the impact of future yield declines.

Climate Conditions 2020-2023

Climate is a crucial factor in the success of rain-fed rice production, especially in areas like West Sekotong that lack technical irrigation systems. Rice crops are highly dependent on the balance of climatic elements, such as air temperature, rainfall, humidity, and sunlight. An imbalance in any of these elements can disrupt plant growth and yield. Climate data for the past four years (2020–2023) in West Sekotong Village provides important insights for analysis. The following section presents four key climatic elements and discusses them to assess how environmental conditions support or hinder rain-fed rice productivity.

Temperature

Air temperature is one of the climatic factors that significantly influences rice plant growth. Ideal temperatures support physiological processes such as photosynthesis and panicle formation. In West Sekotong, air temperatures tend to be stable throughout the year with little variation between months.

Table 2. Average Monthly Temperature °C

Month	2020	2021	2022	2023
Jan	26.3	26.1	26.2	26.3
Feb	26.4	26.5	26.6	26.8
March	26.8	26.9	27.0	27.2
Apr	26.6	26.5	26.6	26.7
May	25.9	26.0	26.1	26.2
June	25.6	25.7	25.7	25.9
Jul	25.6	25.6	25.6	25.8
August	25.6	25.6	25.7	25.8
Sep	25.6	25.6	25.6	25.7
Oct	26.1	26.2	26.2	26.4
Nov	26.7	26.8	26.9	28.3
Des	27.2	27.3	27.5	27.7

Source: Secondary Data (processed), 2024

The data in Table 2, Average Monthly Temperature (°C), shows that the average monthly temperature in West Sekotong is relatively stable, ranging from 25.6°C to 28.3°C. The highest temperatures typically occur in November–December, while the lowest temperatures are recorded in July–September. This reflects a typical seasonal pattern, where temperatures decrease mid-year during the dry season. The mild temperature fluctuations indicate that temperatures in this region are generally still supportive of rice growth, although a temperature increase in late 2023 is important to note as it could pose a risk to flowering and grain filling.

This study shows that temperature is the climate variable with the most consistent influence on rice productivity. Regression results for 2021 and 2022 show that temperature has a lower significance value than other variables. Observations indicate that high temperatures cause increased evaporation and physiological disturbances in rice plants in West Sekotong, especially when water availability is limited.

This is reinforced by (Ruminta, 2016) which states that the increase in air temperature in Bandung Regency has a real impact on reducing rice yields on rain-fed land (Santoso et al., 2022) also stated that high temperatures in the generative phase can inhibit grain formation and filling (Azizah et al., 2021) added that extreme temperatures impact the photosynthesis process and water use efficiency of rice plants.

Rainfall

Rainfall is the primary source of water for rain-fed land. The timing, quantity, and distribution of rainfall are crucial. If rain falls late or unevenly, crops may suffer water shortages during critical periods. Conversely, excessive rainfall in a short period of time can cause waterlogging or crop damage.

Table 3. Monthly Rainfall (mm)

Month	2020	2021	2022	2023
Jan	248.5	302.0	284.5	289.5
Feb	351.5	421.5	300.5	426.0
March	361.5	229.0	233.0	299.0
Apr	173.0	150.5	150.5	143.0
May	60.5	77.0	87.0	50.0
June	11.0	10.0	12.0	3.5
Jul	3.5	1.5	2.5	1.5
August	2.0	0.0	1.0	0.0
Sep	2.5	4.0	2.0	0.0
Oct	19.5	36.5	46.5	22.0
Nov	147.5	202.5	140.5	177.5
Des	327.0	377.0	322.0	334.5

Source: Secondary Data (processed), 2024

Table 3. Monthly Rainfall (mm) Data shows that the highest rainfall consistently occurs from January to March, while the dry season lasts from June to September, with very low rainfall, even approaching zero. High rainfall at the beginning of the year is usually used by farmers to start planting rice. However, if the rain stops early or is too heavy for a short period, it can cause drought at the end of the growing phase or flooding at the beginning of planting. 2023 showed an increase in extreme rainfall in February, which could be an indicator of climate change that warrants attention.

In this study, the sudden decrease in rainfall after the planting phase caused water stress in growing plants. Farmers experienced difficulty irrigating their land due to the lack of alternative irrigation sources. This significantly impacted rainfed rice productivity. The results of the regression analysis showed that, although not partially significant, rainfall contributed significantly to rainfed rice productivity simultaneously.

