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Determinants Of Beef Cattle Farmers' Income In Terbanggi Besar Village, Central Lampung Regency

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Abstract

Beef cattle farming is one of the agricultural activities that plays an important role in supporting rural household income while also promoting regional economic development in Indonesia. This study aims to analyze the determinants of beef cattle farmers' income in Terbanggi Besar Village, Central Lampung Regency. A quantitative approach was employed using primary data collected through structured interviews with 135 farmers. The data were analyzed using the Cobb–Douglas production function, transformed into a natural logarithmic form, and estimated using multiple linear regression. The results show that the interaction between capital and labor, feed costs, and vaccination costs have positive and significant effects on farmers' income, while the number of workers has a negative and significant effect. Meanwhile, herd size and educational attainment do not have significant effects on farmers' income. Simultaneously, all independent variables have a significant effect on farmers' income. The Wald test indicates that the production process exhibits decreasing returns to scale. These findings highlight the importance of strengthening access to productive capital, improving feed-use efficiency, and enhancing livestock health management to increase farmers' income and support the sustainability of smallholder beef cattle farming.

Keywords: farmers' income, Cobb–Douglas production function, capital-labor interaction, feed costs, vaccination costs.

Keywords : Beef Cattle Farmers' Income

INTRODUCTION

The livestock subsector plays a strategic role in supporting food security, generating rural employment, and promoting regional economic development in many

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developing countries. In Indonesia, beef cattle farming is predominantly managed by smallholder farmers and serves not only as a source of animal protein but also as a source of household income, savings, and productive assets. The contribution of beef cattle farming to rural livelihoods has encouraged the government to strengthen livestock development through productivity improvement, capacity building, and the optimization of local production systems. Nevertheless, the income of beef cattle farmers remains relatively heterogeneous due to differences in production input utilization, farm management practices, and resource ownership.

Lampung Province is one of Indonesia's important beef cattle production areas, with Central Lampung Regency recognized as one of the major livestock development centers (Dinas Perindustrian Provinsi Lampung, 2017). The region has a relatively large cattle population and favorable agricultural resources that support integrated croplivestock systems. Terbanggi Besar Village was selected as the research location because beef cattle farming has become one of the dominant economic activities among rural households. Despite its considerable production potential, farmers continue to face challenges in increasing their income due to differences in production costs, capital availability, labor allocation, and livestock management practices.

According to production theory, farmers' income is closely related to the efficiency of combining production inputs (Abubakar et al., 2021). The Cobb–Douglas production function provides a framework for explaining how output is determined by the contribution of production factors, with each input having a specific elasticity with respect to output. In beef cattle farming, production inputs include capital, labor, herd size, education, feed costs, and livestock health expenditures. Efficient allocation of these inputs is expected to increase productivity and, ultimately, improve farmers' income.

Previous studies have reported inconsistent findings regarding the determinants of beef cattle farmers' income. Several studies have found that feed costs, livestock health expenditures, and production capital positively influence farmers' income, whereas labor utilization and farming experience often have statistically insignificant effects. Other studies have indicated that herd size and farmers' characteristics may also contribute to variations in income, depending on the production system and regional conditions. These inconsistent empirical findings suggest that the determinants of farmers' income remain context-specific and require further investigation, particularly in regions where beef cattle farming has become an important rural economic activity .

Although numerous studies have examined the factors affecting farmers' income, most have focused on identifying the significance of individual production inputs through conventional multiple regression analysis. Limited attention has been given to evaluating the production structure using the Cobb–Douglas production function in conjunction with an assessment of production scale through the Wald restriction test. Consequently,

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empirical evidence regarding whether smallholder beef cattle farming operates under constant, increasing, or decreasing returns to scale remains limited, particularly at the village level.

Therefore, this study aims to analyze the determinants of beef cattle farmers' income in Terbanggi Besar Village, Central Lampung Regency, Indonesia, using the Cobb–Douglas production function. In addition to identifying the effects of production inputs on farmers' income, this study evaluates the production scale through the Wald test to provide additional empirical evidence regarding the efficiency of smallholder beef cattle farming. The findings are expected to contribute to the livestock economics literature and provide policy recommendations for improving farmers' income through more efficient allocation of production resources.

OBJECTIVES

This study aims to:

1. To analyze the determinants of beef cattle farmers' income in Terbanggi Besar Village, Central Lampung Regency.
2. To evaluate the production scale of smallholder beef cattle farming using the Wald restriction test.

According to Afriansyah et al., (2022), income is defined as the returns generated from efforts to produce goods and services for the community. Arifin (2015) states that the economic objective of an agricultural enterprise is to generate income and profit through the efficient use of available resources. In livestock farming, income is primarily derived from the sale of livestock. However, Najihah et al., (2024) note that the profits earned by farmers from livestock sales over a production cycle provide economic benefits to them. A livestock farmer's income is determined not only by the scale of the business and sales income but also by the farmer's ability to manage livestock husbandry and production activities. Therefore, farmers' income may vary depending on factors such as capital, education, livestock holdings, labor, and other variable production costs.

