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INCOME AND PRODUCTION OF DAILY COW'S MILK IN TLEKUNG VILLAGE OF JUNREJO DISTRICT (INDONESIA) AND RELATED DETERMINING FACTORS

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ABSTRACT

The development of the livestock sub-sector, especially for dairy cattle, aims to increase milk production towards self-sufficiency, expand employment opportunities and increase farmer income. This study aims to: analyze the level of income, the level of milk production of dairy cows, and the determinants of milk production of dairy cows in Tlekung Village, Junrejo District. The research sample was determined by the census technique, so that the sample studied was 50 dairy farmers. Data analysis using multiple regression analysis of Cobb Douglas production function consists of instrument test (validity test and reliability test), classical assumption test (data normality test, heteroscedasticity test, and multicollinearity test), t test and f test. The results showed that the income level of livestock business in Tlekung Village was Rp. 274,803,500 with an average income of Rp. 5,496,070; The level of milk production of dairy cows in Tlekung Village is between 7-16 liters per head per day. Partial test results showed that the amount of green feed, concentrate feed, and lactation period did not affect the milk production of dairy cows, while the factors of vitamins and drugs and drinking water had an effect on milk production of dairy cows. Forage feed factors, concentrate feed, vitamins and medicines, drinking water, lactation period simultaneously affect cow's milk production.

KEY WORDS

Production, milk, dairy cows, Indonesia.

The development of the livestock sub-sector, especially for dairy cattle, aims to increase milk production towards self-sufficiency, expand employment opportunities and increase farmer income. Dairy cattle farms that are managed by the people still face many obstacles, including the small scale of business due to lack of capital, low skill level and lack of experience of farmers. The agricultural sector is one of the most effective sectors for alleviating poverty in rural areas through increasing incomes working in the agricultural sector (Rahayu et al., 2014). This source of income is also influenced by the control of production factors and household assets. Sources of income can be classified as sources of basic income and sources of additional income based on the amount of income (Amam et al., 2020).

The dairy farming business, which is part of the agricultural sector, has been developed by the government with a social objective, namely to provide employment in rural areas which can further increase income through increasing dairy cow's milk production. The opportunity for developing a dairy cattle business is quite prospective considering that currently domestic milk production is still low (Ahmad and Hermiyetti, 2012). The average milk production ranges from 8-10 liters/head/day (Erwindo, 1998). This is due to the managerial level of local livestock businesses and the low level of technology adoption and the small scale of business (Musyafak and Ibrahim, 2005).

Every business engaged in production, always strives to achieve optimal profit or income. Dairy cattle raising business also has the same effort. Although the dairy farming business has recently developed and can be used as a source of livelihood, in reality the income from this business is still relatively small. As a result, it is difficult to develop a dairy farming business, as well as to meet the needs of farmers and their families. This is



evidenced by the very slow development of the dairy cattle population. The increase in the dairy cattle population in East Java during the 2018-2020 period was from 295-809 heads to 295-141 heads per year (Directorate General of Livestock and Animal Health, 2020). The total population in Indonesia has increased every year. Even BPS has projected the population in 2020. For the total population in Indonesia, the latest data recorded in 2015 was 238,518,000 people in Indonesia. It is projected that in 2020 there will be an increase of 271,066,000 people. Based on BPS data, the level of milk consumption in Indonesia in 2019 was around 16.23 kg/capita/year. According to the Director General of Livestock and Animal Health, I Ketut Diarmita, milk consumption in Indonesia is still relatively low compared to other countries. Although the total national milk needs in 2019 "only" reached 4.33 million tons, Domestic Fresh Milk (SSDN) production was only able to meet 22 percent of these needs. The remaining 78 percent comes from imports (Paramitha, 2020).

Dairy cattle business is a business that has an advanced nature, which selectively uses technological input so that it can proportionally increase production, but in practice farmers do not fully understand the use of this technology. The maintenance of dairy cattle by smallholder farmers still uses simple technology, where knowledge of dairy cattle maintenance is still obtained from generation to generation, and is a sideline business. Every business expects profits to be obtained by using production factors owned by farmers (Emawati, 2011). The people's dairy cattle business in Indonesia has begun to be economically oriented, but its productivity is still low. The low level of livestock productivity is due to a lack of capital, as well as knowledge and skills of farmers covering aspects of reproduction, feeding, post-harvest management, application of recording systems, milking, sanitation, and disease prevention. In addition, the knowledge of farmers regarding aspects of the trade system must be increased so that the profits obtained are proportional to the maintenance (Kamiludin, 2012).

Farming experience is one of the factors that can affect milk production (Lestariningsih and Basuki, 2008). The number of livestock has a positive effect on business productivity. A total of 49.70% of dairy cattle in Indonesia in East Java; 25.60% from Central Java Province; 22.93% in West Java Province; 0.78%. Yogyakarta; 0.5% of DKI Jakarta and 1.08% of other provinces.

Table 1 – Milk Production in Five Provinces in Indonesia

Province	Milk production from 2018-2020 (tons)		
	2018	2019	2020
Jawa Timur	498.915,7	512.846,75	523.103,6
Jawa Barat	310.461,2	319.003,9	351.885,1
JawaTengah	99.606,5	100.889,4	100.799,2
DIY	6.124,5	4.059,4	5.720,6
DKI Jakarta	5.417,8	5.097,9	5.226,8

Source: BPS, 2020.