Study (Hidayatullah & Saitama, 2023) strengthens this finding, where uneven distribution of rainfall causes a mismatch between the planting and growth phases of plants. (Zuhri et al., 2024) stated that the uncertainty of the rainy season also impacts farming strategies and the income of rice farmers (Santoso et al., 2022) emphasizes the importance of an adaptive planting calendar that follows local climate forecasts.

Air Humidity

Air humidity is closely related to the process of water evaporation from the soil and plant leaves. A sufficiently high humidity level will help maintain water content in plants, but too high a level can trigger pest and disease attacks, particularly fungal infections. Therefore, humidity stability is essential for plant management.

Table 4. Average Monthly Air Humidity (%)

Month	2020	2021	2022	2023
Jan	88	87	87	87
Feb	88	88	87	87
Mar	87	86	86	85
Apr	85	84	84	83
May	84	83	83	82
June	83	82	82	81
Jul	83	81	81	80
August	82	80	80	79
Sep	82	81	81	79
Oct	83	82	82	79
Nov	86	85	85	84
Des	89	88	88	87

Source: Secondary Data (processed), 2024

Table 4. Average Monthly Air Humidity (%) shows that over the four years of observation, air humidity in West Sekotong was quite high, particularly during the rainy season (December–March), ranging from 85–89%. During the dry season (June–September), humidity dropped to 79–81%. This decrease in humidity can lead to faster evaporation from the soil surface, causing plants to dry out more quickly. However, overall, humidity in this region remains within a range that supports rice growth.

Based on the results of this study, although humidity did not show a statistically significant effect on rainfed rice productivity, empirically, low humidity accelerated soil drying and caused plants to experience water stress. Interviews with farmers indicated that during prolonged dry seasons, plant growth slowed and grain ripening was hampered, resulting in suboptimal yields.

(Suprapto, 2022) stated that low air humidity can exacerbate environmental stress on rainfed rice. (Estiningtyas & Syakir, 2017) also shows that low humidity shortens plant lifespan and reduces yield potential. Therefore, low humidity needs to be monitored, and microclimate management strategies such as the use of organic mulch can be an adaptive solution.

Sunlight

Sunlight is crucial for the photosynthesis process, which underpins plant growth and production. Adequate sunlight is essential throughout the vegetative and generative phases. Lack of light can cause plants to grow weakly and panicles to fill incompletely.

Table 5. Percentage of Monthly Sunlight (%)

Month	2020	2021	2022	2023
Jan	50	52	53	54
Feb	52	54	55	46
Mar	55	56	57	58
Apr	60	61	62	63
May	65	67	68	69
June	75	76	77	78
Jul	80	81	82	83
August	85	86	87	91
Sep	83	84	85	86
Oct	78	79	80	90
Nov	65	66	67	68
Des	46	48	49	50

Source: Secondary Data (processed), 2024

From Table 5. Monthly Sunlight Percentage (%) It can be seen that the highest irradiance occurs from June to October, during the dry season. Meanwhile, the lowest irradiance is recorded in December and January, coinciding with the peak of the rainy season. This condition significantly impacts the efficiency of plant photosynthesis. If there is prolonged rain without sufficient sunlight, grain filling can be disrupted. Conversely, during the dry season, even with abundant sunlight, plants can struggle to grow without sufficient water. Although irradiance is necessary for photosynthesis, excessively high levels of irradiance can cause increased leaf temperatures and accelerated soil evaporation.

In this study, high light intensity during the dry season, when not matched by sufficient rainfall, causes plants to experience stress due to water shortages. Farmers in West Sekotong reported that during the dry season, when sunlight is high and rainfall is minimal, yields decrease and many grains fail to fill completely. Regression results show that light intensity is not statistically significant, but its physiological effects are still felt in the field.

(Wihardjaka et al., 2020) Conservation techniques such as planting broadleaf varieties and using partial shade to mitigate the impact of extreme light exposure have been suggested. Furthermore, adjusting planting times so that the plant's generative phase does not coincide with peak light exposure has also been shown to be effective in reducing the risk of yield loss.

