*Original Research Article*

# Term Trade Analysis of Fisher in Karimunjawa Village, Jepara


## ABSTRACT

Traditional fishermen are the most dominant fishermen in Indonesia. Unfortunately, it is not directly proportional to fishing technology, capital, and available markets. Uncertain revenue from fishing causes fishermen communities find it difficult to meet their subsistence needs. This study aims to determine the term of trade of fishers and the factors that influence the term of trade of fishers in Karimunjawa Village, Jepara District. Data collection was carried out from August 31, 2021, to September 11, 2021, in Karimunjawa Subdistrict, particularly on the Coast of Karimunjawa Village during the transitional season. The formulation of Fisher's Term of trade Analysis as a tool in measuring the level of welfare. The research method used in this study is a survey method with the list of questions presented in the questionnaire. This research uses an accidental sampling technique in taking sample data. The total respondents used in this study amounted to 45 samples based on the Slovin formula with 87,5%. The results showed that the term of trade of fishers in Karimunjawa Village is 1.026 (FTT > 1); this indicates that the average fishers can meet their subsistence needs. And the factor that affects the term of trade of fishers is the revenue of fishery products (X3) with a significance value of 0.002.



*Keywords: Term of trade; fishers; revenue; expenditure; Karimunjawa village.*




## 1. INTRODUCTION

Traditional fishermen are the most dominant fishermen in Indonesia. Unfortunately, it is not directly proportional to fishing technology, capital, and available markets. Uncertain revenue from fishing causes fishermen communities find it difficult to meet their subsistence needs [1]. As an archipelago surrounded by vast oceans, Karimunjawa Village has considerable potential for its capture of fisheries products. Based on data from Karimunjawa Coastal Fishery Port Service (2021), it is known that the catch of Karimunjawa Beach reached 53 tons in March 2021. The average Karimunjawa fisher is a traditional fisher with a boat size of less than 5 GT. The fishing gear commonly used by locals is conventional, such as handline, trolling, speargun, trap, *barangjang*, and *Bagan perahu*. This research will focus on fishers using handline and trolling fishing gear. In Karimunjawa Village, there are 152 active fishers that use handline and trolling fishing gear. In their fishing operations, each fishing boat has two fishing gears (handline and trolling), which are operated alternately when the ship is sailing.

From the social-economic perspective, the fishers' community is very susceptible. It is due to a high dependence on available natural resources; if these natural resources are not in good condition, fishers will find it challenging to meet their daily needs [2]. Therefore, it can be said that the life of fishers communities is daily-based situation and can be expressed through fishing efforts that are influenced by seasons, natural conditions, limited capital, and low levels of education, resulting in weak socio-economic conditions [3].

The concept of the fisher's term of trade in this study is an indicator in measuring the ability of fishers' families to meet their subsistence needs. Therefore, a fishers

term of trade (FTT) is the subsistence term of trade. FTT assumes that all captured fisheries revenues are exchanged with the non-fishery sector, where the non-fishery goods are used for fishers' families' consumption [4].

Factors that affect fishers' income consist of physical and non-physical factors. Physical factors include environmental conditions, fishing technology, fishing locations, and capital, while non-physical aspects relate to seasons, age of fisher, fishers' education, and fishing experience [5]. In this study, several factors that will be tested to determine their effect on the trade of fishers are work experience by fisher, working time as an fisher (trip), the revenue of fishery products, and the household expenditure of the fisher. This study was conducted to determine the term of trade of fishers and the factors that influence the term of trade of fishers in Karimunjawa Village, Jepara District.

## 2. METHODS

Geographically, Karimunjawa is located at coordinates 110° 27′ 32″ South Latitude; 5° 49′ 9″ East Longitude and is situated in Fishery Management Area 712 (WPP 712). From an administrative point of view, Karimunjawa Village is one of several villages located in the Karimunjawa Subdistrict. Karimunjawa Subdistrict is included in the Jepara District area, located about 45 miles northwest of Jepara City. Karimunjawa Subdistrict has a territorial area of 107.225 ha, with 100,105 ha of the ocean and 7,120 ha are land [6]. Based on a study from WCS (Wildlife Conservation Survey) Karimunjawa [7]. Karimunjawa is one of the artisanal fishing areas or small-scale fisheries, where traditional fishing systems still dominate fishing activities. This can be seen from the relatively small fishing vessels, short fishing trips, and relatively small capital and labor required [8].