Factors Affecting Beef Cattle Farmers' Income in Terbanggi Besar Village

1. Capital
2. Education
3. Feed Costs
4. Vaccination Costs
5. Number of Livestock
6. Family Labo\

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DISCUSSION

This study employed a quantitative approach. Primary data were collected through structured questionnaires administered to 135 beef cattle farmers across six hamlets in Terbanggi Besar Village. The respondents were selected using simple random sampling based on Slovin's formula with a 5% margin of error. The estimation model is specified as follows:

$$LN_INC = C + \beta_1 C_L + \beta_2 LN_EDU + \beta_3 LN_FC + \beta_4 LN_VC + \beta_5 LN_LS + \beta_6 LN_L + €$$

$$= 1{,}765 + 0{,}752\ C_L + 0{,}011\ LN_EDU + 0{,}072\ LN_FC + 0{,}112\ LN_VC - 0{,}700\ LN_LS - 0{,}705\ LN_L$$

Prior to hypothesis testing, the model was subjected to four classical assumption tests: normality, heteroscedasticity, autocorrelation, and multicollinearity. The results indicated that all four assumptions were satisfied; therefore, the model was considered appropriate for further analysis as a Best Linear Unbiased Estimator (BLUE).
The following table presents the results of the regression analysis, showing the effects of the explanatory variables on farmers' income.

Table 1. Regression Result.

Variable	Coefficient	Prob	Effect
C_L	0.75249	0.00000	Positive Significant
LN_FC	0.07249	0.0646	Positive Significant (10%)
LN_VC	0.11173	0.0373	Positive Significant
LN_EDU	0.01100	0.8609	Not Significant
LN_LS	-0.70058	0.2655	Not Significant
LN_L	-0.70581	0.0000	Negative Significant

Source: Author's calculations using EViews 12.

The coefficient of determination (R^2) of 0.676 indicates that 67.6% of the variation in farmers' income is jointly explained by the independent variables included in the model, including the interaction term between capital and labor. The remaining 32.4% is explained by the error term and other factors not included in the model. The F-test indicates that the independent variables jointly have a statistically significant effect on farmers' income (F-calculated = 44.49 > F-critical = 2.17; $p < 0.001$).

The interaction between capital and labor was founds to have strongest positive and significant association with farmers income among the variables included in the model. This finding is consistent with the view that capital, which includes expenditures on livestock purchases, housing facilities, and equipment, constitutes a fundamental

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basis for the sustainability of livestock farming. According Asriadi et al., (2021), initial capital also has a positive effect on farmers' income. Interestingly, when capital and labor are combined, the effect is greater than when each factor is studied separately. This suggests that capital use is highly dependent on how workers use it.

Feed costs and vaccination costs also have positive and significant effects, supporting the idea that these expenses are not only costs of production but also investments in productive results. Adequate feed expenditure supports livestock weight gain and accelerates the attainment of marketable weight, as also found by Maulidiah and Sunyigono, (2023). Vaccination costs also help reduce the risk of disease-related livestock mortality, which means the quality of livestock sold remains high.

In contrast, the number of workers has a negative and significant effect. This is because it is a characteristic of small-scale family livestock farming, which is usually managed by families without formal salaries, and increasing the number of workers does not always result in increased productivity and can even decrease efficiency, as shown by Rindayati et al., (2026), who emphasize that the efficiency of labor use is more important in determining farmers' income than the number of workers alone.

The number of livestock and farmers' educational attainment were found to have no significant effects on farmers' income. A larger number of livestock does not necessarily increase farmers' income if it is not accompanied by proper livestock management and adequate supporting inputs. However, livestock-rearing skills may be acquired primarily through practical experience in the field rather than through formal education.

Because small-scale livestock farming in Terbanggi Besar Village has not yet reached its optimal production scale, Wald test results show a total production elasticity of 0.216, indicating that the production process exhibits decreasing returns to scale, and a proportional increase in all production inputs results in a less-than-proportional increase in farmers' income. Therefore, increasing inputs without improving farm management may not lead to a proportional increase in farmers' income.

CONCLUSION

Based on the results of the analysis, it can be concluded that capital, feed costs, and vaccination costs are the main determinants that have positive and significant effects on the income of beef cattle farmers in Terbanggi Besar Village, while the number of workers has a negative and significant effect. Meanwhile, the number of livestock and farmers' education level were not found to have significant partial effects, although all variables jointly have a significant effect on farmers' income. The results suggest that livestock ownership and educational attainment alone are not sufficient to explain variations in farmers' income in the study area. Instead, farmers' income is more strongly

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influenced by their ability to manage capital, feed, and livestock health efficiently. The decreasing returns to scale identified through the Wald test also indicate the need to improve production management so that additional inputs can generate a more proportional increase in income.

As a practical implication, improving access to capital, strengthening feed management, and enhancing livestock health through routine vaccination programs should be prioritized by both farmers and local policymakers to promote the sustainability and productivity of smallholder beef cattle farming in agropolitan areas such as Central Lampung Regency.

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