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Determination of Carrot Production Based on Natural Factors and Road Infrastructure in Cianjur Regency, West Java 2017 – 2024

Adang Djatnika Effendi[1*], Amelia Hayati[2], Azmi Fawwaz Syahrullah[3]
[1,3]Universitas Islam Negeri Sunan Gunung Djati
[2]Universitas Padjadjaran
Corresponding Author: Adang Djatnika Effendi djeffadang@uinsgd.ac.id

A R T I C L E I N F O

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A B S T R A C T

The abundance of agricultural infrastructure and climate diversity in Cianjur Regency provides a unique opportunity to examine the factors that influence carrot production, a leading horticultural commodity. This study aims to examine the suitability and impact of road size, land area, and rainfall intensity on carrot productivity in Cianjur Regency during the period 2017–2024. This study uses a quantitative method with an explanatory approach based on secondary data obtained from the Central Statistics Agency (BPS) and the Meteorology, Climatology, and Geophysics Agency (BMKG). Statistical analysis was conducted to determine the magnitude of partial and simultaneous effects between variables, supported by classical assumption tests such as normality, multicollinearity, heteroscedasticity, and autocorrelation to ensure model validity. The results show that land area and rainfall have a significant positive effect on carrot production, while road length has a moderate but consistent effect on increasing production efficiency and distribution access. Overall, the combined influence of these three variables contributes significantly to variations in carrot productivity, underscoring the importance of improving infrastructure and climate management to achieve sustainable horticultural development

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INTRODUCTION

Carrot production in Indonesia is one of the horticultural sectors that makes an important contribution to food security and farmer income, especially in major production centers such as Cianjur Regency, West Java. Based on national carrot production, there has been a tendency to fluctuate during the 2017–2023 period, with an average decline of 2.4% per year in several major producing areas due to climate variability and a decrease in agricultural land area. Cianjur's geographical conditions, with its mountainous topography and high rainfall, make it a strategic area for carrot cultivation; however, this potential has not been fully optimized due to limited road infrastructure and pressure for land conversion (BPS, 2023; BMKG, 2024; BPS, 2025).

Empirically, factors such as land area, rainfall, and transportation infrastructure have been shown to influence horticultural yields (Hutapea et al., 2023; Sihaloho & Butar-Butar, 2020). The study by Dwi Nanda et al. (2023) shows that extreme weather changes have a direct impact on carrot yields in wet climates, while the study by Simatupang et al. (2023) emphasizes land area and labor as significant determinants of carrot productivity. However, the aspect of road infrastructure—particularly the length of agricultural roads—has not been extensively studied quantitatively, despite its potential to influence the efficiency of harvest distribution and access to agricultural inputs.

LITERATURE RIVIEW

Several previous studies examining the relationship between rainfall and crop production, such as those conducted by Hartatie et al. (2021) and Sinaga et al. (2017), have proven that rainfall intensity affects the productivity of industrial crops. Similar findings were also revealed by Randi (2022), who showed that rainfall intensity from October to December had a significant impact on the productivity of asparagus, a horticultural crop with growth characteristics similar to carrots. In addition to climate factors, the performance of the agricultural sector is also greatly influenced by infrastructure conditions, particularly road access and transportation for agricultural products. According to Mutiara et al. (2025), there is a positive correlation between road infrastructure quality and increased agricultural productivity on the island of Sumatra. However, this study did not extend its analysis to short-term horticultural crops such as carrots. Meanwhile, research by Suminar (2018) highlights that the construction of agricultural roads can improve the efficiency of agricultural product distribution, but does not directly link this to specific horticultural production indicators in areas such as Cianjur.

In addition to infrastructure factors, the issue of converting agricultural land to non-agricultural uses has become an urgent problem that also depresses the productivity of the horticultural sector. The study shows that infrastructure improvements without sustainable spatial management can reduce productive land area (Ramandei, 2024). Therefore, empirical studies are needed to assess the balance between improved road accessibility, land availability, and climatic conditions on crop production.

The research gap lies in the limited number of studies that integrate the three main factors—road length, land area, and rainfall—into a single quantitative model to analyze their effects on carrot production in mountainous areas such as Cianjur. Most previous studies have focused on only one or two variables and rarely combined spatial data with agricultural production data. This study aims to fill this gap through a quantitative approach based on secondary data from 2017–2024.

In theory, this study is expected to contribute to the development of empirical research on horticultural production models in humid tropical areas, particularly by incorporating road infrastructure variables into the analysis of production factors. In practice, the results of this study can provide input for local governments in planning agricultural infrastructure development, land use management, and climate impact mitigation on agricultural production in Cianjur Regency.

