Fisheries Journal, 14(2), 713-721 (2024)
http://doi.org/10.29303/jp.v14i2.827

ANALYSIS OF FISHERY PRODUCTION FACTORS IN KUPANG CITY (CASE STUDY: FRESHWATER FISH CULTIVATION IN KOTA RAJA AND ALAK DISTRICTS)

Analisis Faktor-Faktor Produksi Perikanan Di Kota Kupang (Studi Kasus: Budidaya Ikan Air Tawar Di Kecamatan Kota Raja Dan Kecamatan Alak)

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(Received May 14th 2024; Accepted June 10th 2024)

ABSTRACT

The study focuses on the analysis of the production factors that influence the sustainability of fish farming in the Raja District and Kupang District. This research aims to provide knowledge about the efficiency of fishing production and sustainability status. The research methods used are descriptive and analytical, involving the study of literature, observation, and statistical testing to analyse the relationship between the factors of production and sustainability of fish Lele (Clarias sp) and Nila (Oreochromis Niloticus). The analytical methods used include the Cobb-Douglas Function using SPSS version 25. The analysis involved testing classical assumptions to determine data distribution, testing regression models to understand the influence of production factors on fish production, and then analysing the sustainability of freshwater fish farming, looking at economic, social, and environmental aspects. The findings show that the regression model used shows a high degree of confidence in explaining the relationship between and the influence of independent variables (X1,X2,X3,X4,X5) on the dependent variable (Y). Based on research conducted on the sustainability of freshwater fish farming in Raja City and Kupang Alak City districts, it can be concluded that production factor analysis provide useful insights for stakeholders, policymakers, and researchers. These studies have shown that the efficiency of production factors can have a significant impact on various aspects of sustainability, including the social and environmental dimensions.

Keywords: Aquaculture, Freshwater Fish, Efficiency, Production Factors

ABSTRAK

Studi ini berfokus pada analisis faktor-faktor produksi yang mempengaruhi keberlanjutan budidaya ikan di Kecamatan Kota Raja dan Kecamatan Alak Kota Kupang. Penelitian ini bertujuan untuk memberikan pengetahuan tentang efisiensi produksi perikanan. Metode penelitian yang digunakan adalah deskriptif dan analitis, yang melibatkan studi literatur, pengamatan, dan pengujian statistik untuk menganalisis hubungan antara faktor-faktor produksi ikan Lele (Clarias sp) dan Nila (Oreochromis Niloticus). Metode penelitian yang digunakan ; metode deskriptif dan analitis, dengan pengumpulan data studi literatur, observasi, dan

wawancara. Metode analisis yang digunakan meliputi Efisiensi Faktor Produksi (Fungsi Cobb-Douglas) menggunakan SPSS versi 25 Analisis melibatkan menguji asumsi klasik untuk menentukan distribusi data, pengujian model regresi untuk memahami pengaruh faktor-faktor produksi pada produksi ikan. Temuan menunjukkan bahwa model regresi yang digunakan menunjukkan tingkat kepercayaan yang tinggi dalam menjelaskan hubungan antara dan pengaruh variabel independen (X1,X2,X3,X4,X5) terhadap variabel dependen (Y), Berdasarkan penelitian yang dilakukan tentang keberlanjutan budidaya ikan air tawar di Kecamatan Kota Raja dan Alak Kota Kupang, dapat disimpulkan bahwa analisis faktor produksi memberikan wawasan bermanfaat bagi stakeholder, pembuat kebijakan, dan peneliti. Studi ini telah menunjukkan bahwa efisiensi faktor produksi dapat memiliki dampak yang signifikan pada berbagai aspek keberlanjutan, termasuk dimensi sosial dan lingkungan.

