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FACTORS AFFECTING PRODUCTIVITY AND THEIR EFFECT ON PROFITS OF TILAPIA (*Oreochromis niloticus*) FARMERS

Faktor-Faktor yang Memengaruhi Produktivitas dan Pengaruhnya terhadap Keuntungan Pembudidaya Ikan Nila (*Oreochromis niloticus*)

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ABSTRACT

The success of tilapia farming is strongly influenced by the productivity it produces, but it often happens that the productivity of tilapia produced by farmers is very low. The purpose of the study was to analyze the factors that affect the productivity of tilapia and its effect on the farmers' profit. The parameters measured include stocking density (X1), feed protein content (X2), pond area (X3), length of maintenance (X4), productivity (Y), and profit (Z). There were 40 respondents from Selomerto Sub-district, Wonosobo Regency, Central Java Province. Data analysis was conducted using SPSS version 22 and pathway analysis. The results of the study indicate that X1, X3, and X4 have a significant effect on Y, while X2 has no effect on Y. Furthermore, X3 and Y have a significant effect on Z, while X1, X2, and X4 have no effect on Z. X1, through Y, has an effect on Z, while X2, X3, and X4, through Y, have no effect on Z. The research data is expected to provide meaningful information to various parties in improving the success of tilapia farming activities carried out by farmers.

Keywords: Tilapia Farming, Productivity, Farmer Profitability

ABSTRAK

Keberhasilan budidaya ikan nila sangat dipengaruhi produktivitas yang dihasilkan, namun sering terjadi produktivitas ikan nila yang dihasilkan pembudidaya sangat rendah Tujuan penelitian untuk menganalisis faktor-faktor yang mempengaruhi produktivitas ikan nila dan pengaruhnya terhadap keuntungan pembudidaya. Parameter yang diukur meliputi padat tebar (X1), kadar protein pakan (X2), luas kolam (X3), lama pemeliharaan (X4), produktivitas (Y) dan keuntungan (Z). Jumlah responden pelaku usaha perikanan sebanyak 40 orang dari Kecamatan Selomerto Kabupaten Wonosobo Provinsi Jawa Tengah. Analisis data dengan SPSS versi 22 dan analisis jalur (pathway analysis). Hasil penelitian X1, X3 dan X4 berpengaruh nyata terhadap Y, sedangkan X2 tidak berpengaruh terhadap Y. Kemudian X3 dan Y berpengaruh nyata terhadap Z, sedangkan X1, X2 dan X4 tidak berpengaruh terhadap Z. X1 melalui Y berpengaruh terhadap Z, sedangkan X2, X2 dan X4 melalui Y tidak

berpengaruh terhadap Z. Data hasil penelitian diharapkan dapat memberikan informasi yang bermakna kepada berbagai pihak dalam meningkatkan keberhasilan kegiatan budidaya ikan nila yang dilakukan pembudidaya.

Kata Kunci: Budidaya Ikan Nila, Produktivitas, Keuntungan Pembudidaya

INTRODUCTION

Tilapia (*Oreochromis niloticus*) is one of the aquaculture fish commodities that has become a priority program of the Ministry of Marine Affairs and Fisheries. Tilapia is a freshwater fish commodity with the highest national production to meet domestic and export markets. Tilapia is cultivated at small-, medium-, and large-scale production levels, and the production from large-scale tilapia aquaculture is entirely marketed to international markets. Tilapia is cultured in ponds and floating net cages in lakes and reservoirs; however, over the last five years, brackishwater tilapia aquaculture has been developed in brackishwater ponds.

Several types of tilapia include Best tilapia (Bogor Enhanced Strain Tilapia), Srikandi tilapia (Salinity Resistant Improvement from Sukamandi), Nirwana tilapia (Nila Ras Wanayasa), Gesit tilapia (Genetically Supermale Indonesian Tilapia), Jatimbulan tilapia, Larasati tilapia (Red Tilapia Strain Janti), and SAN tilapia (Aquafarm Nusantara). Tilapia has advantages such as relatively fast growth, high protein content in the flesh, and tolerance to various environmental conditions.

Fish production is influenced by the number of stocked seeds, growth rate, and mortality rate. Fish growth rate is affected by the amount, quality, and feeding methods. Feed quality that greatly influences fish growth is the protein content of the feed. Fish mortality is influenced by water quality and pest and disease attacks. The effect of stocking density on growth has been studied by Pardiansyah *et al.* (2018), who found that at stocking densities of 20–56 fish/m², each increase in density increased biomass growth. Zaldi *et al.* (2023) reported that stocking density affects weight growth rate, length growth, and survival rate. Tilapia growth becomes slower at the highest stocking density (Zalukhu *et al.*, 2016).