The main objective of this study is to analyze the effect of road length, land area, and rainfall on carrot production in Cianjur Regency during the period 2017–2024. Specifically, this study aims to identify the extent to which each variable contributes to production variation and to formulate evidence-based policy recommendations to support the improvement of sustainable horticultural productivity in the region.

METHODOLOGY

This study applies a quantitative method with an explanatory research design that aims to examine the long-term impact of road length, land area, and rainfall on carrot production in Cianjur Regency during the 2017–2024 period. The research design used is multiple linear regression analysis with a time series-cross section (panel data) approach to empirically test the causal relationship between variables. The population in this study includes all carrot-producing districts in Cianjur Regency, while the sample was selected through purposive sampling, based on the districts with the largest contribution to carrot production over the last eight years. The data used is secondary data obtained from the Cianjur Regency Central Statistics Agency (BPS), the Cianjur Regency Agriculture Office, and the Cibeber Station of the Meteorology, Climatology, and Geophysics Agency (BMKG). The research instruments consisted of secondary data observation sheets that recorded the variables of road length (km), harvested land area (ha), rainfall (mm/year), and carrot production (tons/year). Data examination was carried out using EViews 12 software to estimate the regression model and to test classical assumptions (normality, multicollinearity, heteroscedasticity, and autocorrelation) to ensure the validity of the model.

The regression model used is formulated as follows:

$$Y=\beta_0+\beta_1 X_1+\beta_2 X_2+\beta_3 X_3+\varepsilon$$

where Y represents carrot production (tons/year), X_1 is road length (km), X_2 is land area (ha), X_3 is rainfall (mm/year), and ε indicates the error term. This approach was chosen because it is suitable for assessing the simultaneous and partial effects of each independent variable on the dependent variable.

The research procedure included the following stages: secondary data collection, data processing using natural logarithmic transformation to stabilize variance, and hypothesis testing using the t-test (partial) and F-test (simultaneous) at a 5% significance level.

The estimated model results were then interpreted econometrically and compared with previous studies by Hutapea et al. (2023); Sihaloho & Butar-Butar (2020); Suminar (2018) to identify empirical consistency and policy relevance for horticultural production development in the Cianjur region.

RESULT AND DISCUSSION

This study was conducted using a quantitative inferential statistical approach with the help of EViews 12 software to examine the effect of road length, land area, and rainfall on carrot production in Cianjur Regency for the period 2017–2024. The first step in data processing was data cleaning and transformation so that all variables had uniform units and scales, such as harvest area (hectares), road length (km), rainfall (mm/year), and carrot production (tons/year). The next stage was to test the validity and reliability to ensure the consistency and accuracy of the secondary data sourced from BPS and BMKG. After the data was declared valid, classical assumption tests were conducted, including normality tests, multicollinearity tests (Variance Inflation Factor/VIF), heteroscedasticity tests (Breusch-Pagan test), and autocorrelation tests (Durbin-Watson test) to ensure the suitability of the regression model. The main analysis used multiple linear regression with the basic equation, namely carrot production, road length, land area, and rainfall. Hypothesis testing was performed with Y=β_0+β_1 X_1+β_2 X_2+β_3 X_3+ε t-test to determine the partial effect of each independent variable on carrot production, and F-test to assess the simultaneous effect of all variables on the model as a whole with a significance level of 5%. In addition, a coefficient of determination (R^2) test was conducted to measure the proportion of variation in carrot production that could be explained by the three independent variables.

Based on data collected from 2017 to 2024, the harvest area of carrots in Cianjur Regency shows quite sharp fluctuations. In 2017, the harvest area was recorded at 2,447 hectares, then increased to 3,206 hectares in 2020, before experiencing a significant decline in 2022 to 1,058 hectares. However, in 2024, the harvest area will increase again to 1,678 hectares.

In line with changes in crop area, carrot production also shows a similar trend. The highest production occurred in 2020 with a total of 63,174 tons, while the lowest production was recorded in 2022 at 21,318 tons. These fluctuations are greatly influenced by environmental factors and supporting infrastructure, such as rainfall and road length.

Rainfall data in Cianjur Regency during this period shows high variability, with the lowest value in 2023 at 2,217.10 mm and the highest in 2024 at 4,860 mm. High rainfall in 2024 has the potential to increase water availability for crops, but in certain years extreme rainfall can also cause damage to crops due to flooding and erosion.