Kata Kunci: Budidaya, Ikan Air Tawar, Efisiensi, Faktor-faktor Produksi

INTRODUCTION

Cultivation areas are being developed to develop economic areas. Fisheries cultivation in Kupang City relies mostly on land (freshwater) fisheries such as catfish, tilapia, catfish, pomfret and goldfish. Catfish (*Clarias* sp.) and tilapia (*Oreochromis niloticus*) are fish products for consumption. Most of the freshwater fish cultivated in Kupang City are cultivated by business groups. However, cultivation itself can be carried out relatively by all levels of society, growth and development is fast, marketing is easy, business capital is small, and the cultivation period is relatively short. Freshwater fisheries cultivation in Kupang City in 2017 as many as 20 groups carried out cultivation businesses that almost achieved a 100% percentage of business success, in terms of continuous harvesting so that it had a significant impact on group and individual income (CCD-IFAD PIU Kupang City, 2017). Freshwater fish cultivation is considered effective and efficient in its development as a cultivation technology in reducing the value of the Food Conversion Ratio (FCR). The environmentally friendly nature of freshwater fish farming is still lacking.

The resulting impact on the aquatic environment, such as organic material pollution, the spread of pathogens and the efficiency of land and water use, tends to decrease, while energy input, the need for materials and equipment increases, this is something that has the potential to contribute to a potential decline in global environmental quality. The way to determine the efficiency of freshwater fish cultivation in the Kupang City area, specifically in the small fish cultivator group, requires a sustainable approach with the concept of production efficiency and sustainability status to assess the environmentally friendly nature of the freshwater fish cultivation system. Efficiency aims to reduce resource consumption so that it is not excessive and has an impact on the environment. Closely related to sustainability, measuring production efficiency in the business world is an important method, in the reality of entrepreneurship to achieve sustainability, even though in research (Paulus, 2023) freshwater fish cultivation in Kupang City is still sustainable, with social and cultural aspects having the highest sustainability value However, this is an indicator to see the supporting capacity of the industrial/business environment.

Assessment of production efficiency and sustainability status must be included in the sustainable or very sustainable category. After knowing the production efficiency value of the production factors using the Cobb-Douglas function, this research will measure and see the production efficiency value of freshwater fish cultivation, namely, catfish (*Clarias* sp.) and tilapia (*Oreochromis niloticus*) in Kupang City.

RESEARCH METHODS

Time and Place

This research will take place from January to March 2024. The determination of areas in this research was determined deliberately (*purposive method*), namely the sampling technique according to (Sugiyono, 2019) involves taking samples according to the desired criteria and using certain considerations to be able to determine the number of samples required. will be checked. The locus in this research is in Kupang City, East Nusa Tenggara; Kota Raja and Alak Districts.

Research methods

The research method used in this research is descriptive and analytical. The descriptive method is intended to describe systematically, realistically and accurately for a particular population or region various characteristics and factors (Santoso, 2012). The analysis method includes hypothesis testing and in-depth explanation of relationships (Nazir, 2005). Using the Slovin Formula to determine the sample is as follows:

$$n = \frac{N}{1+N\,(e)^2}$$

$$n = \frac{311}{1+\,311\,(0{,}1)^2}$$

$$n = 75.6$$

Source : Sugiyono, DR (2013).

The results of the Slovin formula calculation were that 75 respondents used the variables: output (Y), land area (X1), number of seeds (X2), amount of feed (X3), selling price (X4), labor wages (X5). The functional relationship between input and output (production factors and output) uses the Cobb-Douglas function.

The descriptive method is obtained from literature studies and observations at the research location, while the analytical method uses Production Factor analysis (Cobb-Douglas function) with IBM SPSS *Statistics Version* 25. The results of observations and interviews in the cultivation business process will become primary data, and secondary data by searching information through literature study.

RESULTS

Data Analysis of Production Factors

Fish Production in Kota Raja and Alak Districts

The selection of this research area was based on the consideration that in Kota Raja and Alak sub-districts, Kupang City, to be precise, each fish cultivator group has become a cultivation production center which is well known to the people of Kupang City, then the commodities used are catfish (Clarias sp) and tilapia. (Oreochromis niloticus). The entrepreneurial activity of cultivating freshwater fish has good potential because fish farmers in Kota Raja District have promising areas of cultivation land extending to several sub-districts including Alak District, so researchers chose to conduct research in these two sub-districts.

