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Analysis of Movement Generation for Rice Commodity in West Java Province

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ABSTRACT

West Java Province produces several superior commodities, especially in agriculture. Rice production needs to be increased through the movement of the flow of goods effectively and efficiently in logistics activities so that it can increase the rate of the economy in West Java Province. This study aims to analyze rice production on the movement of rice commodities in West Java Province. The research method uses descriptive quantitative methods. The data used in this study are data generated by the movement of rice commodities and data on rice production in West Java Province in 2016. The analytical approach used is linear regression and statistical tests are performed on the regression equation function to test the significance level. Based on the results of linear regression analysis, the function equation is y = 316.21 + 0.16x. It can be concluded that the greater the amount of rice production, the greater the generation of rice commodity movement. In addition, from statistical tests, it can be seen that the amount of rice production has a strong relationship and has a positive and significant linear effect on the rise of the movement of rice commodities in West Java.

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1. INTRODUCTION

The Covid-19 pandemic is a major problem for Indonesia and all countries. This pandemic is capable of causing a domino effect on health, social, economic and financial aspects. In the global economic recovery due to the pandemic, demand for goods and services was able to drive the economy, save industry, and restore micro, small and medium enterprises (Rasul et al, 2021). Conversely, the economy will find it difficult to move if the demand for goods and services is still low. In Indonesia, one of the provinces that has high economic potential is West Java Province. This is supported by the availability of natural resources in West Java Province which are abundant and produce several superior commodities, especially in agriculture (Heryawan et al, 2014).

Geographically, West Java Province is located between 5 ° 50 ' - 7 ° 50 ' South Latitude and 104 ° 48'- 108 ° 48 ' East Longitude. With an area of 37,851.11 km², administratively West Java has 18 districts and 9 cities. West Java Province is also directly adjacent to the Java Sea and DKI Jakarta to the north, to the east by Central Java, to the south by the Indian Ocean and to the west by the Province of Banten. West Java is one of the provinces in Indonesia as a fairly high agricultural producer. Products in agriculture include rice, corn, soybeans, peanuts, green beans, cassava and sweet potatoes (Fatoni et al, 2020). The main agricultural product in West Java is rice. Rice is one of the cultivated plants that produces rice and is a staple food product for the majority of the world's population, especially in Indonesia (Heryawan et al, 2014). In addition, rice is also used as a staple in the manufacture of food industries such as cakes and rice flour industries. According to the Central Statistics Agency Indonesia, the total production of milled dry unhulled rice in West Java reached 9,016,772.58 tons in 2020. If the production of milled dry unhulled rice is converted to rice based on the conversion rate of milled dry unhulled rice of 64.02%, the total rice production in West Java reached 5,772,537.81 tonnes in 2020.

Support from various sectors is needed to accelerate the pace of the economy and the movement of superior commodity production in logistics activities in West Java Province. The transportation sector is one of the sectors that can support economic activity. Transportation infrastructure has an important role, namely as a tool to encourage the development and movement of people and/or goods that arise as a result of the activity system (Dwiatmoko H, 2018). West Java Province at present has land transportation infrastructure (road and rail), sea transportation and air transportation infrastructure. The role of land transportation in West Java is quite dominant, especially to distribute industrial products to various regions, especially in Java, and raw materials through the Tanjung Priok sea port. In addition, land transportation is very much needed in serving the needs of the community, especially driving the economy in rural areas (Seda et al, 2020). With the existence of adequate transportation infrastructure, the movement of the flow of goods can reach processing locations or consumers so that it can increase the pace of the economy, including encouraging an increase in the commodity of rice in West Java Province. In addition, to determine the conditions of commodity distribution between regions, it is necessary to identify and analyze the movement patterns (origin-destination) of the main food-based commodities between regions (Yandra et al, 2016), which in this study examines the movement of rice commodity generation.

Based on this description, this study aims to analyze the movement of the rice commodity generation in West Java Province. The results of this study are expected to support the movement of goods effectively and efficiently, especially in an effort to increase rice commodities in West Java Province.

2. METHODS

This research uses descriptive quantitative research methods with secondary data analysis approach. Secondary data analysis is a method that utilizes secondary data as the main data source or from data that is clearly valid, obtained from certain agencies or institutions and then processed systematically and objectively. The location of the research was carried out in several districts/cities in West Java Province, including: Bandung City, Bogor City, Sukabumi City, Cirebon City, Bekasi City, Depok City, Cimahi City, Tasikmalaya City, Banjar City, Bandung Districts and West Bandung Districts. The location of the province of West Java is shown in Figure 1.