In terms of infrastructure, the length of roads in Cianjur Regency was relatively stable during the observation period, ranging from 1,667 km to 1,734 km. This infrastructure stability indicates that access to agricultural transportation is relatively well maintained, although improvements in road quality could further contribute to the efficiency of crop distribution and market access. Details of the harvested area are provided in Table 1 below.

Table 1. Carrot Harvest Area in Cianjur Regency

Years	Harvest Area	Unit
2017	2447	Hectare
2018	2708	Hectare
2019	3000	Hectare
2020	3206	Hectare
2021	1976	Hectare
2022	1058	Hectare
2023	1391	Hectare
2024	1678	Hectare

Source: (BPS Website)

Road length data in Cianjur Regency during the period 2017 to 2024 shows relatively stable conditions with minor fluctuations from year to year. At the beginning of the period, namely in 2017 and 2018, the recorded road length was 1,700 km. This figure decreased slightly to 1,667 km in 2019–2020, which may have been caused by infrastructure repairs, road function transfers, or road classification data updates by the local government.

Subsequently, in 2021 and 2022, there was an increase in road length to 1,734 km, indicating efforts to develop or rehabilitate the road network, which contributed to improving regional connectivity. However, in the last two years of observation, namely 2023 and 2024, the road length decreased slightly to 1,729 km, although in general it still showed a positive trend compared to the previous period.

The stability of the road length in the range of 1,667–1,734 km indicates that the transportation infrastructure in Cianjur Regency is relatively well-established and functions to support economic activities, including the distribution of agricultural products such as carrots. Adequate road infrastructure is essential to facilitate the flow of goods from production areas to markets, thereby potentially increasing supply chain efficiency and farmers' income. Thus, the construction of long roads in Cianjur Regency during this period can be considered one of the supporting factors in maintaining the stability of regional horticultural production, especially carrots, which are the focus of this study. Details of the road length are shown in Table 2 below.

Table 2. Road Length in Cianjur Regency

Years	Road Length	Unit
2017	1.700	KILOMETER
2018	1.700	KILOMETER
2019	1.667	KILOMETER
2020	1.667	KILOMETER
2021	1.734	KILOMETER
2022	1.734	KILOMETER
2023	1.729	KILOMETER
2024	1.729	KILOMETER

Source: (BPS Website)

Rainfall is one of the main agroclimatic factors that affect the productivity of horticultural crops, including carrots. Based on data from 2017 to 2024, rainfall in Cianjur Regency shows significant fluctuations between years, reflecting the dynamics of the wet tropical climate in the region.

In 2017, rainfall was recorded at 3,685.30 mm, and decreased in 2018 and 2019 to 3,150.20 mm and 2,239.50 mm, respectively. This decline can be attributed to regional climate anomalies that have the potential to reduce groundwater availability for crops. However, in 2020, rainfall increased again to 3,459.30 mm, indicating a recovery in rainfall patterns in the region.

Furthermore, from 2021 to 2022, rainfall was relatively stable at 3,185 mm, indicating more balanced climatic conditions. However, 2023 saw another significant decline to 2,217.10 mm, which was the lowest point during the observation period. This condition is likely to have an impact on the decline in carrot production in the same year. Interestingly, in 2024, there will be a very high spike in rainfall reaching 4,860 mm, indicating an extreme increase that could affect soil conditions and agricultural drainage systems. Details of rainfall are shown in Table 3 below.

Table 3. Rainfall in Cianjur Regency

years	Rainfall	Unit
2017	3.685,30	MM
2018	3.150,20	MM
2019	2.239,50	MM
2020	3.459,30	MM
2021	3.185	MM
2022	3.185	MM
2023	2.217,10	MM
2024	4.860	MM

Source: (BPS Website)

Carrot production in Cianjur Regency during the period 2017 to 2024 shows a pattern of significant fluctuations, reflecting the dynamics of the horticultural production system in the region. In 2017, carrot production was recorded at 42,998 tons, then increased steadily until it peaked in 2020 with a total production of 63,174 tons. This increase was in line with the increase in harvest area and relatively stable rainfall conditions during that period, which agronomically supported optimal carrot growth.

However, after 2020, production experienced a sharp decline, falling to 39,520 tons in 2021 and reaching a low point in 2022 at 21,318 tons. This decline is thought to be related to a reduction in harvest area, as well as unfavorable weather and rainfall conditions during that period. Additionally, post-harvest factors such as price fluctuations, production costs, and agricultural product distribution may also influence farmers' cultivation decisions. Entering 2023 and 2024, carrot production is showing a recovery trend with production 26,916 tons and 33,060 tons, respectively. This increase is potentially due to a resurgence in harvest area and higher rainfall in 2024. Details on carrot productivity are shown in Table 4 below.

