Analysis of factors affecting beef cattle farming income (case study in Langkat Regency)

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Abstract. This study aims to obtain empirical evidence and to analyse the effect of simultaneous and partial variable feeder cattle, livestock feed costs, cage depreciation costs, medicine and vitamin costs, labour costs on beef cattle farming. This research was conducted in Batang Serangan District, Stabat District, Babalan District with 73 respondents. The data analysis is used Multiple Linear Regression method to test the hypothesis simultaneously and partially using the F test and t test. The results of this study simultaneously (F test) show that the variable of feeder cattle, livestock feed costs, cage depreciation costs, medicine and vitamin costs and labour costs are simultaneously affect the income of beef cattle farming, while partially (t test), namely the variable of feeder cattle, livestock feed costs and cage depreciation costs shows a positive and significant effect on the beef cattle farming. It can be concluded that the cost of feeding livestock, the cost of animal feed, and the depreciation of pens are factors that have a significant effect on the income of beef cattle farming in Langkat Regency.

1. Introduction
Livestock is one of the most important subsectors to improve the standard of living of the community's economy. The development of the livestock sub-sector is part of the development system, food security, quality human resource development, poverty alleviation, trade in food and non-food commodities and environmental development, the national economy, because it is known that the needs for animal protein increases every year along with increasing public awareness for consumption of animal protein. Cows are one of the largest livestock producing livestock commodities for the ruminant livestock group to national meat production [1]. The problem that is that the demand for meat is increasing but it is not balanced by the production of meat itself. The lack of utilization of existing potential is a factor that causes most beef cattle farming not to achieve optimal results. This makes imports a solution that the government relies on. One of the potential areas in developing beef cattle farming is Langkat Regency. Langkat Regency is the centre of livestock, especially beef cattle. The total population of beef cattle in Langkat Regency in 2017 was 193,074 heads [2], while the beef cattle population in North Sumatra Province in 2013 was 523,277 heads. Beef production in Langkat Regency from 2015 to 2018 has increased which is not too significant. In 2015, beef production in Langkat Regency was not optimal, only 851 tons, but in 2016 it jumped up to 2,805 tons and continued to increase in 2017 and 2018. However, this increase was not too significant, so it is the main problem at this time. These beef cattle farmers in Langkat Regency generally still adhere to the traditional system. Even though in this modernization era, there are not a few farmers who use modern
methods. Traditional system of livestock is marked by low livestock numbers, low technology input, family labour and low. Meanwhile, the characteristics of the modern livestock system are the large number of livestock, high technology input, specific labour in the livestock sector and high profit. Although many people have a beef cattle farming, it can be seen in the field that the condition of the beef cattle farming is still not supportive. This is due to the small amount of income they get when compared to their expenses. In addition, there are farmers whose farming is broad but have few livestock. The factors that affect beef cattle farming are the quality of feeder cattle, livestock feed, cattle cage, marketing of produce, capital, labour, ownership of beef cattle, livestock cultivation, number of livestock, age of farmers, farmer education level, and farmer income. The various problems above can certainly be an obstacle for farmers in the rate of increasing beef cattle production. The purpose of this study was to determine the factors that affect the income of beef cattle farming in Langkat Regency.

2. Materials and methods
This research was conducted in the area of Langkat Regency with a high, medium and low beef cattle population, namely Batang Serangan District, Stabat. The farmers who were sampled were farmers who were members of the livestock group in Batang Serangan District, Stabat District and Babalan District. Sampling was conducted purposive sampling on 73 respondents with 28 questionnaires in Batang Serangan Regency, 28 questionnaires in Stabat Regency and 17 questionnaires in Babalan Regency. The data used to support this research include secondary data and primary data. Primary data is data collected directly from beef cattle farmers through direct observation and interviews with questionnaires. Meanwhile, secondary data was obtained from related agencies such as the Department of Agriculture and Food Security of Langkat Regency, the Central Bureau of Statistics of North Sumatra. The method used to determine the number of samples in this study is to use the Slovin formula [3]. Before processing the data, several tests were carried out on the data. The tests carried out on the data are:

2.1. Classical assumption test
This study conducted several classical assumption tests. The following is a description of the classical assumption test.

2.1.1. Normality test. Normality test aims to test whether in the regression model, the independent variable and the dependent variable both have a normal distribution or not [4]. This can also be seen in the histogram diagram where the basis for decision making is if the histogram graph is not leaning to the left and right, the research data is normally distributed, and the other way around.