Figure 1. Map of West Java Province

Secondary data used in this study include data on the movement of rice commodity generation and data on rice production in West Java Province in 2016. The use of data in 2016 adjusted for the generation of rice commodity movement data obtained from the results of the last survey conducted by the Ministry of Transportation of the Republic of Indonesia in 2016. For rice production data obtained from the book of West Java Province published by the Central Statistics Agency (BPS) of West Java Province. The data sources in this study are detailed in Table 1.

Table 1. Secondary Data Type

No.	Data Types	Data Sources
1	Rice production data	Badan Pusat Statistik Provinsi Jawa Barat
2	Data on the rise of the movement of rice commodities in West Java Province	Kementerian Perhubungan Republik Indonesia

After data collection, an analysis of the movement of rice commodities in Indonesia was conducted out using a zone-based correlation-analysis model. This model uses the assumption that the generation and attraction of movement can be expressed as a function of several zone-based socioeconomic attributes (Putra, 2013) so that a relationship is obtained in numerical form and interrelated variables.

$$P = f(X1, X2, \ldots, XN) \quad (1)$$
$$A = f(X1, X2, \ldots, XN) \quad (2)$$

where:
P: generation movement A: attraction movement
X; zone-based socioeconomic attributes

The rice commodity movement generation model approach can use linear regression analysis. Linear regression analysis was conducted to determine the relationship between the dependent variable (y) and the independent variable (x) in a form of equation function (Bhirawa, 2020). The y variable in this study is the generation of the movement of rice commodities from the origin zone to the destination zone, in this study the city/regency zone in West Java Province. While the variable x is rice production in several cities/districts in West Java Province. Furthermore, a statistical test is carried out on the regression equation function to test the level of confidence. The statistical test used in the linear regression equation includes the correlation coefficient test to determine the relationship between the y and x variables, as well as the t-test and ANOVA test to determine the significance of the slope of the regression line. The level of importance used for the t-test and ANOVA test was 0.05.

3. RESULTS AND DISCUSSION

The movement pattern of rice commodities can be described by an origin-destination matrix and a line graph of desire. The origin-destination matrix is a two-dimensional matrix in which each row and column describes the movement of rice commodities in the origin and destination zones in the study area of West Java Province. The matrix of origin- destination for the movement of rice commodities in West Java Province is shown in Table 2.

Table 2. Matrix of origin-destination for rice commodity in West Java

	1	2	3	4	5	6	7	8	9	10	11	Generation (ton / month)
1	53	8	122	51	295	14	90	691	505	20	38	**1887**
2	28	1	14	27	7	2	87	33	21	5	4	**229**
3	491	18	278	110	106	97	207	747	282	38	418	**2792**
4	26	1	61	5	7	2	96	33	20	8	4	**263**
5	338	2	36	15	3	3	27	153	354	6	9	**946**
6	29	3	18	6	6	2	13	38	17	2	10	**144**
7	16	1	69	34	4	1	7	20	12	4	2	**170**
8	27391	460	5746	2535	5296	721	4422	4617	12951	1048	2481	**67668**
9	19080	165	3453	1486	11638	303	2578	12343	854	591	797	**53288**
10	309	9	330	955	81	16	323	309	245	14	42	**2633**
11	824	140	390	159	174	107	293	1349	454	57	81	**4028**
Attraction (ton / month)	**48585**	**808**	**10517**	**5383**	**17617**	**1268**	**8143**	**20333**	**15715**	**1793**	**3886**	**134048**

where: zone 1. Bandung, 2. Banjar, 3. Bekasi, 4. Bogor, 5. Cimahi, 6. Cirebon, 7. Depok, 8. Bandung Districts, 9. Bandung Barat Districts, 10. Sukabumi, 11. Tasikmalaya. Meanwhile, the distribution of movement can also be represented in the form of Desire Lines, which is a line that connects the center of a zone on a map, with a line thickness indicating the magnitude of the movement (Astutik, 2020). This study uses a desire line model with two constraints, namely a model with a boundary of movement generation and attraction. The line of desire for the movement of rice commodities between zones in West Java Province is shown in Figure 2.