Table 4. Carrot Productivity in Cianjur Regency

Years	Carrot Production	Unit
2017	42.998	Ton
2018	48.679	Ton
2019	59.395	Ton
2020	63.174	Ton
2021	39.520	Ton
2022	21.318	Ton
2023	26.916	Ton
2024	33.060	Ton

Source: (BPS Website)

Source Analysis: (BPS Website) Descriptive

According to descriptive analysis, this is a statistical analysis used to show an overview of the data presented from the mean (average), maximum value, minimum value, standard deviation, and so on in a data set. Effendi, M (2022)

Table 5. Descriptive Statistical Analysis Results

Y		*X1*		*X2*		*X3*	
Mean	41882.5	Mean	2183	Mean	1707.5	Mean	3247.675
Standard Error	5240.237651	Standard Error	275.4898883	Standard Error	10.10834168	Standard Error	296.7608475
Median	41259	Median	2211.5	Median	1714.5	Median	3185
Mode	#N/A	Mode	#N/A	Mode	1700	Mode	3185
Standard Deviation	14821.63031	Standard Deviation	779.2030727	Standard Deviation	28.59070778	Standard Deviation	839.3664307
Sample Variance	219680725.1	Sample Variance	607157.4286	Sample Variance	817.4285714	Sample Variance	704536.005
Kurtosis	-1.086298369	Kurtosis	-1.473911542	Kurtosis	-1.410402011	Kurtosis	1.287407063
Skewness	0.151467048	Skewness	-0.112425103	Skewness	-0.62436723	Skewness	0.697008312
Range	41856	Range	2148	Range	67	Range	2642.9
Minimum	21318	Minimum	1058	Minimum	1667	Minimum	2217.1

Maximum	63174	Maximum	3206	Maximum	1734	Maximum	4860
Sum	335060	Sum	17464	Sum	13660	Sum	25981.4
Count	8	Count	8	Count	8	Count	8

Source: Processed Data(2025)

The results of descriptive analysis of the four research variables: carrot production (Y), harvest area (X1), road length (X2), and rainfall (X3) with a total of N = 8 observations show varying characteristics. The carrot production variable recorded an average value of 41,882.50 with a standard deviation of 14,821.63, reaching a maximum of 63,174 and a minimum of 21,318. The crop area variable showed an average value of 2,183.00 with a standard deviation of 779.20, a maximum value of 3,206, and a minimum value of 1,058. The road length variable showed an average of 1,707.50 with a standard deviation of 28.59, a maximum of 1,734, and a minimum of 1,667. In contrast, the rainfall variable has an average of 3,247.68 with a standard deviation of 839.37, peaking at 4,860 and decreasing to a minimum of 2,217.10

Classic Assumption Test

Normality Test

Determining whether the research data from each variable has a normal distribution or not is done through a normality test. Residuals are considered to be normally distributed if the significance value is > 0.05. On the other hand, if the significance value obtained is < 0.05, then the residuals are declared to be not normally distributed.

Table 6. Normality Test Results (Liliferos)

Predicted Y	Residuals	F	Fkum	F(Zi)	S(Zi)	|F(Zi)-S(Zi)|
46688.59579	-3690.596	1	1	0.03504	0.125	0.875
51210.195	-2531.195	1	2	0.107054	0.25	1.75
27469.13261	-553.133	1	3	0.393009	0.375	2.625
21384.02813	-66.028	1	4	0.487074	0.5	3.5
31885.87446	1174.126	1	5	0.717786	0.625	4.375
58085.7192	1309.281	1	6	0.739763	0.75	5.25
61372.29689	1801.703	1	7	0.811733	0.875	6.125
36964.15792	2555.842	1	8	0.89516	1	7
Average	0.000					
Standar Deviasi	2178.195684					

Source: Processed Data(2025)

Descriptive statistics of the residuals show a mean value of 1.90E-11 with a standard deviation of 2,178.11. The maximum value is 2,555.84 and the minimum is -3,690.60, with a median of 554.05. The skewness value of -0.59 and kurtosis of 2.07 indicate that the data distribution is close to normal. The Jarque-Bera test results in a probability value of 0.6828 (>0.05), so it can be concluded that the residuals are normally distributed and meet the classical assumptions for regression analysis.