2.1.2. Multicollinearity test. Multicollinearity test was conducted to ensure that there was no multicollinearity in the data from the independent variables. The point is that there is no perfect correlation or imperfect correlation but it is relatively high on the independent variables [5].

2.1.3. Heteroscedasticity test. Heteroscedasticity test aims to test whether in a model of regression used there is an inequality of variants from the residuals of one observation to another. If the variance from the residuals of one observation to another is constant, it is called homoscedasticity and if it is different it is called heteroscedasticity [4].

2.2. Statistical test
Hypothesis testing in this study uses the multiple linear regression approach (Multiple Regression Analysis) with the SPSS tool which aims to determine the effect of costs of feeder cattle, livestock feed costs, cage depreciation costs, medicine and vitamin costs and labour costs simultaneously and partially using the F test and t test. Based on the proposed hypothesis, the multiple linear regression analysis model in this study can be formulated as follows:
$$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + \mu$$  \hspace{1cm} (1)

Where:

$$X_1 = \text{Feeder Cattle Costs (IDR/year)}$$

$$X_2 = \text{Livestock Feed Costs (IDR/year)}$$

$$X_3 = \text{Cage Depreciation Costs (IDR/year)}$$

$$X_4 = \text{Medicine and Vitamin Costs (IDR/year)}$$

$$X_5 = \text{Labour Costs (IDR/year)}$$

$$Y = \text{Beef Cattle Farming Income (IDR/year)}$$

$$\mu = \text{error}$$

To test the hypothesis, two tests were carried out, namely:

1. Partial test (t-test) with the criteria

$$H_0: \beta_i = 0: i = 1,2, ..., n$$

$$H_1: \beta_i \neq 0: i = 1,2, ..., n$$

If -t-table≤ t-count≤t-table and the significance value>α = 10%, then it does not reject $H_0$.

2. Simultaneous test (F-test) with the criteria

$$H_0: \beta_1 = \beta_2 = 0: i = 1,2, ..., n$$

$$H_1: \beta_1 \neq \beta_2 \neq 0: i = 1,2, ..., n$$

If -F-table≤F-count≤F-table and the significance value>α = 10%, then it does not reject $H_0$.

3. Results and discussion

The results of the regression analysis on the factors that influence the income of beef cattle farming in the respondents are presented in Table 1.

Table 1. Analysis of factors affecting the income of beef cattle farming on the respondents

| Model                        | Regression Coefficient | T   | Sig.  |
|------------------------------|------------------------|-----|-------|
| (Constant)                   | 2604495                | 4.817 | 0.000  |
| Feeder Cattle Costs          | 0.906                  | -2.433 | 0.018 |
| Livestock Feed Costs         | 0.115                  | -2.474 | 0.016 |
| Cage Depreciation Costs      | 3.640                  | 2.715 | 0.008 |
| Medicine and Vitamin Costs   | 41.606                 | 0.298 | 0.766 |
| Labour Costs                 | -0.468                 | -0.238 | 0.813 |
| $R$                          |                        |       | 0.489 |
| $R^2$                        |                        |       | 0.640 |
| $F_{cal}$                    |                        |       | 4.222 |
| Significant                  |                        |       | 0.002 |

Based on Table 1 shows that the multiple linear equation on beef cattle farming income is:

$$Y = 2604495 + 0.906X_1 + 0.115X_2 + 3.640X_3 + 41.606X_4 - 0.468X_5$$  \hspace{1cm} (2)

3.1. Coefficient of determination

The coefficient of determination ($R^2$) is used to show how much variation dependent variable explained by the independent variable. Nilai coefficient of determination is between zero and one. The smaller the value of $R^2$, the more limited the ability of independent variables to explain the dependent variable. The value of $R$ Square in beef cattle farming in Langkat Regency is 0.640. This means that the beef cattle farming income can be influenced by the variable feeder cattle costs ($X_1$), livestock feed costs ($X_2$), cage depreciation costs ($X_3$), medicine and vitamin costs ($X_4$) and labour costs ($X_5$) to beef cattle farming income ($Y$) 64%. While the remaining 36% is influenced by other
variables not examined in this study.

3.2. Simultaneous influence test of variables (F test)
To see the presence or absence of the influence of variables of independent on the dependent variable, we can see the f-count value. Based on Table 1 shows that the f-count value in beef cattle farming is 4.222, greater than the f-table value of 2.50 with a significance level of 0.002 (P<0.05). It can be seen that simultaneously the variable factors of feeder cattle costs (X1), livestock feed costs (X2), cage depreciation costs (X3), medicine and vitamin costs (X4) and labour costs (X5) have an effect on beef cattle farming income (Y).