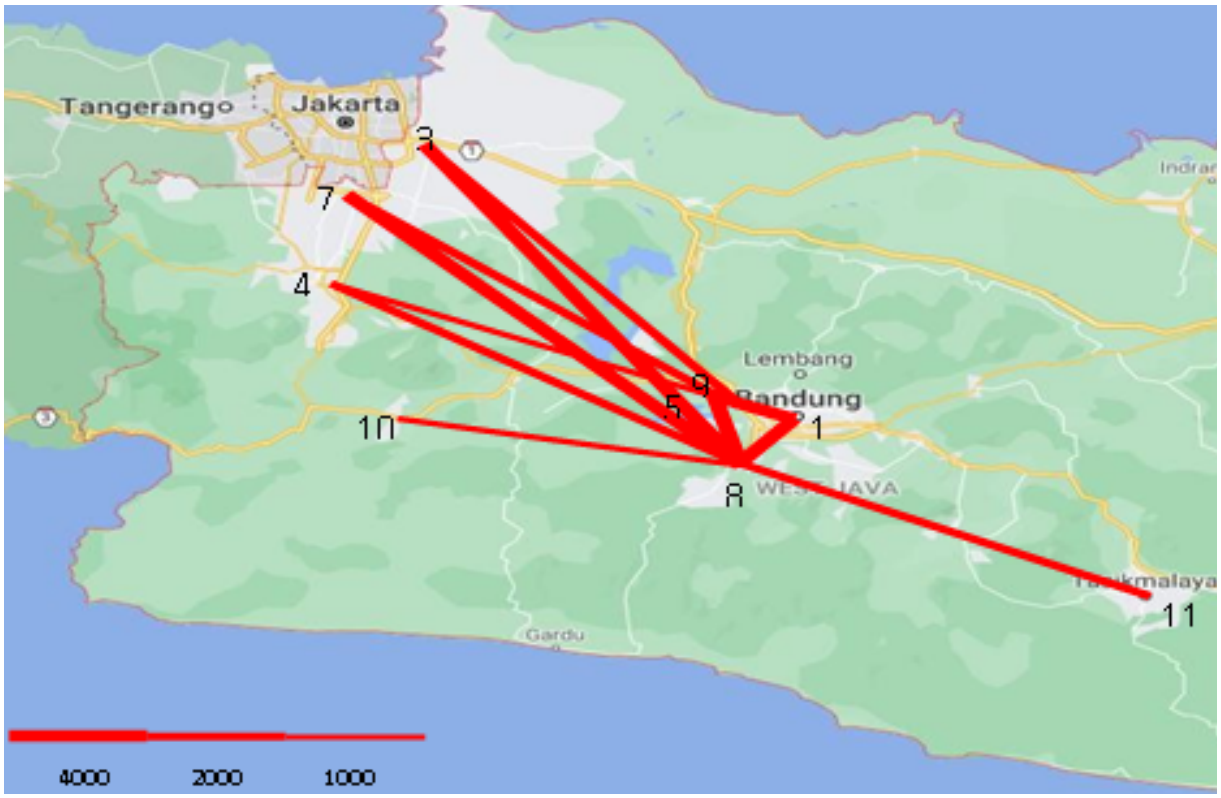

Figure 2. Case-study scenarios for simulation
(Source: Ivanov, D., 2020)

Figure 2. Shows the orientation of the movement of rice commodities which is depicted by the line thickness on a scale of 1000 tonnes/month, 2000 tonnes/month and 4000 tonnes/month (for the line of movement < 1000 tonnes/month not shown). Based on the desire line, it can be seen that the largest rice commodity movement occurs in the Bandung Districts and West Bandung Districts.

3.1. Linear Regression Analysis

The general equation for simple linear regression lines can be expressed in a function of the following equation:

$$y = a + b\,x \quad (3)$$

where:
y = The number of generated movement of goods

x = Amount of rice production
a = Constant of the regression line intercept on the y-axis
b = Regression line coefficient

The linear regression analysis approach in this study uses generated data from the movement and production of rice to West Java for several areas reviewed in 2016 shown in Table 3.

Table 3. Data for the Generation of Goods Movement and Rice Production

No.	Zone	Generation of Rice Commodity Movement (tonnes / month)	Rice Producti
1	Bandung	1887	10672
2	Banjar	2792	38143
3	Bekasi	229	3050
4	Bogor	263	3588
5	Cimahi	946	2241
6	Cirebon	144	2427
7	Depok	170	1475
8	Bandung Districts	67668	483316
9	Bandung Barat Districts	53288	205562
10	Sukabumi	2633	24473
11	Tasikmalaya	4028	65827

The results of linear regression analysis can be briefly seen in Table 4.

Table 4. Results of Linear Regression Analysis

Regression Statistics	
Multiple R	0,95
R Square	0,90
Adjusted R Square	0,89
Standard Error	7888,95
Observations	11

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	316,21	2706,42	0,12	0,91
Rice Production (ton)	0,16	0,02	9,19	7,17E-06

From the table above, the linear regression equation y = 316.21 + 0.16x can be generated. Based on this equation, it can be concluded that:

1. A constant value of 316.21 provides information that if the value of rice production (x) does not change, then the rise of the movement of rice commodities in West Java Province will increase by 316.21.