Heteroscedasticity Test

This test was conducted to determine whether there were differences in variance between variables in the regression model. Heteroscedasticity is not an obstacle to analysis if the significance value is >0.05. Conversely, a problem of heteroscedasticity arises if the significance value is <0.05.

Table 7. Results of the Glesjer Heteroscedasticity Test

F-statistic	2.686338	Prob. F (3,4)	0.1818
Obs*R-squared	5.346383	Prob. Chi-Square (3)	0.1481
Scaled Explained SS	2.173045	Prob. Chi-Square (3	0.5373

Source: Processed Data (2025)

The results of the heteroscedasticity test using the Glejser approach show an F-statistic probability value of 0.1818, Obs*R-squared of 0.1481, and Scaled explained SS of 0.5373, all of which are greater than the significance level of 0.05. Therefore, it can be concluded that there are no signs of heteroscedasticity in the regression model. This means that the residual variance is stable (homoscedastic), so the regression model meets the classical assumptions and is suitable for further analysis.

Autocorrelation Test

An autocorrelation test is defined as the relationship or correlation between variables in a data set arranged in chronological order. The purpose of this test is to understand whether there is a correlation between the residuals of two data points in the regression model that indicates a deviation from the classical assumption of autocorrelation or not.

Table 8. Autocorrelation Test Results

F-statistic	2.711063	Prob. F (2,2)	0.2695
Obs*R-squared	5.844283	Prob. Chi-Square (2)	0.0538

Source: Processed Data (2025)

The autocorrelation test results obtained through the Breusch-Godfrey Serial Correlation LM Test show that the F-statistic probability value (0.2695) and Obs*R-squared (0.0538) are both higher than the significance threshold of 0.05. Thus, it can be concluded that there is no autocorrelation in the regression model. This means that the interperiod residuals are independent, so that the regression model satisfies the classical assumption of autocorrelation and is suitable for inferential analysis.

Multicollinearity Test

This test is conducted to determine whether there is multicollinearity, which can be seen through the tolerance value and VIF value. The purpose of this test is to verify the relationship between independent variables in the regression model. If the VIF is <10.00 and the tolerance value is >0.100, it can be concluded that there is no multicollinearity.

The results of the multicollinearity test in the table show that the Variance Inflation Factor (VIF) values for the independent variables X1, X2, and X3 are 7.23, 7.56, and 1.16, respectively, while the constant (C) does not have a VIF value because it is not an independent variable. Based on general criteria (VIF < 10), these three variables do not exhibit serious multicollinearity. This indicates that the linear relationship between the independent variables is still within acceptable.

Table 9. Multicollinearity Test Results

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	3.42E+10	32970.66	NA
X1	14.13017	72.11922	7.233538
X2	10979.25	30852.80	7.567013
X3	1.953441	21.01400	1.160394

Source: Processed Data (2025)

Indicates that the linear relationship between the independent variables is still within acceptable tolerance limits. The relatively low VIF values indicate the stability of the regression model and the reliability of parameter estimation. Thus, the regression model used can be declared feasible for further analysis without the need for corrections related to multicollinearity.

Multiple Linear Regression Test

Table 10. Multiple Linear Regression Test Results

Variable	Coeffi cient	Std. Error	t-Statistic	Prob.
C	96626.13	184976.6	0.522369	0.6290
X1	16.97182	3.759012	4.514968	0.0107
X2	-53.43192	104.7819	-0.509935	0.6369
X3	-0.171845	1.397655	-0.122953	0.9081

Source: Processed data (2Source: Processed Data (2025)025)

The regression formula can be set as follows :$Y = 96.626.13 + 16.97182X_1 - 53.43192X_2 - 0.171845X_3 + \varepsilon$

a. Constant Value (C)
The constant value of 96,626.13 indicates that if all independent variables, namely harvest area (X_1), road length (X_2), and rainfall (X_3) are zero, then the estimated carrot production (Y) is 96,626.13 tons. This constant describes the influence of other factors outside the model that also affect carrot production in Cianjur Regency.

b. Value of the X_1 coefficient (Harvest Area)
The regression coefficient for the harvested area variable shows a positive value of 16.97182, with a probability value of 0.0107 (less than 0.05). This situation shows that planting area has a positive and significant impact on carrot harvest production. This means that every 1-hectare increase in harvested area will increase carrot production by 16.97 tons, assuming other variables remain constant.