3.3. Partial test of variables (t test)
Partial test of variables (t test) was carried out to see as a whole (individually) the effect of the independent variables under study on (X1) feeder cattle costs, livestock feed costs (X2), cage depreciation costs (X3), medicine and vitamin costs (X4) and labour costs (X5).

3.3.1. Feeder cattle costs (X1). Based on Table 1 shows that the t-stat on the feeder cattle costs variable (X1) is -2.433, smaller than the t-table, which is 1.667 with a significant level of 0.018 (P<0.05), so it was concluded that H0 is rejected. H1 is accepted. Therefore, the conclusion is feeder cattle costs partially has a significant effect on beef cattle farming income. The coefficient value with a negative value is 0.906, which means that an increase in the cost of buying feeder cattle is IDR 1,000,- will increase the beef cattle farming income to IDR 906,-. The average cost incurred by the farmers is IDR 121,416,667,-. The feeder cattle costs purchased by local farmers have an effect on the quality of feeder cattle purchased. Therefore, feeder costs affect beef cattle farming income in the local area.

3.3.2. Livestock feed costs (X2). Based on Table 1 shows that the t-stat on the livestock feed costs variable (X2) is -2.474 with a significant level of 0.016 (P <0.05), so it was concluded that H0 is rejected. H1 is accepted. Therefore, the conclusion is livestock feed costs partially has a significant effect on beef cattle farming income. The value coefficient of which is positive shows that the livestock feed costs (X2) has a positive effect of 0.115, which means that an increase in the cost of purchasing livestock feed by IDR 1,000,- will increase livestock income at IDR 115,-. The livestock feed costs incurred by the farmer is an average of IDR 599,918,-/year. Feed purchased by local farmers with quality feed of quality containing sufficient forage and other intake. Therefore, the livestock feed costs affect the beef cattle farming income in the local area.

3.3.3. Cage depreciation costs (X3). Based on table 1 shows that the t-stat on the cage depreciation costs variable (X3) is 2.715 with a significant level of 0.008 (P<0.05), so it was concluded that H0 is rejected. H1 is accepted. Therefore, the conclusion is cage depreciation costs partially has a significant effect on beef cattle farming. The value of coefficient which is positive shows that the cage depreciation costs (X3) has a positive effect of 3.640, which means that the increase in the cost of the cowshed is IDR 1,000,- will make the beef cattle farming income become regular at IDR 3,640,-. The cage depreciation costs incurred by the farmer is an average of IDR 4,723,288,-/year and the average depreciation value of IDR 4,343,790,-/year. Cage is the largest cost component incurred by farmers in their farming. The cost of production tends to increase along with the increase in the scale of the farming which owned farmer [6].

3.3.4. Medicine and vitamin costs (X4). Based on table 1 shows that the t-stat on the medicine dan vitamin costs variable (X4) is 0.298 with a significant level of 0.766 (P>0.05), so it was concluded that H0 is accepted. H1 is rejected. Therefore, the conclusion is medicine dan vitamin costs partially has no significant effect on beef cattle farming income. The value of coefficient which is positive shows the variable of medicine and vitamin costs (X4) of 41.606, which means that the decrease in
the medicine and vitamin to cattle is IDR 1,000.- will decrease beef cattle farming income of IDR 41,606.-. The variable medicine and vitamin costs incurred by farmers was an average of IDR 159,452, the lower the medicine and vitamin costs does not affect the income of the beef cattle farming.

3.3.5. Labour costs ($X_5$). Based on table 1 shows that the t-stat on the labour costs variable ($X_5$) is -0.238 with a significant level of 0.813 (P>0.05), so it was concluded $H_0$ accepted $H_1$ rejected. Therefore, the conclusion is labour costs variable partially has no significant effect on beef cattle farming income. The negative coefficient value shows the labour costs variable ($X_5$) of -0.468, which means that the decrease in labour costs in cattle is IDR 1,000.- will decrease beef cattle farming income of IDR 468.-. The variable labour costs incurred by the farmer is an average of IDR 1,671,78.-/month or IDR 9,742,500.-/year.

4. Conclusions

Feeder cattle costs, livestock feed costs, and cage depreciation were factors that had a significant effect on beef cattle farming income in Langkat Regency. The variable medicine and vitamin and labour costs did not have a significant effect on the income of beef cattle in the farmer group in Langkat Regency.

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