Being one of the achievements and success of a cultivation business, the production value produced becomes the output of the results of the cultivation business. The following are the production results per research locus:

Table .1 Fish Production/Harvest Results in two sub-districts

Location	Production Amount (Kg)	Average Production (Kg)
Kota Raja District	3944	88
Alak District	2767	92
TOTAL	**6711**	**180**

Production is an activity that is calculated as the level of *output* per unit of period or time. In this production process, there is a very close relationship between the production factors used and the production produced. It can be seen in the table above that the amount of production in Kota Raja District is 3,944 per harvest, and in Alak District it is 2,767 per harvest cycle. This data shows that Kota Raja District has more dominant production numbers, this is the result of the large number of cultivation businesses in Kota Raja District, while Alak District has fewer businesses according to the results of observations by researchers in the field. Production factors such as land area, number of seeds sown, and amount of feed given determine the average production per harvest cycle, even though the difference is only 16 kilograms, this difference shows that Kota Raja District is more dominant than Alak District.

Test the Multiple Linear Regression Model Analysis

Production Function using Multiple Linear Regression Analysis. The results of the research analysis show the influence of production factors, below is the Regression Model Validity Test table which contains the coefficient of determination or R^2 and the results of the F Test (Simultaneous). These results, if explained econometrically, can be seen as follows:

Table.2 Results of Determination Coefficient Analysis

Variable	Regression coefficient	t count	Sig	F count	R^2	Sig.
(Constant)	-4,774	-0.798	0.428	35,527	0.849	0,000
Ln_X1 (Land Area)	0.118	2,362	0.021			
Ln_X2 (Number of Seeds)	0.675	6,700	0,000			
Ln_X3 (Amount of Feed)	0.196	1,187	0.239			
Ln_X4 (Selling Price)	0.261	0.440	0.661			
Ln_X5 (Kindergarten Wage)	0.030	0.219	0.219			

Source: Primary Data, 2024

Based on the table above the regression analysis, the production function for fish production in catfish and tilapia cultivation can be formulated as follows:

Ln Y = Ln -4.774+ 0.118 LnX1 + 0.675 LnX2 + 0.196 LnX3 + 0.261 LnX4 + 0.030 LnX5

* *Information :*

Y = Fish Production
X1 = Land area
X2 = Number of seeds
X3 = Amount of Feed
X4 = Selling price of fish
X5 = Labor wages

a) R Square (R^2):

R *Square* is a coefficient of determination that shows how much variation in the dependent variable can be explained by the regression model. The R Square value of 0.849 indicates that around 84.9% of the variation in the dependent variable can be explained by the independent variables in the regression model . Thus, the remaining 15% of the variation is the result of error or other variables other than the independent variable which can explain the

dependent variable in this regression model. So it can be said that land area, number of seeds, selling price of fish, and labor wages influence the production or harvest of freshwater fish, in this case catfish and tilapia.

b) F *Change* (F -*Statistic Change*):

F *Change* is a statistical value that shows the significance of adding a certain independent variable to the model. The F *Change value* of 35.527 indicates that the addition of this independent variable significantly improves the overall quality of the regression model. F-*Statistic* is a statistical value used to test the overall significance of the regression model. A high F value indicates that at least one independent variable has a significant influence on the dependent variable. The F-Statistic is calculated by dividing the Mean Square Regression by the Mean Square Residual in the F value table which is 35.527.

In addition, the analysis results also show the statistical significance of the overall regression model. The high F- *statistic value, amounting to 35.527, with a very low p- value* (0.000), confirms that the regression model as a whole has a significant influence on the dependent variable. This indicates that at least one of the independent variables included in the model makes a significant contribution in explaining the variation in the dependent variable.

c) *Significance* (Sig):

Significance (Sig) is a p-value that shows the statistical significance of the regression model. A low p-value (usually < 0.05) indicates that the overall regression model is statistically significant. A low Sig value indicates that there is sufficient evidence to reject the null hypothesis, which states that there is no relationship between the independent and dependent variables in the population. Therefore, these results indicate that at least one of the independent variables has a significant influence on the dependent variable.

a. Independent Variables: These are variables that are thought to influence the dependent variable. In this case, the independent variables are Ln_X1 (Land Area), Ln_X2 (Number of Seeds), Ln_X3 (Amount of Feed), Ln_X4 (Selling Price), and Ln_X5 (Kindergarten Wages).