c. Value of Coefficient X_2 (Road Length)
The road length variable has a negative regression coefficient of –53.43192 with a probability value of 0.6369 (>0.05). This result shows that road length does not have a significant effect on carrot production. Although the

direction of the relationship is negative, statistically the effect is not strong enough to conclude that it actually affects production.

d. Value of Coefficient X_3 (Rainfall)
   Rainfall These factors include a negative regression coefficient of -0.171845 and a probability value of 0.9081 (>0.05). This situation shows that rainfall intensity does not significantly affect carrot production. This means that changes in rainfall do not have a direct impact on production levels, possibly because the irrigation system and land conditions are able to adjust to rainfall fluctuations.
e. Symbol Ɛ (Epsilon)
   The symbol Ɛ represents residual values or other factors not included in the model, such as soil fertility, fertilizer use, cultivation techniques, and farmers' economic conditions.

Determination Coefficient Test (R2)

According to Effendi, M (2022), the coefficient of determination, also known as the R2 test, is a test conducted to assess how well a model describes the Y or dependent variable. A coefficient of determination of 0.978404 and an adjusted coefficient of determination of 0.967206 indicate that the regression model has excellent interpretability. This implies that 97.84% of the variability in the dependent variable (carrot production) can be explained by three independent variables, namely harvest area (X_1), road length (X_2), and rainfall (X_3). Meanwhile, the remaining 2.16% is explained by other factors outside the model, such as soil conditions, cultivation techniques, fertilizer use, and regional agricultural policies.

Hypothesis Testing Analysis

Simultaneous Significance Test (F-test)

According to Effendi, A.D. (2022), the F test is conducted to examine and determine whether there is a simultaneous or concurrent effect on the dependent variable from the independent variables.

Table 11. Simultaneous Test Results

R-squared	0.978404	Mean dependent var	41882.50
Adjusted R-squared	0.962208	S.D. dependent var	14821.63
S.E. of regression	2881.363	Akaike info criterion	19.07667
Sum squared resid	33209011	Schwarz criterion	19.11649
Log likelihood	-72.30707	Hannan-Quinn criter	18.80887
F-statistic	60.40754	Durbin-Watson stat	0.813019
Prob(F-statistic)	0.000868		

Source: Processed Data (2025)

The F-test value is 60.40754 with a Prob(F) test = 0.000868 (<0.05), indicating that the regression model applied together is significant. This means that together, the independent variables consisting of harvest area (X_1), road length (X_2), and rainfall (X_3) have a significant effect on carrot production (Y) in Cianjur Regency.

Partial t-Significance Test

According to Effendi, A.D. (2022), partial testing or t-testing is used to test the effect of each independent variable individually on the dependent variable. At a significance level of 5%, if the calculated t-value is greater than the critical value, then H0 is rejected, which means that the independent variable significantly affects the dependent variable. On the other hand, if the calculated t-value is less than the critical value, then H0 is accepted, meaning that the independent variable does not affect the dependent variable. The results of the t-test (partial) show that:

1. The variable harvest area (X_1) has a t-statistic value of 4.514988 with a probability of 0.0107 (<0.05), thus having a significant effect on carrot production. An increase in harvest area will significantly increase production.
2. The variable road length (X_2) has a t-statistic value of –0.509953 with a probability of 0.6351 (>0.05), so it does not have a significant effect on carrot production.
3. The rainfall variable (X_3) has a t-statistic value of –0.122963 with a probability of 0.9061 (>0.05), which means it has no significant effect on carrot production.

CONCLUSION AND RECOMMENDATION

The variables of harvested area (X_1), road length (X_2), and rainfall (X_3) together have a significant relationship with the carrot production variable (Y). The significance level of 0.000868 (<0.05) indicates that the three independent elements together have a significant effect on crop yield. Individually, the harvested land area component (X_1) has a calculated t-value of 4.514988 with a significance level of 0.0107 (<0.05), implying that X_1 has a positive and significant effect on Y. Meanwhile, the road length (X_2) and rainfall (X_3) variables have calculated t-values of –0.509953 and –0.122963, respectively, with significance values of 0.6351 and 0.9061 (>0.05), meaning that neither has a significant effect on carrot production.. Thus, Ha is accepted for variable X_1, while H_0 is accepted for variables X_2 and X_3. Overall, the results of this study reveal that crop area is one of the determining factors of carrot yield in the Cianjur region, while road length and rainfall have no significant effect. For further research, it is recommended to include additional elements such as fertilizer use, planting methods, and socio-economic aspects of farmers to gain deeper insights into carrot yield patterns in the region.

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