The analysis on the term of trade of fisher in Karimunjawa Village, Jepara District, was carried out from August 2021 to February 2022. Data collection was carried out from August 31, 2021, to September 11, 2021, in Karimunjawa Subdistrict, more precisely on the Coastal Coast of Karimunjawa Village, during the transitional season. This condition indicates an increase in ocean warming compared to the eastern monsoon.

The research method used in this study is a survey method with the list of questions presented in the questionnaire. Sources of data collected in this study are primary data and secondary data. Primary data is data obtained directly through interviews with respondents and using a list of questions (questionnaires) as a tool. Secondary data is data obtained from related agencies.This research uses an accidental sampling technique in taking sample data. Accidental sampling is a technique by chance that takes a sample of anyone who happens to meet the researcher at the research location [9]. The total respondents used in this study amounted to 45 samples based on the Slovin formula.

### 2.1 Data Analysis

Analysis of the data used in this study, including:

#### 2.1.1 Fisher Term of trades

Fisher's term of trade is a tool used to see the welfare of fisher communities in meeting their subsistence needs [6]. If the fisher's term of trade in an area is more than one, the fisher has been able to meet his subsistence needs. If the fisher's term of trade is around one, the fisher's family can only meet their subsistence needs and are very vulnerable if there are other needs other than subsistence needs. On the other hand, if the fisher's term of trade in an area is less than one, the fisher's family has low purchasing power to meet their daily needs and is very vulnerable to household budget deficits [10].

The formulation of Fisher's Term of trade Analysis as a tool for measuring the level of welfare according to Singer (1950) [6] is as follows:

$$FTT : \frac{\sum P_{xi} Q_{xi}}{\sum P_{yi} Q_{yi} + \sum P_{yj} Q_{yj}}$$

**Information:**

FTT : Fisher's Term of trade
Pxi : Fishery Commodity Price (IDR)
Qxi : Fishery Commodity Quantity (type)
Pyi : Production Input Price (IDR)
Qyi : Production Input Quantity (indicator)
Pyj : Price of Household Expenditure (IDR)
Qyj : Quantity of Household Expenditure (indicator)

**The following conclusions can be drawn:**

FTT > 1 means prosperous
FTT = 1 means relatively prosperous, as well as;
FTT < 1 means less prosperous

**2.1.2 Factors affecting the term of trade**

Generally, regression analysis is a method used to determine the dependence of the dependent variable on one or more independent variables. In this study, multiple linear regression analysis was used to determine the factors that could affect the term of trade of fisher in Karimunjawa Village, Jepara District; the following model was used:

$$Y: a + B1X1 + B2X2 + B3X3 + B4X4 + e$$

**Information:**

Y : FTT number.
a : Constant.
X1 : Work Experience (years).
X2 : Outpouring of work as a fisher (trips or days).
X3 : Fishery Income (IDR).
X4 : Fisher's Household Expenditure (Rp).
B1-B4 : Coefficient Value of each variable.
E : Error. Using Ordinary Least Square (OLS) method.

**2.1.3 Statistical performance test**

*2.1.3.1 Normality test*

The normality test in statistical performance is used to measure the fair value of the data used in the study [7]. To find out whether the data used has met the normality test, it can be seen from the data points on the normal P-Plot that are spread around the diagonal line and follow the direction of the diagonal line. Meanwhile, data that does not meet the assumption of normality has characteristics distributed unevenly (away from the diagonal line) and do not follow the direction of the diagonal line [10].

