FACTORS AFFECTING CARP PRODUCTION IN FLOATING NET CAGES (KJA) IN TABIR LINTAS SUB-DISTRICT MERANGIN DISTRICT

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ABSTRACT

Carp farming in Indonesia, especially in the Merangin Regency, has excellent potential to improve food security and farmers' welfare. This study analyzes the factors affecting carp production in floating net cages (KJA) in Tambang Baru Village, Tabir Lintas District. The research was conducted from March to April 2020, and 15 fish farmers were interviewed using the census method. The research variables included cage area, seeds, feed, and labor, with carp production as the dependent variable. Primary data were collected through interviews using a questionnaire, while secondary data were obtained from the Fisheries Service and the Central Statistics Agency (BPS). Data analysis used multiple linear regression with the help of SPSS to identify the influence of each variable. The results showed that seedlings significantly affected carp production, with a calculated T value of 103.291, higher than T table 1.81246. Meanwhile, cage size, feed, and labor did not show a significant effect on production. The R-square value reached 1,000, signifying a perfect correlation between the independent and dependent variables. This finding indicates that improving the quality of fingerlings can directly increase production, while other factors such as cage area, feed, and labor require further attention to improve the efficiency of carp production.

Keywords: carp farming; floating net cages; fish production; production factors; Merangin Regency.

INTRODUCTION

Carp farming in Indonesia has a rich history, playing an essential role in food security and local economies. (Rizkiana et al., 2022). As a widely consumed fish species, carp is particularly important in household and commercial fisheries markets (Syandri et al., 2017). Since 1920, aquaculture techniques have advanced, initially introducing seedlings from various countries such as China, Taiwan, Japan, and Europe (Syandri et al., 2017). (Syandri et al., 2017). Among these techniques, floating net cages have emerged as a prominent and cost-effective method, enabling intensive cultivation with increased safety and easier harvesting processes (Syandri et al., 2017). Research by Putri and Anna (2014) highlighted the efficiency and input optimization of carp farming, emphasizing its potential to reduce costs while increasing productivity. However, further research is needed to address the challenges faced by farmers, particularly in high-potential areas such as the Tabir Lintas sub-district and Merangin district. (Syandri et al., 2017).

Previous research has extensively explored carp production in floating nets in different regions, highlighting various aspects of production. However, there is a glaring gap in understanding the factors affecting production and barriers in Merangin District, particularly in Tabir Lintas District, where consistent production growth is observed despite challenges such as varying farming practices and fluctuating market prices. The study analyzed the factors affecting carp production in floating nets and production bottlenecks in Baru Tambang Village in Tabir Lintas District to address this gap. By focusing on this specific area, the research sheds light on local conditions and offers valuable insights with broader implications for the fisheries sector. (Simangunsong & Hidayat, 2017), (Das et al., 2015), (Mukuan et al., 2013).
Previous research has explored various aspects of aquaculture production in different regions, but there is a lack of specific knowledge regarding carp production in floating nets in Merangin District, particularly in Tabir Lintas District. (Junaidi et al., 2022). Despite challenges such as varying farming practices and market price fluctuations, Tabir Lintas District has grown consistently. This study aims to address this gap by analyzing factors affecting carp production in floating nets in Tabir Lintas District, offering insights for broader application in the fisheries sector in Indonesia. (Junaidi et al., 2022). By utilizing the latest data and a comprehensive methodology, the study sought to make significant discoveries to improve the efficiency and productivity of carp farming, contributing valuable insights to current literature and the fisheries sector in Indonesia. (Junaidi et al., 2022)

MATERIALS AND METHODS

This study was conducted at Betuk Dam Tourism Object Reservoir, Tambang Baru Village, Tabir Lintas Sub-district, Merangin Regency, Jambi Province, from March 1 to April 31, 2020. This location was purposively selected because it has the most floating net cage (KJA) units in the Merangin District, which provided a rich context for this study. The population in this study was all fish farmers using KJA in the study site, totaling 15 people. With a census approach (Rianse & Abdi, 2012), all of these farmers were used as respondents, resulting in 15 respondents.