b. Regression Coefficients (*Regression Coefficients*): This is the estimated coefficient for each independent variable. This coefficient shows how much the independent variable contributes to changes in the dependent variable. The higher the coefficient, the greater the contribution of the independent variable to the dependent variable. Each independent variable has a different regression coefficient: -4.774 for constant, 0.118 for Ln_X1, 0.675 for Ln_X2, 0.196 for Ln_X3, 0.261 for Ln_X4, and 0.03 for Ln_X5.

c. t- *Statistics* (t- *Statistics*): This is a statistical value used to test the statistical significance of regression coefficients. The higher the t value, the more significant the regression coefficient. In the table, each independent variable has a different t- *statistic value: -0.798 for constant, 2.362 for Ln_X1, 6.700 for Ln_X2, 1.187 for Ln_X3, 0.440 for Ln_X4, and 0.219* for Ln_X5.

DISCUSSION

Production Factors that influence the Production of Freshwater Fish Catfish (*Clarias* sp.) and Tilapia (*Oreochromis niloticus*)

The analysis of the regression output results that has been provided illustrates a deep understanding of the quality and significance of the regression model used to measure the influence of production factors on freshwater fish production, in this case catfish and tilapia. In this explanation, the key aspects revealed in the output will be discussed. First of all, the main indicator in regression analysis is R *Square* (R^2), which shows how well the variability in the dependent variable can be explained by the independent variables in the model. The high R *Square value*, equal to 0.849, indicates that approximately 84.9% of the variation in the dependent variable can be explained by the independent variables included in the model. This indicates that the regression model can generally predict the value of the dependent variable well.

Below are production factors or inputs which are things that absolutely must be present to produce a production or product. In the production process, business actors must be able to analyze certain technologies that can be used and how to combine several productions in such a way that optimal and efficient production results can be obtained (Munirudin, 2017) and the use of production factors can provide information regarding whether the addition of one factor can increase or reduce production value. Variables or research *inputs* that influence fish production *output* in cultivation businesses in Kota Raja and Alak Districts are as follows:

1. Land area

Land is a resource. According to (Purba, 2020) land is a container or factor for the development of human welfare, physically land is divided into land and water land. For this reason, land donations determine the success of a business, especially aquaculture businesses. The value of the LnX1 coefficient or land area is 0.118, the value of this land area variable shows a positive value, so expanding 1 square meter of land can increase 0.118 kg of fish harvest or increase 0.118 fish production in one cycle (Nurdiana *et al.,* ., 2022) . The positive results of the research are also in line with the results of (Purwati, 2019) that, the more land area is added, the indications that production will increase will increase and efficiency will also have a positive effect. In the production function used, the variable that has a real influence on the production of milkfish cultivation is the land area variable. At the 95 percent confidence interval, the t-calculated value of land area is 2.362 greater than the t-table value, which means that every 1% additional land area input assuming *cateris paribus* (other inputs are constant) will increase milkfish production by 0.118 percent of the area coefficient land, or elasticity. This means that, compared to other predictor variables, increasing milkfish production will be more sensitive to land area (Purwati, 2019) .

2. Number of Fish Seeds

The independent variables which generally have a positive influence are seeds. One of the studies by (Trisani, 2013) Based on the regression results obtained, the independent variables which have a significant influence on income are goldfish production, tilapia production, goldfish seed prices, seed prices tilapia fish, and the price of goldfish feed. For this reason, the number of fish seeds stocked is used. The reason for this independent variable is that the number of fish seeds and the area of land determine fish production. The results of the regression analysis of increasing the number of certain seeds will add 0.675 kg of fish at harvest, this amount is also determined by other variables. The number of seeds also shows a positive influence in this research, in line with previous research such as in (Sumartin, 2018) The elasticity value of seed production is 0.377. This shows that by increasing the number of seeds invested by 1 percent, catfish cultivation production can increase by 0.377 percent. Thus the seeds have a positive significance to the independent variable.