*2.1.3.2 Multicollinearity Test*

The multicollinearity test is a testing stage that aims to determine whether or not a significant correlation between the independent variables in the multiple linear regression model. A good regression model is a model that does not correlate with the independent variables [8]. To know the presence or absence of multicollinearity in this regression model, it can be understood by the Variance Inflation Factors (VIF) method. If the tolerance value is close to 1 with the VIF value around the number 1 and does not exceed the number 10, it can be stated that the regression model in this study does not have multicollinearity.

*2.1.3.3 Heteroscedasticity Test*

The heteroscedasticity test is used to detect the presence or absence of variance inequality from residuals for all observations in the regression model. If there is a deviation in the heteroscedasticity test, then the multiple linear regression model can be inaccurate. Suppose the heteroscedasticity test points on the

scatterplot between standardized predicted value (ZPRED) and studentized residuals (SRESID) show a spread of data and do not form a particular pattern. In that case, it can be ascertained that the multiple linear regression model is homoscedasticity [8]. The method used to detect the presence of heteroscedasticity is to see whether or not there is a pattern formed on the scatterplot graph between the residual value and the standardized Z prediction.

*2.1.3.4 T-test*

The t-test was used to test each independent variable's ability to explain the dependent variable on the regression model. The t-test was carried out by comparing the t-count with the t-table with a confidence level of 5% (0.05). If the t count is greater than the t-table, then H0 is rejected. However, if the t-count is smaller than the t table, then H1 is rejected [9].

*2.1.3.5 F-test*

The F test is a test model that aims to determine the effect of all independent variables simultaneously on the dependent variable. The test was conducted using a confidence level of 5% (0.05). If the calculated F is greater than the F table, then H0 is rejected, but if the computed F is smaller than the F table, H0 is accepted [9].

**2.1.3.6 Goodness level test ($R^2$)**

The coefficient of determination ($R^2$) is a test model used to measure how big the percentage of the ability of the independent variable (independent) can explain the dependent variable in the regression model. In the coefficient of determination, the value of $R^2$ is between 0 and 1. Suppose the value of $R^2$ shows a small number and is close to 0 (zero). In that case, the independent variable in the regression model cannot explain the variation in the dependent variable. On the other hand, if the value of $R^2$ is close to 1 (one), the independent variable can explain 100% of the variation in the dependent variable.

## 3. Result and Discussion

### 3.1 Characteristics of Fisher in Karimunjawa Village

In order to find out the term of trade of fisher and the factors that influence it, data on the respondents' characteristics were needed to know the respondents' background and condition. The characteristic data collected are age, education, number of family members, work experience as a fisher, working time, revenue of fishery products, and household expenditure.

#### 3.1.1 Age

From the data in Table 1, it can be seen that the average age of fisher in Karimunjawa Village is 42.8 years, with the fisher with the highest age in this study aged 59 years and the youngest fisher being 25 years old. Even so, fisher in Karimunjawa Village is dominated by fisher at the age of 45 years.

Age is an important indicator and is directly related to a person's productivity in carrying out his work. A person at productive age has a higher level of productivity because people who are not of a fertile age tend to have weaker and limited energy [11]. The productive age group is in the age range of 15 to 55 years [12]. Based on the study's results, fisher in Karimunjawa Village is included in the productive age group.

#### 3.1.2 Education

A fisher's education can be seen from the last level of education. Education is directly related to the quality of human

resources because the higher person's education, the rate that person will increase as well [13].

In Karimunjawa Village, the fisher's average level of education is 1.3 and is dominated by fishers with an elementary education level (Table 2). From these data, it can be seen that the average fisher in Karimunjawa Village has a low level of education. The most common reason fisher drop out of school is that fisher's parents cannot afford to pay for their children's education [14]. In addition, the low level of education can be caused by low motivation when they were children because they were more interested in going to the sea with their parents and earning income [15].

### 3.1.3 Total of Family members

The number of family members is one of the essential factors in determining the social characteristics of a fisher; this is because the more family members, the more family needs will also increase [16]. Based on the data obtained (Table 3), family members of fisher in Karimunjawa Village are dominated by families with one wife, two children and the fishermen itself (4 family members). The data can be seen in Table 3.