Primary data were obtained from interviews using questionnaires covering factors affecting carp production and cultivation techniques in KJA. Secondary data were collected from the Fisheries Service and the Central Bureau of Statistics (BPS) to obtain information on the general condition of the study area. The independent variables in this study are cage area (X₁), seed (X₂), feed (X₃), and labor (X₄). The dependent variable is Total carp production (Y).

\[ Y = a + b₁X₁ + b₂X₂ + b₃X₃ + b₄X₄ + e \]  \( (1) \)

Data were analyzed using multiple linear regression with the SPSS application, following the method outlined by (Sugiyono, 2015) for descriptive analytics. The analysis included the regression coefficient for each factor (X), t-test to assess the partial effect of each independent variable, F test to determine the simultaneous effect of independent variables on the dependent, and the Coefficient of Determination (R²) to measure how far the independent variable explains the dependent variable. (Algifari, 2013). The hypothesis tested in the F test is \( H₀: b₁ = b₂ = b₃ = b₄ = 0 \) versus \( H₁: \) At least one value of \( bᵢ \neq 0 \), and in the t-test, is \( H₀: bᵢ = 0 \) versus \( H₁: bᵢ \neq 0 \).

A descriptive analysis was conducted to identify production bottlenecks and describe and present data in a structured and easy-to-understand manner. This research integrates quantitative and qualitative approaches to gain a deeper understanding of the dynamics of carp production in KJAs. The use of multiple linear regression in this context enabled the identification of critical factors affecting production, while descriptive analysis provided insights into the barriers faced by farmers.

RESULTS AND DISCUSSION

Respondent Identity

This study involved 15 carp farmers in floating net cages (KJA) in Tambang Baru Village, all of whom were male. This shows gender dominance in the carp farming sector in the study location, which aligns with general findings in this sector. Most farmers are at the productive age of 33 - 41 years, which, according to (Soeharjo & Patong, 1984), is the optimal age for creativity and acceptance of new information in farming. Their education levels vary, with the majority having primary to secondary education and farming experience ranging from 1 to more than 16 years, indicating varying levels of expertise and experience in farming practices.

The average number of cages operated is two units per farmer. This finding indicates a small to medium scale of operation and potential for further development. Compared to similar studies in other regions, this scale of operation is relatively small, suggesting that there is room for intensification and modernization.

Factors such as age, education, and experience significantly influence productivity and innovation in aquaculture. (Unekwu et al., 2020), (Gbigbi, 2021) [5]. The literature suggests that male gender dominance and low education levels may hinder the adoption of new technologies and practices, emphasizing the critical role of education and training in improving productivity and sustainability in agricultural enterprises. (Unekwu et al., 2020), (Omitoyin & Adediran, 2022). However, limitations in the study, such as focusing on a single location with a small number of
respondents and the absence of female participants, may limit the generalizability of the findings. (Gbigbi, 2021), (Aphunu & Agwu, 2014). Encouraging broader participation, including women, in aquaculture, especially carp farming, is critical to unlocking untapped potential and promoting modern technologies’ adoption for scale-up operations. (Gbigbi, 2021), (Aphunu & Agwu, 2014).

Carp Production in Floating Net Cages

Fish farmers in floating net cages (KJA) tend to choose carp as the primary culture species. Although the cultivation process takes about six months, carp show a high level of resilience with a mortality rate of only about 1% of total production. In addition, the relatively high price of carp in the market ranges from Rp. 29,000 - Rp. 31,000, making it an economically profitable option for farmers, mainly due to the significant demand from fishing ponds.

The study revealed significant variations in production between farmers, with Taufik Ikhshin recording the highest production of 1,980 Kg and Ponimin the lowest with 329 Kg. Overall, carp production from all respondents was 12,506 Kg in one harvest cycle, with an average production of about 833.73 Kg. Factors such as the size of the cages, the quality of the seedlings, the right portion of feed, and efficient labor were shown to influence production.

Studies on carp production in KJAs revealed varying levels of efficiency among farmers, with technical efficiency at 75.5%, allocative efficiency at 91.9%, and economic efficiency at 83.2%. (Intan Mulia et al., 2023). In Poland, research focused on carp diseases affecting carp populations, highlighting the economic importance of disease control and resistance strategies (Kempter et al., 2009). These findings underscore the importance of efficient aquaculture management, species selection, and technological advances to optimize carp production in KJAs and increase profitability while emphasizing the need for further research and innovation in carp farming practices.