3. Amount of Feed

Research related to the influence of feed on fish production (Fajriati *et al.,* 2018). The coefficient value of the feed variable has a positive sign of 0.569. This means that adding 1% of the amount of feed with the Citeris paribus assumption will increase the production of red tilapia by 0.569. The feed factor has a significant influence on the production of red tilapia. In line with the results of the analysis of the independent variable, the amount of feed is added by 1%, there will be an increase in production of 0.196 so that the amount of feed has a positive effect on fish production.

4. Selling Price of Fish

The independent variable selling price of fish is one of the determinants of profit from production results, according to (Saihani & Yulia, 2016) the selling price can be influenced by the costs incurred during production, therefore if the selling price of fish decreases or increases it will also affect fish production, as seen in In this research analysis, the increasing selling price variable can increase production by 0.261. A study of selling prices found that the selling price

variable (X1) was 0.111. In other words, the variables ``land area" (X2) and ``production costs" (X3) are constant and their significance value is 0.012. It can be concluded that the selling price influences the variable "business income" (Y). A positive t value indicates that the selling price variable influences the business income variable (Y) in the same direction (Suyono *et al.,* 2022) . Departing from the influence of selling prices, in this research there is a t-calculated value from the analysis of 0.440 which is greater than the t-table so that it has an effect on fish production. In line with previous research, although it only contributes a small percentage of its influence, according to (Saihani & Yulia, 2016), the influence of variable (X), namely production costs, on variable (Y), selling price, is 37.4%. This is also information for cultivators so that if a low selling price is offered at the business actor level it will affect the activities they carry out, both as the main livelihood of the family and as an additional livelihood, thus if high production is desired the selling price must be calculated first to prevent loss when making a sale.

5. Labor Wages

One of the factors of production is labor, this is an input to the business, one of the main capital in the production process. Factors that influence the efforts people make in carrying out their duties and responsibilities. The main determining factor here is work motivation, which requires the individual's desire to progress and improve his work performance. (Ramadan, 2013)). The productivity achieved by these workers is included in production costs, namely wages. labor has not had a significant influence on mackerel production in Pati Regency. Labor analysis in the agricultural sector often refers to the work steps required on the farm itself.

This information is very important for determining the allocation of labor input during the production process so that there is no shortage or excess of labor in a particular activity (Soekartawi, 1996) in (Wahyuni *et al.,* 2019) . However, other research suggests that the work variable (X4) has a significant effect on red tilapia production (Y) at a significance level of 95%. Labor has a significant impact on red tilapia production, because managing tilapia cultivation requires real labor (Fajriati *et al.,* 2018). Likewise, with the results of the regression analysis of the coefficient of the labor wage variable, adding 1% to the total wage means production increases fish by 0.030. The t-calculated value of 0.219 is greater than the t-table, so this variable has a positive effect on fish production. The coefficient value of the independent variable labor wages has a lower value than the other independent variables, so that the addition of labor wages from the current amount makes a contribution, although not too high, due to the fact that in the field the workforce and the capacity of these cultivation businesses are existing capacity, it is deemed unnecessary to add additional labor wages, even though it can contribute to business production.

Thus, the results of this analysis imply that the regression model used has statistical significance in explaining the variability in the dependent variable. This explanation is important to measure the suitability of the model and the significance or significance of the independent variables in predicting the dependent variable. With statistically significant results, this regression model can be considered relevant in calculating input production factors that influence the dependent variable.

CONCLUSION

The results of this ANOVA analysis imply that the regression model as a whole has a significant influence on the dependent variable, with at least one independent variable making a significant contribution to this regression model, and is in the fit category or simultaneously independent variables such as land area, feed price, number of seeds. , selling price and labor wages, all of these indicate that the regression model significantly explains or influences the dependent variable.

Overall, the results of the analysis imply that the regression model used is reliable in explaining the relationship between the independent variables and the dependent variable in the context analyzed. With significant statistical values and good prediction quality, these models can provide valuable insights and support better decision making in relevant situations.

ACKNOWLEDGEMENT

The researcher would like to thank Mr. & Mrs. Supervisor, and all parties who contributed directly or indirectly to this research activity. This research has been carried out and is running well in accordance with the required requirements.

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