### 3.1.4 Work Experience as Fisher

Experience is one of the essential components that can affect the results of one's work. The results of a fisher's work can be seen from the length of the work period. Someone who has been at sea longer has a greater chance of getting a better catch [17]. Fisher in Karimunjawa Village is dominated by experienced fisher with an average work experience of 24 years, as shown in Table 4. In addition, the fisher in Karimunjawa Village has a maximum work experience of 40 years. The other with the minimum knowledge of fishing activities is one year of work.

**Table 1. Distribution of age**

| No | Parameter | Value (Year) |
|---|---|---|
| 1 | Maximum Age | 59 |
| 2 | Minimum Age | 25 |
| 3 | Average Age | 42.8 |
| 4 | Median Age | 44 |
| 5 | Mode Age | 45 |

**Table 2. Distribution of education**

| No | Parameter | Value |
|---|---|---|
| 1 | Maximum Education | 3 |
| 2 | Minimum Education | 0 |
| 3 | Average Education | 1.3 |
| 4 | Median Education | 1 |
| 5 | Mode Education | 1 |

*Note: 0 (Un-educated); 1 (Primary School); 2 (Junior High School); 3 (Senior High School); 4 (Bachelor).*

**Table 3. Distribution of total family members**

| No | Parameter | Value |
|---|---|---|
| 1 | Maximum Family Member | 6 |
| 2 | Minimum Family Member | 1 |
| 3 | Average Family Member | 3.7 |

| | | |
|---|---|---|
| 4 | Median Family Member | 4 |
| 5 | Mode Family Member | 4 |

**Table 4. Distribution of Work Experience**

| No | Parameter | Value (year) |
|---|---|---|
| 1 | Maximum Work Experience | 40 |
| 2 | Minimum Working Experience | 1 |
| 3 | Average Working Experience | 24 |
| 4 | Median Working Experience | 25 |
| 5 | Mode Working Experience | 25 |

### 3.1.5 Working Time

Working time is one of the essential factors of production because the amount of production output is very dependent on how often or how long someone does work. The higher the effort of the fisher in catching, the more the catch will be [18]. In this study, the work time is calculated in trips per month.

The research (Table 5) shows that the average fisher in Karimunjawa Village has an outpouring working time (trips/month) of 25.2 trips and is dominated by fisher who catch 26 times a month. Based on the interviews, fisher in Karimunjawa Village set aside at least one day a week (on Friday on average), which is designated for resting and worship.

### 3.1.6 Revenue of the fishery sector

Revenue is one of several components that can describe the level of welfare of a household. Based on the activities carried out, revenue is the result of the business received by a person or household as a result of the economic activities they carry out [19]. In this study, the receipt of fishery products results from multiplying the average trip income with the number of trips in one month. Based on Table 6, it is known that the acceptance of fisher in Karimunjawa Village has the highest value of Rp. 27,534,000, with an average of Rp. 15,616,922, and the smallest is Rp. 4,788,000

### 3.1.7 Household Expenditure

Household expenditure is the amount paid by the fishing family to meet the household's needs. Household spending is usually divided into two broad categories: food and non-food [17]. The household expenditure of fishers in Karimunjawa Village is divided into six indicators, namely: basic food costs, electricity costs, water costs, health costs, education costs, and transportation costs. Data regarding household expenditures for fishers in Karimunjawa Village can be seen in Table 7.

Based on the study's results (Table 7), the largest household expenditure of fisher in Karimunjawa Village shows the figure of Rp. 5,650,000, the lowest household expenditure is Rp. 900,000, with an average fisher household expenditure of Rp. 2,459,000.