Climate Factors Affecting Rainfed Rice Productivity

Climate change is a major challenge in the agricultural sector, especially for rain-fed rice farmers who are highly dependent on environmental conditions. This study aims to understand the extent to which climate factors such as temperature, rainfall, humidity, and solar radiation affect rain-fed rice productivity in West Sekotong Village from 2020 to 2023. The analysis was conducted using multiple linear regression, which includes a model summary test, a partial T-test, and a simultaneous F-test for each year. The results are as follows:

Table 6. Test of the Relationship between Observation Variables and Rice Productivity in 2020-2023

Year	R	R Square	Adjusted R Square	Standard Error of the Estimate
2020	.699a	.489	.197	1.33939
2021	.592a	.350	-.021	1.50981
2022	.652a	.425	.096	1.45613
2023	.307a	.094	-.424	1.89185

a. Predictors: (Constant), Sunlight (X4), Temperature (X1), Humidity (X3), Rainfall (X2)

In 2020, the model summary results showed a correlation coefficient (R) of 0.699, indicating a fairly strong relationship between the independent variables and rice productivity. The R-squared value of 48.9% indicates that almost half of the variation in rice productivity can be explained by climate variables, while the remainder is influenced by other factors. However, the adjusted R-squared value was only 19.7%, indicating that this model does not adequately explain the data.

In the following year, 2021, the analysis showed an R value of 0.592 with an R Square of 35.0%, meaning that climate variables explained one-third of the variation in rice productivity. However, a negative Adjusted R Square value (-0.021) indicated that this model was not suitable for the wider population. In 2022, the R value was 0.652, with an R Square of 42.5%, indicating a stronger relationship than the previous year. An Adjusted R Square of 0.096 indicated a slight improvement in model fit. Then in 2023, the results of the model summary showed an R value of 0.307, with an R Square of 9.4%, indicating a very weak relationship. A negative Adjusted R Square value (-0.424) indicated that the model was less effective in explaining data variation.

Table 7. Results of the Analysis of Climate Factors Affecting Rainfed Rice Productivity in 2020-2023

Observation Variables	Climate Influence Year							
	2020		2021		2022		2023	
	t	Sig.	T	Sig.	T	Sig.	t	Sig.
Temperature(X1)	.719	.496	.032	.975	.032	.977	.091	.930
Rainfall (X2)	.580	.580	-.637	.544	-.637	.545	-.439	.674
Humidity(X3)	-1,912	.098	.240	.817	.240	.100	.454	.664
Sunlight (X4)	-.494	.637	-1,081	.315	-1,081	.297	-.346	.740

a. Dependent Variable: Rice Production (Y)

In the 2020 T-test (partial), it showed that variables were partially insignificant such as temperature (X1), rainfall (X2), humidity (X3), and sunlight (X4) with a t-table value smaller than the t-table or 5% level. Furthermore, the 2021 T-test (partial) showed that there were significant variables such as temperature (X1) 0.032 which was smaller than the 5% level of significance. Meanwhile, those that were not significant were rainfall (X2), humidity (X3), and sunlight (X4). Furthermore, the 2022 T-test (partial) showed that there were significant variables such as temperature (X1) 0.032 which was smaller than the 5% level of significance. Meanwhile, those that were not significant were rainfall (X2), humidity (X3), and sunlight (X4). The 2023 partial t-test again showed partially insignificant variables such as temperature (X1), rainfall (X2), humidity (X3), and sunlight (X4) with a calculated t-value smaller than the t-table or at the 5% level. Therefore, based on the explanation above, the temperature factor influenced rice productivity in 2021 and 2022.

Table 8. Results of the Influence of Climate Variables on Rice Productivity in 2020-2023

Model		Sum of Squares	Df	Mean Square	F	Sig.
2020	Regression	12,008	4	3,002	1,673	.259b
	Residual	12,558	7	1,794		
	Total	24,566	11			
2021	Regression	8,609	4	2,152	.944	.492b
	Residual	15,957	7	2,280		
	Total	24,566	11			
2022	Regression	10,965	4	2,741	1,293	.359b
	Residual	14,842	7	2,120		
	Total	25,807	11			
2023	Regression	2,603	4	.651	.182	.941b
	Residual	25,054	7	3,579		
	Total	27,657	11			

a. Dependent Variable: Rice Production (Y)
b. Predictors: (Constant), Sunlight (X4), Temperature (X1), Humidity (X3), Rainfall (X2)