This study aims to determine the factors that influence tilapia productivity and their effects on farmers' profits. The results of this study are expected to provide input for stakeholders to improve the success of tilapia aquaculture.

RESEARCH METHODS

The model used in this study is path analysis with the following equation:

$$Y = X1 + X2 + X3 + X4$$
$$Z = X1 + X2 + X3 + X4 + Y$$

X1 = Stocking density
X2 = Feed protein content
X3 = Pond area
X4 = Maintenance period
Y = Productivity
Z = Profit

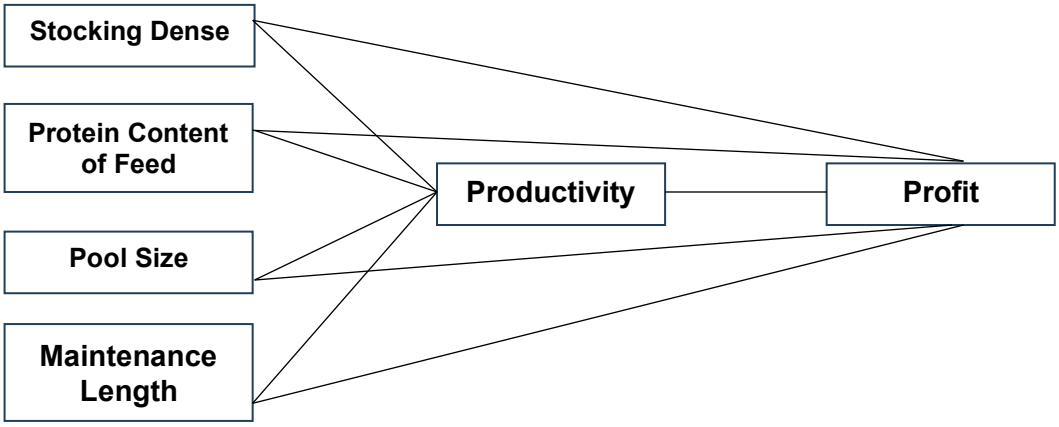

Figure 1. Path Analysis

General Hypothesis:

The effects of stocking density (X1), feed protein content (X2), pond area (X3), and culture duration (X4) on productivity (Y) and their effects on farmers' profit (Z).

Specific Hypotheses

H1 = Stocking density affects productivity
H2 = Feed protein content affects productivity
H3 = Pond area affects productivity
H4 = Culture duration affects productivity
H5 = Stocking density affects profit
H6 = Feed protein content affects profit
H7 = Pond area affects profit
H8 = Culture duration affects profit
H9 = Productivity affects profit
H10 = Stocking density through productivity affects profit
H11 = Feed protein content through productivity affects profit
H12 = Pond area through productivity affects profit
H13 = Culture duration through productivity affects profit

Data Analysis

Research data were analyzed using SPSS version 22 and path analysis (pathway analysis). Further testing was conducted using a 95% confidence interval. If $P < 0.05$, then there is a significant difference among treatments.

RESULTS

The number of respondents was 40 tilapia farmers from Selomerto District, Wonosobo Regency, Central Java Province. Tilapia farmers were derived from six fisheries business groups (77.5%), while the remaining respondents were not members of fisheries groups (22.5%). The positions of respondents within the group structure consisted of management members at 45% and group members at 32.5%.

Path Analysis

The results of the path analysis of the effects of X1, X2, X3, and X4 on Y, the effects of X1, X2, X3, X4, and Y on Z, and the indirect effects of X1, X2, X3, and X4 through Y on Z are presented in Figure 1.

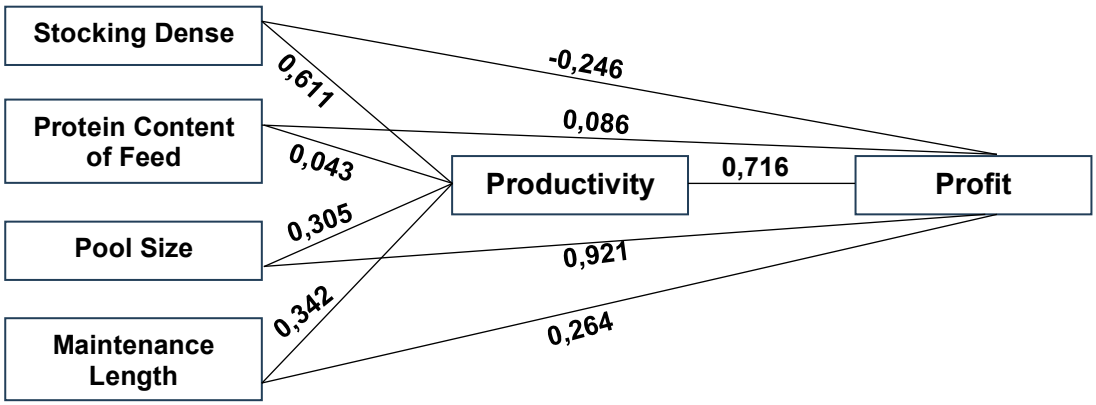

Figure 2. Path analysis

The results of the analysis of the influence of X1, X2, X3, and X4 on Y are shown in Table 1. X1, X3, and X4 have a significant effect on Y ($P < 0.05$), while X2 has no effect on Y ($P > 0.05$). The coefficient of correlation (R2) is 0.819.