**Table 5. Distribution of Working Time**

| No | Parameter | Trip per month |
|---|---|---|
| 1 | Maximum Working Time | 28 |
| 2 | Minimum Working Time | 14 |

| | | |
|---|---|---|
| 3 | Average Working Time | 25.2 |
| 4 | Median Working Time | 26 |
| 5 | Mode Working Time | 26 |

**Table 6. Distribution of revenue in fishery sector**

| No | Parameter | Value (IDR) |
|---|---|---|
| 1 | Maximum Revenue | 27.534.000 |
| 2 | Minimum Revenue | 4.788.000 |
| 3 | Average Revenue | 15.616.822 |
| 4 | Median Revenue | 15.834.000 |
| 5 | Mode Revenue | 19.578.000 |

Source: Primary data (2021)

**Table 7. Distribution of household expenditure**

| No | Parameter | Value (IDR) |
|---|---|---|
| 1 | Maximum Expenditure | 5.650.000 |
| 2 | Minimum Expenditure | 900.000 |
| 3 | Average Expenditure | 2.459.000 |
| 4 | Median Expenditure | 1.890.000 |
| 5 | Mode Expenditure | - |

Source: Primary data (2021)

## 3.3 Fisher term of trades

Fisher's term of trade is a tool or indicator used to see the welfare of fishing communities in meeting their subsistence needs [20]. If the fisher's term of trade is more than one, the fisher has been able to meet his subsistence needs. If the fisher's term of trade is around one, the fisher's family can only meet their subsistence needs, and they are very vulnerable if there are other needs than subsistence needs. On the other hand, if the fisher's term of trade is less than one, the fisher's family has the low purchasing power to meet their daily needs, and it is very vulnerable to household budget deficits; therefore, it is necessary to increase fisher's household income to meet their subsistence needs [21]. The data regarding the fisher trade term in Karimunjawa Village can be seen in Table 8.

Based on the data obtained, the term of trade of fisher in Karimunjawa Village in the transition season (August – September 2021) has the highest value of 1,712 with the lowest value of 0.389 and an average of 1,026. This shows that most of the fisher in Karimunjawa Village have sufficient purchasing ability to meet their subsistence needs but are very vulnerable if there are other needs other than their subsistence needs. When compared with BPS data (2020) regarding the term of trade of fisher in Central Java, FTT in Karimunjawa Village has a slightly lower value than Central Java FTT in the same month (September 2020), which is 1.03 in Central Java and the amount of FTT in Karimunjawa Village only 1,026.

**Table 8. Distribution of terms of trade**

| No | Parameter | Value (IDR) |
|---|---|---|

| | | |
|---|---|---|
| 1 | Maximum Term of trade | 1,712 |
| 2 | Minimum Term of trade | 0,389 |
| 3 | Average Term of trade | 1,026 |
| 4 | Median Term of trade | 1,030 |
| 5 | Mode Term of trade | - |

### 3.4 Analysis of Factors Affecting Term of trades

To find out the factors that affect the term of trade of fisher in Karimunjawa Village, multiple linear regression analysis was used with statistical tests using SPSS 25 software and a 95% confidence level. Furthermore, the classical assumption test was carried out with a normality test, multicollinearity test, heteroscedasticity test, partial hypothesis test (t-test), f-test, and coefficient of determination (R2).

In this study, the fisher's term of trade was used as the dependent variable (Y), and other variables such as work experience, working time, fishery income, and fisher's household expenses were used as independent variables. The results of the analysis can be seen in Table 9; The following is the regression model used:

$$\boldsymbol{Y = -8.558 - 0.025X_1 - 0.614X_2 + 0.677X_3\text{-}0.051X_4}$$

**Table 9. Regression results of the effect of variable inputs on term of trades**

| Variabel | Coefficient | Description |
|---|---|---|
| LogX1 | 0,025 | Work Experience |
| LogX2 | -0,614 | Working Time |
| LogX3 | 0,677 | Revenue of Fishery Sector |
| LogX4 | -0,051 | Household Expenditure |

#### 3.4.1 Normality test

The results of the normality test in this study can be seen in the following Normal Probability Plot Figure 1. It can be seen that the value of Y (FTT), which is a fixed variable, has an even distribution of points and follows a diagonal line. Suppose the data collected has a spread around the diagonal line and follows the direction of the diagonal line. In that case, the data is normally distributed, and the regression model meets the normality assumption. On the other hand, if the data is spread far from the diagonal line and tends not to follow the diagonal direction, then the data is not normally distributed, and the regression model does not meet the assumption of normality [24].