2. The variable x, which is the number of movements in rice production, has a coefficient value of 0.16, indicating that if there is a change in the amount of rice production by 1 unit, the generation of movement of rice commodities will experience a change of 0.16.
3. In the table above, it is known that the coefficient sign of the x variable equation is positive (+), it can be concluded that the greater the amount of rice production, the greater the generation of rice commodity movements.
4. The value of r2 in the results of the analysis above is 0.90 or 90%, which means that rice production is able to explain changes in the generation of rice commodity movements and the rest is explained by variables not found in the model by 10%.

The generation of rice commodity movements in West Java Province for 2018 and 2019 can be projected using the equation y = 316.21 + 0.16x based on rice production data at Central Statistics Agency Indonesia in 2021. The projection results are shown in the Table 5.

Table 5. Projections of the generation of rice commodity movements in West Java Province

No.	Zone	Rice Production (ton)		Rice Commodity Generation (tonnes/month)	
		2018	2019	2018	2019
1	Bandung	8244,51	7317,23	1635,33	1486,97
2	Banjar	31610,43	28744,69	5373,88	4915,36
3	Bekasi	2459,63	3045,2	709,75	803,44
4	Bogor	420,38	304,28	383,47	364,89
5	Cimahi	393,82	406,54	379,22	381,26
6	Cirebon	1767,92	1090,79	599,08	490,74
7	Depok	357,06	465,03	373,34	390,61
8	Bandung Districts	314869,16	344214,39	50695,28	55390,51
9	Bandung Barat Districts	170934,99	158988,38	27665,81	25754,35
10	Sukabumi	14436,5	15103,37	2626,05	2732,75
11	Tasikmalaya	46943,05	37041,64	7827,10	6242,87

3.2. Correlation Coefficient Test

The correlation coefficient test aims to determine whether the independent variable (x) and the dependent variable (y) have a level of the relationship or relation (Schober et al, 2018). The correlation coefficient follows the sign of the regression line coefficient (b) which ranges from -1 to +1. The relationship value of a good variable correlation between the x and y variables is ±0.5–1.0. The correlation test between the x and y variables can be calculated using the following formula.

$$\sqrt{\frac{(\Sigma) + (\Sigma) - ()}{(\Sigma)^2 - ()^{-2}}}$$

where:

r = Correlation coefficient
n = Number of regions under review
$\sum$ = Total value of the variable y
$\sum^{-}$ = The average of the y variable
a = Constant of the regression line intercept on the y-axis
b = Regression line coefficient

The results of the correlation test that have been carried out are shown briefly in Table 6.

Table 6. Correlation Matrix

	Generation of Movement (y)	*Rice Production (x)*
Commodity Rice (tonnes/month)	1	
Rice Production (ton)	0,951	1

Judging from the correlation matrix above, it can be seen that the correlation value between the variables y and x is 0.951. Because the correlation coefficient is ≥ 0.5, it means that the relationship between the generation of rice commodity movements (y) and rice production (x) has a strong relationship.

3.3. Uji-t

T-test or so-called partial testing is done to test each independent variable (x) on the dependent variable (y) (Wohon et al, 2017). The t-test is done by comparing the t-count and t-table values in the t distribution table. Based on the results of the analysis in Table 4, it is known that the rice production variable (x) has a tcount value of 9.19 which is greater than the ttable value of 1.83 and the probability is 7.17E-06 <0.05 so that it can be interpreted that the variable amount of rice production has a positive effect and significant to the variable generation of rice commodity movements.

3.4. ANOVA Test

ANOVA test or simultaneous testing is a test that reflects the effect of the independent variables together having a significant effect on the dependent variable (Larson, 2008). In this study, it can be seen that rice production has an influence on the generation of the movement of rice commodities in West Java Province, as shown in the Table 7.

Table 7. Results of Simultaneous Influence Test Analysis

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	5,26E+09	5,26E+09	84,53	7,17E-06
Residual	9	5,60E+08	6,22E+07		
Total	10	5,82E+09			

The value of Fcount in Table 7. is 84.53> 5.12 (Ftable) and a significant value of 7.17E-06 <0.05 provides information that overall the variable amount of rice production has an effect on the variable generation of rice commodity movements in West Java Province.

4. CONCLUSION

Based on the results of the analysis of fish production on the flow of goods in West Java Province that has been carried out, several conclusions can be drawn as follows:

1. Linear regression analysis produces the equation function y = 316.21 + 0.16x. Based on the positive sign (+) on the variable coefficient x, it can be concluded that the greater the amount of rice production, the greater the generation of rice commodity movements in West Java.
2. From the results of the correlation coefficient test with a value of ≥ 0.5, it can be concluded that the generation of rice commodity movements with rice production has a strong relationship.
3. Based on the results of statistical tests, including the t-test and ANOVA test, it can be seen that the amount of rice production has a positive and significant linear effect on the generation of movement of rice commodities in West Java.

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