In the 2020 F-test (simultaneous) produced an F-value of 1.673 (sig. 0.259), indicating that the four climate variables collectively did not have a significant effect on rice productivity, then in 2021, the results of the F-test (simultaneous) produced an F-value of 0.944 (sig. 0.492), indicating that the climate variables collectively had no significant effect. The F-test (simultaneous) in 2022 gave an F-value of 1.293 (sig. 0.359), which remained collectively insignificant. Then in 2023, the F-test (simultaneous) obtained an F-value of 0.182 (sig. 0.941), indicating there was no significant collective effect. Overall, the research results show that climate variables (temperature, rainfall, humidity, and sunlight) do not have a significant influence on rainfed rice productivity in West Sekotong Village during the 2020-2023 period.

CONCLUSION AND RECOMMENDATIONS

Conclusion

Based on the results and discussion, the following conclusions can be drawn:

1. Rainfed rice productivityIn West Sekotong Village, productivity fluctuated annually from 2020 to 2023, with a downward trend. The sharpest decline occurred in 2023, with productivity reaching only 0.61 tons/ha. The average productivity over the four years was 0.93 tons/ha, indicating that the agricultural system in this region remains highly vulnerable to external disturbances, particularly climate change.
2. Climate conditions of West Sekotong Village during the period 2020 to 2023, Climate elements such as air temperature, rainfall, humidity, and sunlight experience significant variations. Temperatures tend to rise at the end of the year, rainfall is uneven and decreases sharply after March, humidity decreases during the dry season, and sunlight is very high during the dry months. Changes in these climate elements put pressure on the growth and yield of rain-fed rice crops.
3. Climate factors that influence the productivity of rain-fed rice, fromThe results of multiple linear regression analysis indicate that there is no statistically significant effect of temperature, rainfall, humidity, and sunlight on rice productivity, either simultaneously or partially, in most observation years. However, empirically, temperature showed the most consistent effect on rice productivity, particularly in 2021 and 2022. This indicates that air temperature is the climate factor that requires the most attention in managing rainfed rice farming in the region.

Recommendation

Based on the research results and conclusions that have been described, the following suggestions can be given:

1. For Farmers
   Farmers are expected to utilize available weather forecasts and climate patterns to adjust planting times, thereby minimizing the risk of crop failure due to climate change.
2. For Local Government
   Local governments are expected to provide support through outreach, provision of accurate climate information, and policies that help farmers adapt their farming practices to changing climate conditions.

FURTHER STUDY

It is recommended that further research be conducted with a larger sample size and a longer observation period, and take into account the social and economic factors of farmers, so that the relationship between climate and rice productivity can be understood more comprehensively.

REFERENCES

Aditya, F., Gusmayanti, E., & Sudrajat, J. (2021). Pengaruh Perubahan Curah Hujan terhadap Produktivitas Padi Sawah di Kalimantan Barat. *Jurnal Ilmu Lingkungan*, *19*(2), 237–246. https://doi.org/10.14710/jil.19.2.237-246

Azizah, F., Suwarsito, S., & Sarjanti, E. (2021). Pengaruh Pola Curah Hujan Terhadap Produktivitas Padi di Kecamatan Bukateja Kabupaten Purbalingga. *Sainteks*, *18*(1), 1. https://doi.org/10.30595/sainteks.v18i1.10567

Badan Pusat Statistik Lombok Barat, 2024. (n.d.). *Dokumen_LOMBOK_BARAT2024.pdf*.

Bps NTB 2024. (2024). *Potensi Pertanian Provinsi Nusa Tenggara Barat: Tantangan dan Profil Komoditas Unggulan Menuju Pertanian Berkelanjutan*.

Butarbutar, T. (2015). Perubahan Iklim (Perubahan Iklim). *JurnalAnalisis Kebijakan Kehutanan*, *9*(1), 1–10. https://dlh.bulelengkab.go.id/informasi/detail/artikel/perubahan-iklim-climate-change-32#:~:text=IPCC (2001) menyatakan bahwa perubahan,(biasanya dekade atau lebih)

Estiningtyas, W., & Syakir, M. (2017). Pengaruh Perubahan Iklim Terhadap Produksi Padi Di Lahan Tadah Hujan (Impact of Climate Change on Rice Production in Rainfed Area). *Jurnal Meteorologi Dan Geofisika*, *18*(2), 83–93.