#### 3.4.2 Multicollinearity test

The VIF value in this study can be seen in Table 10. Based on these data, it can be seen that the VIF value in this study ranges from 1.495 to 2.359, with a Tolerance value of 0.424 to 0.669. if the tolerance value in a study has a value of > 0.100 with a VIF value of < 10, then there is no correlation between the independent variables and no multicollinearity in the regression model. Thus, this research can fulfill the assumption of multicollinearity [22].

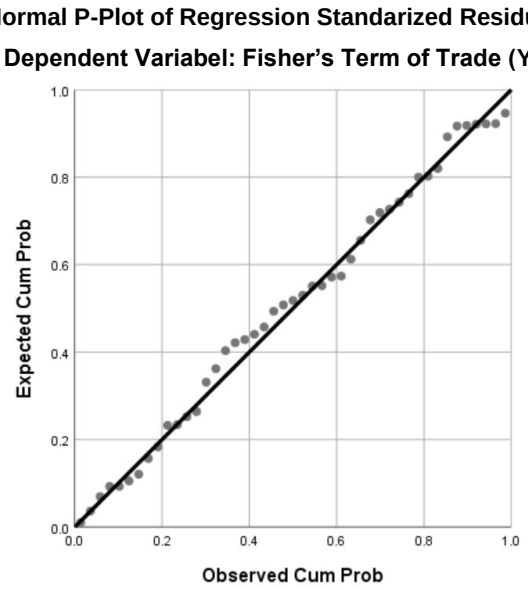


Fig 1. Fisher p-plot chart

**Table 10. Fisher *Tolerance* dan *Variance Inflation Factor* (VIF) Value**

| Independent Variable | *Tolerance* | *Variance Inflation Factor* (VIF) |
|---|---|---|
| LogX1 | 0,424 | 2,359 |
| LogX2 | 0,558 | 1,792 |
| LogX3 | 0,473 | 2,115 |
| LogX4 | 0,669 | 1,495 |

### 3.4.3 Heteroscedasticity test

The results of the heteroscedasticity test can be seen from the scatterplot distribution plot between the residuals and the predictive value on the standardized dependent variable. The results of the heteroscedasticity test in this study can be seen in the scatterplot image (Figure 2):

Based on the graphic, it can be seen that the distribution of points on the scatterplot does not form a clear pattern. A regression model can be homoscedastic if there is no clear pattern on the scatterplot (such as a wavy, widening, or narrowing pattern); besides that the points will spread at the top and bottom of the number 0 on the Y-axis. That way, the regression model in this study does not occur heteroscedasticity and can meet the assumption of heteroscedasticity [8].

### 3.4.4 T-test

When viewed from the significance value, the X3 variable, the acceptance of fishery products, is the only variable with a significance value smaller than the confidence level (0.05), which is 0.002. If the value of Sig < confidence level (0.05), then the independent variable (X) partially influences the fixed variable (Y) [8]. The t-count value reinforces this in X3, which shows a more significant number (3.341)

than the t-table (2.021). If the value of t arithmetic > t table, then the independent variable (X) partially affects the fixed variable. This situation means that the variables X1, X2, and X4 do not affect the dependent variable, while the independent variable X3 partially affects the dependent variable (Y) [8].