Analysis of Factors Affecting Carp Production

Analysis of factors affecting carp production with multiple liner regression analysis obtained results such as Table 1 below:

Table 1. Regression analysis

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>T</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>0.970</td>
<td>1.194</td>
<td></td>
<td>0.812</td>
</tr>
<tr>
<td>Size of Cage</td>
<td>-0.045</td>
<td>0.192</td>
<td>-0.002</td>
<td>-0.233</td>
</tr>
<tr>
<td>Seedlings</td>
<td>0.331</td>
<td>0.003</td>
<td>1.004</td>
<td>103.291</td>
</tr>
<tr>
<td>Feed</td>
<td>-0.001</td>
<td>0.001</td>
<td>-0.001</td>
<td>-0.874</td>
</tr>
<tr>
<td>Labor</td>
<td>-0.531</td>
<td>0.389</td>
<td>-0.002</td>
<td>-1.363</td>
</tr>
<tr>
<td>F</td>
<td>192474.281</td>
<td></td>
<td></td>
<td>0.000</td>
</tr>
<tr>
<td>R Square</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Processed Research Data, 2020

Based on Table 1 above, the regression analysis can be written as follows:

\[ Y = 0.970 \cdot 0.045 X_1 + 0.331 X_2 - 0.001 X_3 - 0.531 X_4 + e \]  

(2)

Based on the above equation, it can be concluded that the goldfish production value is 0.970. This means that without the influence of other variables, the goldfish production value is 0.970. The value of b1 is - 0.045 from the value of the cage area (X1), where if the value of the cage area (X1) is increased by 1%, it will increase the value by -0.045%. The value of b2 is 0.331 from the seed value (X2); if the seed value (X2) is increased by 1%, it will increase the value by 0.331%. The value of b3 is - 0.001 from the feed value (X3), where if the feed value (X3) is increased by 1%, the value will be increased by - 0.001%. The value of b4 is - 0.531 from the value of labor (X4), where if the value of labor (X4) is increased by 1%, it will increase the value by -0.531% from the independent variable factors of cage area (X1), seeds (X2), feed (X3), and labor (X4), the seeds (X3) that give the most significant contribution with a value of 0.331 to the dependent variable carp production (Y).

The effect of each independent variable, namely cage area (X1), seeds (X2), feed (X3), and labor (X4) on the dependent variable of carp production (Y) is used T-test while to determine the effect of independent variables, namely cages (X1), seeds (X2), feed (X3), and labor (X4) together on the dependent variable of carp production (Y), the F test is used. (Kumar et al., 2020). Table 1 shows the F value of 192474.281, and the sig value is 0.000. According to Soekartawi (1994), If sig <0.05, then
together, the free parameters in production (Xi) have a real influence on production results. Based on the calculated F value above, there is a joint influence between the variables of cage area (X1), seeds (X2), feed (X3), and labor (X4) on the dependent variable of goldfish production (Y). If the T value is calculated partially, only seeds have an effect, while the cage area, feed, and labor have no effect. However, simultaneously / together, they affect goldfish production. (Kumar et al., 2020). However, logically, partially only seeds have an effect, especially together. They will not have an effect, and the reason the F test has an effect is because the F test is carried out together and becomes a single unit. For example, the cage area is expanded, seeds are added according to the cage area, feed is given three times a day, and labor is divided according to their respective fields, so carp production will increase and be more efficient. (Kumar et al., 2020).

Table 1 in the literature presents an R-squared value of 1,000, indicating a perfect correlation between the independent variables (herd size, seed, feed, and labor) and the dependent variable of carp production. The calculated T value of 0.233 is lower than the T table value of 1.81246, leading to the acceptance of the null hypothesis (H0) and rejection of the alternate hypothesis (H1), indicating that cage area (X1) does not affect carp production (Y). Farmers are more likely to focus on the potting soil area rather than expanding the net due to the risk of overcrowding and potential damage to the fishing net with heavier carp. The reluctance to increase cage size beyond 4 x 4 m2 was also attributed to the high capital requirement for cage and net expansion, further supporting the conclusion that cage area does not significantly affect carp production (Shishman et al., 2015). (Shishman et al., 2019). (Munday et al., 1994).