Fitriana, R. (2015). PENERAPAN TEKNOLOGI SISTEM PENGELOLAAN AIR PADA TANAMAN PADI DI LAHAN SAWAH TADAH HUJAN. *Procedia Manufacturing*, *1*(22 Jan), 1–17.

Hidayati, I. N., & Suryanto, S. (2015). Pengaruh Perubahan Iklim Terhadap Produksi Pertanian Dan Strategi Adaptasi Pada Lahan Rawan Kekeringan. *Jurnal Ekonomi & Studi Pembangunan.*, *16*(1), 42–52. https://doi.org/10.18196/jesp.16.1.1217

Hidayatullah, Z. A., & Saitama, A. (2023). Analisa Perubahan Iklim dan Pengaruhnya pada Produktivitas Tanaman Padi di Kabupaten Malang Analysis of Climate Change and Its E. *Agricultural Science*, *Vol. 8 No*(2), 173–180.

Mirza, M., Nurahmi, E., & Ichsan, C. N. (2022). *Respon Pertumbuhan dan Hasil Padi (Oryza sativa L.) pada Kondisi Stres Air, Dosis Pupuk Organik dan Temperatur yang Berbeda (Growth Response and Yield of Rice (Oryza sativa L.) Under Water Stress Conditions, Different Doses of Organic Fertilizer an*. *7*, 87–92.

Ruminta, R. (2016). Analisis penurunan produksi tanaman padi akibat perubahan iklim diKabupaten Bandung Jawa Barat. *Kultivasi*, *15*(1), 37–45. https://doi.org/10.24198/kultivasi.v15i1.12006

Santoso, A. B., Supriana, T., & Girsang, M. A. (2022). Pengaruh Curah Hujan pada

Produksi Padi Gogo di Indonesia. *Jurnal Ilmu Pertanian Indonesia*, *27*(4), 606–613. https://doi.org/10.18343/jipi.27.4.606

Suprapto, T. (2022). Analisis Pengaruh Perubahan Iklim Terhadap Produktivitas Dan Pilihan Adaptasi Petani Padi Tadah Hujan Di Kabupaten Langkat Joglo. *Http://Ejurnal.Unisri.Ac.Id/Index.Php/Joglo/Article/View/779*, *26*.

Tarisa, T., & Dinar Melani, H. (2022). Analisis Faktor-Faktor Yang Mempengaruhi Produksi Padi Di Kabupaten Pati Tahun 1990-2019. *Jurnal Litbang Kota Pekalongan*, *20*(2), 107–118. https://doi.org/10.54911/litbang.v20i2.215

Ummah, M. S. (2019). STATISTIK DAERAH KABUPATEN LOMBOK BARAT TAHUN 2024. *Sustainability(Switzerland)*,*11*(1),114.http://scioteca.caf.com/bitstream/handle/123456789/1091/RED2017Eng8ene.pdf?sequence=12&isAllowed=y%0Ahttp://dx.doi.org/10.1016/j.regsciurbeco.2008.06005%0Ahttps://www.researchgate.net/publication/305320484_SISTEM_PEMBETUNGAN_TERPUSAT_STRATEGI_MELESTARI

Ummah, M. S. (2022). Luas Panen dan Produksi NTB 2022. In *Sustainability (Switzerland)* (Vol. 11, Issue 1). http://scioteca.caf.com/bitstream/handle/123456789/1091/RED2017-Eng8ene.pdf?sequence=12&isAllowed=y%0Ahttp://dx.doi.org/10.1016/j.regsciurbeco.2008.06.005%0Ahttps://www.researchgate.net/publication/305320484_SISTEM_PEMBETUNGAN_TERPUSAT_STRATEGI_MELESTARI

Wihardjaka, A., Pramono, A., & Sutriadi, M. T. (2020). Peningkatan Produktivitas Padi Sawah Tadah Hujan Melalui Penerapan Teknologi Adaptif Dampak Perubahan Iklim. *Jurnal Sumberdaya Lahan*, *14*(1), 25. https://doi.org/10.21082/jsdl.v14n1.2020.25-36

Zuhri, N. M., Santoso, W. I., & Perdana, I. (2024). *KABUPATEN DEMAK Influence of Climate Change on Household Consumption Patterns of Rice Farmers in Demak Regency*. *2*, 226–244.