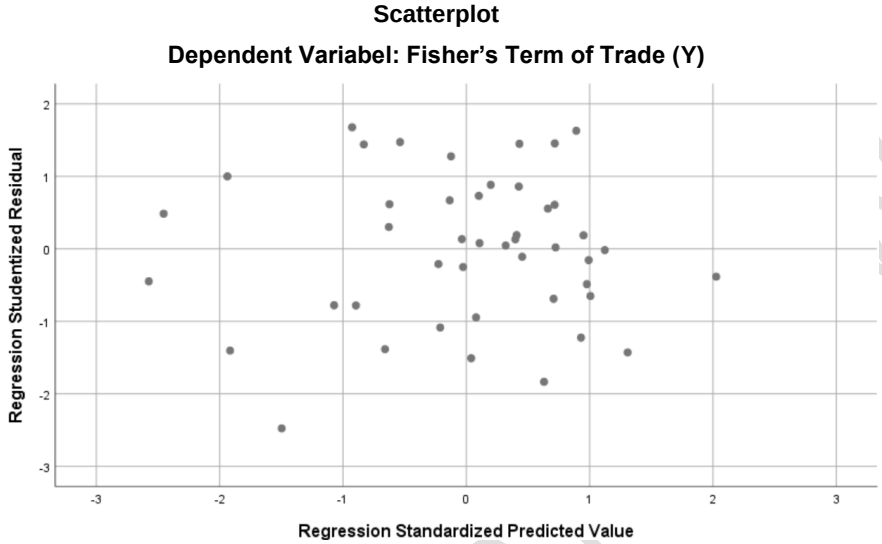


**Fig 2. Fisher heteroscedasticity**

### 3.4.5 F-test

In this study, the f-test was used to determine the ability of all independent variables (together) to influence the fixed variables. From these results in Table 12, it can be seen that the significant value in the regression model shows the number 0.005. If the value of Sig <0.05 then the independent variable (X) simultaneously influences the fixed variable (Y). This means that the variables X1, X2, X3, and X4 influence the dependent variable (Y) [8].

**Tabel 11. Traditional fisher coefficient table**

| Model | Unstandarized Coefficients | Std. Error | t | Sig. | Coelinearity Statistics | |
|---|---|---|---|---|---|---|
| | | | | | Tolerance | VIF |
| (Constant) | -8,558 | 3,137 | -2,728 | 0,009 | | |
| Work Experience | 0,025 | 0,097 | 0,262 | 0,795 | 0,424 | 2,359 |
| Working Time | -0,614 | 0,572 | -1074 | 0,289 | 0,558 | 1,792 |
| Revenue of Fishery Sector | 0,677 | 0,293 | 3,341 | 0,002 | 0,473 | 2,115 |
| Household Expenditure | -0,051 | 0,100 | -0,513 | 0,611 | 0,669 | 1,495 |

**Tabel 12. Traditional fisher anova table**

| Model | Sum of Squares | df | Mean Square | F | Sig |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| Regression | 1,383 | 4 | 0,346 | 4,336 | 0,005[b] |
| Residual | 3,189 | 40 | 0,080 | | |
| Total | 4,752 | 44 | | | |

**Tabel 13. Traditional fisher summary table**

| Model | R | R Square | Adjusted R Square | Std. An error in the Estimate | Durbin-Watson |
|---|---|---|---|---|---|
| 1 | 0,550[a] | 0,302 | 0,233 | 0,28237 | 1,901 |

### 3.4.6 Goodness level test ($R^2$)

The value of $R^2$ ranges between 0 and 1; if the value of $R^2$ in a study shows a number close to 0, it means that the independent variable used cannot explain the variation of the dependent variable. There are other variables outside the model that can explain; on the contrary, if the value of $R^2$ is close to 1, then the independent variable in the regression model can define the dependent variable. As seen from the Table 13, it can be seen that the value of R2 in this study obtained a result of 0.302; this shows that the variables X1, X2, X3, and X4 used to have an influence of 30.2% in explaining the fixed variables, while 69.8% others are influenced by other variables not found in the regression model.

## CONCLUSION

Based on the results of the study, it can be concluded that: The term of trade of fisher in Karimunjawa Village has an average value of 1.026 (FTT > 1); this shows that the average fisher can meet their subsistence and sailing needs . And the factor that affects the term of trade of fisher in Karimunjawa Village is the revenue of fishery products (X3) with a significance value of 0.002. The variables that used in this study have 30.2% in explaining the fixed variables.

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