Seeds (X2) has a t-count of 103.291 and T table 1.81246 then stated Because the value of T count> T table, it can be concluded that H0 is rejected and H1 is accepted, meaning that Seeds (X2) affect goldfish production (Y). Seeds partially affect goldfish production because the seeds cultivated are superior seeds directly imported from Maninjau, West Sumatra. The seeds put in the cages also follow the conditions of the cages. In the delivery of seeds, they are also packaged well and tightly. Plastic wrapping is also not used, and one wrapper is coated with two plastics so that it is not easily torn and filled with oxygen so that the seeds are more resistant to their destination. Therefore, the selection of good seedlings dramatically affects the production of goldfish. The selection of high-quality seedlings, such as those directly imported from Maninjau, West Sumatra, can significantly impact carp production. (Sarifudin & Nasmia, 2023). When cultivated well and shipped carefully with proper packaging techniques, these superior seedlings can contribute to increased production yields. Therefore, ensuring seedling quality and minimizing environmental stress can indeed have a significant influence on carp production.

Feed (X3) has a t-count of -0.874 and T table 1.81246. It is stated that because the value of T count < T table, it can be concluded that H0 is accepted and H1 is rejected, meaning that feed (X3) does not affect goldfish production (Y). Feed does not partially affect goldfish production because goldfish farming in the research area does not pay attention to the weight of the fish, which, according to theory and previous research, affects fish production, but this is not because the nature of the cultivation is only to produce fish for fishing ponds and the selling price of feed fluctuates. Usually, goldfish farmers buy feed per sack. With the price of feed fluctuating, farmers reduce feeding from three times a day to twice a day. Therefore, feed does not affect goldfish production because the feed is not balanced.

A study on the effectiveness of domestic extruded compound feed in feeding carp (Senechyn et al., 2022) revealed that such feeds significantly impact carp production, positively affecting growth rates, weight gain, and overall fishery and economic indicators. However, in the context of carp farming at the study site, where attention to fish weight is lacking and feed management practices are suboptimal (J. M. Munguti et al., 2014), (J. Munguti et al., 2021), the impact of feed on carp production may be reduced. Factors such as fluctuations in feed prices leading to changes in feeding
frequency from 3 to 2 times a day (J. M. Munguti et al., 2014) and unbalanced feed given to the fish (J. Munguti et al., 2021) may contribute to the decreased effectiveness of feed in increasing carp production. Therefore, the study suggests that under these circumstances, feed \( X_3 \) may not fully contribute to maximizing carp production due to inadequate attention to fish weight, inconsistent feeding practices, and provision of unbalanced feed.

Labor impact analysis on carp production in the context of aquaculture (Roy, 2011) and manufacturing companies (Choutagunta, 2019) revealed that labor does not significantly affect carp production. Labor \( X_4 \) has a T-count value of -1.280 compared to the T-table value of 1.81246, indicating that \( H_0 \) is accepted, meaning that labor \( X_4 \) does not affect carp production. This is supported by the observation that labor is not essential for goldfish farming, as farmers can manage tasks independently or seek help from peers, minimizing the direct impact of labor on goldfish production. Therefore, labor in carp farming mainly contributes to farmers' capital rather than directly affecting production levels. Labor does not partially affect goldfish production because the presence of labor only adds to the capital of goldfish farmers, labor is not really needed because each farmer can do everything. Sometimes farmers only ask for help from other farmers not to be used as labor. Therefore, labor has no effect on goldfish production because labor is not needed and only adds to the farmer's capital.

CONCLUSIONS AND SUGGESTION

This study revealed that cage area, seedlings, feed, and labor influence carp production in Tabir Lintas Subdistrict, Merangin Regency. Seeds were the most significant factor affecting production, while cage size, feed, and labor showed a lesser or partially insignificant effect. This finding confirms the importance of seed quality in increasing production yields and indicates that more intensive education and training are needed to optimize the use of cultivation technology. While male gender dominance and low education levels can be a constraint, an emphasis on improving skills and knowledge can help overcome these obstacles. To improve the productivity and sustainability of carp farming, it is recommended that women's involvement in the sector be expanded, and modern technologies and more efficient farming practices should be adopted. Further studies are needed to understand these factors on a larger scale and across different geographical contexts.

REFERENCES


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