Table 1. Results of the analysis of the influence of X1, X2, X3, and X4 on Y

Parameter	Beta	Significant Value	Description
X1	0,611	0,000	Significant
X2	- 0,043	0,559	Not Significant
X3	- 0,305	0,001	Significant
X4	- 0,342	0,000	Significant

The results of the analysis of the influence of X1, X2, X3, X4, and Y on Z are shown in Table 2. Factors X3 and Y have a significant effect ($P < 0.05$) on Z, while X1, X2, and X4 have no effect on Z ($P > 0.05$). The correlation coefficient (R2) is 0.514.

Table 2. Results of the analysis of the influence of X1, X2, X3, X4, and Y on Z

Parameter	Beta	Significant Value	Description
X1	- 0,246	0,272	Not Significant
X2	0,086	0,483	Not Significant
X3	0,921	0,000	Significant
X4	0,264	0,100	Not Significant
Y	0,716	0,016	Significant

The results of the analysis of the indirect influence of X1, X2, X3, and X4 through Y on Z are shown in Table 3. Factor X1 has a significant indirect influence through Y on Z (significant value > beta value), while X2, X3, and X4 do not have a significant influence through Y on Z (significant value < beta value).

Table 3. Results of the analysis of X1, X2, X3, and X4 through Y on Z

Parameter	Beta	Significant Value	Description
X1	- 0,246	0,437	X1 through Y has a significant effect on Z
X2	0,086	0,03	X2 through Y has no significant effect on Z
X3	0,921	0,218	X3 through Y has no significant effect on Z
X4	0,264	0,244	X4 through Y has no significant effect on Z

DISCUSSION

Parameters that influence fish production include stocking density or the number of fish stocked at the beginning of the culture period, growth rate, and survival rate. When optimal stocking density, rapid growth, and high survival rates are achieved, fish production will be high. The results of this study indicate that fish stocking density has a significant effect on productivity, in accordance with previous studies showing that higher stocking density increases pond productivity (Hwang *et al.*, 2014; Riana, 2021). Tilapia grow-out at stocking densities of 150, 200, 250, and 300 fish/m³, after being cultured for 120 days, based on regression analysis, showed the highest biomass at a stocking density of 229 fish/m³ (Pai *et al.*, 2024). Pond area has a significant effect on productivity. Pond area affects productivity by facilitating a larger living space for fish, allowing fish to move and grow more freely and to perform necessary activities, such as foraging and social interaction, which contribute to fish health, growth, and higher productivity. The results of research by Andayani in (Nashrullah *et al.*, 2021) state that land area has a significant and positive effect on aquaculture activities. This is because an increase in pond area can increase the opportunity to improve productivity through an increase in the capacity of the number of seeds being cultured, whereas the results of research by Laksmidevi and Purwohandoyo in (Nashrullah *et al.*, 2021) state that pond area has a significant and inversely proportional (negative) effect on pond productivity.

Culture duration has a significant effect on productivity. The longer organisms are cultured, the longer they have time to grow and develop. Organisms cultured over a sufficiently long period generally have larger sizes and higher weights.

Pond area has a significant effect on fish farmers' income. This can be explained by the fact that the larger the pond area, the greater the number of fish stocked, resulting in a higher number of fish harvested. Increased harvest yields and a higher number of fish sold have an impact on increasing fish farmers' income (Nashrullah *et al.*, 2021).

The indirect effect of fish stocking density through productivity is able to increase farmers' profits. High stocking density, by maximizing productivity through efficient and controlled management of inputs such as water, feed, and raw materials, has been shown to increase the profits obtained by farmers. Experienced tilapia farmers who are able to properly manage the aquaculture process have a greater opportunity to obtain higher profits. In general, less experienced farmers with high stocking density but without maximizing productivity tend to obtain lower profits due to high fish mortality resulting from culture facilities that are inadequate for high stocking density.

CONCLUSION

Tilapia aquaculture activities that optimize stocking density, pond area, and culture duration are able to produce higher tilapia productivity. Profits from tilapia aquaculture are directly influenced by the scale of the aquaculture operation and indirectly influenced by fish stocking density.

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