Fresh milk production in Indonesia is produced from several provinces in Indonesia. Based on BPS data (2020) the 5 provinces with the most fresh milk production include; East Java, West Java, Central Java, Yogyakarta Special Region, and DKI Jakarta. Central Java is in third place in terms of fresh milk production. The largest milk producing areas in East Java are Pasuruan Regency, Malang Regency, Tulungagung Regency: Blitar Regency and Batu City (East Java Province Animal Husbandry Service 2015). The availability of feed is an important factor in the dairy cattle business, namely to ensure the stability of milk production (Mukhtar, 2006). The high level of milk production will directly affect the acceptance of farmers. The profits received by farmers will be able to give an idea of how big the role of the dairy cattle business is in contributing to family income. Revenue from dairy cattle business consists of sales of milk, sales of cows that are no longer productive, calves that are not used for rejuvenation and sales of manure (Siregar, 2008). is the value of the total product of the dairy cattle business in a certain period of time. Revenue from the sale of milk, dung, calves and rejected cows. One component of the livestock sub-sector that has many



advantages and has the potential to be developed in Indonesia is milk production. In connection with the description that has been stated, it is necessary to conduct research in Tlekung Village, Junrejo District, regarding income, production and determinants of cow's milk production. This study aims to: analyze the level of income, the level of milk production of dairy cows, and the determinants of milk production of dairy cows in Tlekung Village, Junrejo District.

METHODS OF RESEARCH

The research was carried out for one month starting from January 24 to February 24 2022. The research location is in Tlekung Village, Junrejo District, Batu City. Determination of the location in Batu City, especially in Tlekung Village, with the consideration that this village is one of the centers for developing dairy cattle business. The research population was 50 dairy farmers. Determination of respondents using the census method. The census method is a sampling technique when all members of the population are used as samples (Sugiono, 2012). Therefore, the research sample amounted to 50 dairy farmers.

The data collection method used in this research is the method of observation, interviews and questionnaires. The data obtained include primary data and secondary data. The data will be taken in the form of production data, income and determining factors such as forage feed, concentrate feed, vitamins and medicines, drinking water, lactation period. The data were analyzed using the Cobb Douglas production function method. The mathematical equation using the Cobb Douglas production function model is as follows:

$$Y = a + X_1^{b_1} + X_2^{b_2} + X_3^{b_3} + X_4^{b_4} + X_5^{b_5}$$

In estimating the parameters in the Cobb Douglas function equation, it must be converted into the natural logarithm (Ln), the form of the equation is as follows:

$$\text{Ln } Y = \text{Ln } b_0 + b_1 \text{Ln } X_1 + b_2 \text{Ln } X_2 + b_3 \text{Ln } X_3 + b_4 \text{Ln } X_4 + b_5 \text{Ln } X_5$$

Where:

- Y = Milk Production;
- X₁ = Forage;
- X₂ = Concentrated Feed;
- X₃ = Vitamins and Medicines;
- X₄ = Drinking water;
- X₅ = Lactation Period;
- b₀ = Constant;
- b_i = Regression Coefficient of each variable;
- e = Standard Error.

The data analysis technique used regression analysis method which consisted of analysis of research instruments (validity test and reliability test), classical assumption test (data normality test, heteroscedasticity test, and multicollinearity test), t test and f test.

The operational definitions used in this research are:

1. Income is the monetary value of selling agricultural products. Revenue is the product of the product produced and the selling price;
2. Milk production is the amount of yield obtained from livestock activities and is measured in liters of milk and produced per liter per day;
3. The determining factor is one of the supporting factors for cow's milk production such as forage feed, concentrates, water, vitamins and drugs, lactation period;
4. Forage feed is feed given to dairy cattle with high crude fiber and consumed by livestock and measured per kilogram;
5. Concentrated feed is feed as a complementary material to forage feed with low crude fiber and easily digestible by livestock;



6. Lactation period is a cow that produces milk and is taken every day usually measured in liters;

7. Drinking water is water given to dairy cows to help the digestive process. In addition, water also serves to push food into the body of livestock;

8. Vitamins and medicines are supplements given to cattle with the aim of treating and maintaining the condition of the cattle in order to keep them in prime condition. The administration of drugs and vitamins uses ml units and is given on a week or month scale.

RESULTS AND DISCUSSION

Characteristics of Dairy Cattle Business in Tlekung Village. Dairy farming business activities in Tlekung Village, greatly affect the improvement of the farmer's economy. The dairy cattle chosen by the breeder in the livestock business in Tlekung Village is the Friesian Holstein type of dairy cow. According to local breeders, this type of cow was chosen because it has several advantages such as high milk production and good milk quality; susceptible to disease; easy to adapt to the environment; increase milk production of dairy cows, breeders provide forage feed; concentrate feed; vitamins and drugs. Forage feeds of choice include elephant grass, weed grass, calliandra; corn husks, kingres grass; and dentures. This type of forage can be obtained from own land and Perhutani land where its use is free of charge.

The frequency of feeding forage and concentrate to dairy cows is two to three times a day, namely in the morning, afternoon and evening. Concentrated feed can be obtained by farmers from the nearest KUD. Vitamins and medicines are given to dairy cows every 1-3 months. If the cow has rheumatic pain and mastitis (udder pain) the farmer can handle it himself, namely by giving treatment using an antiseptic, in addition to being given herbal ingredients that are made by himself.

Factors that need to be considered in an effort to increase milk production for dairy cows, in addition to livestock that must be productive, also need to be accompanied by increased livestock resources, availability of business capital and appropriate technological innovation. Related to breeder resources, it can be improved through technical guidance or counseling, with the aim that breeders are more skilled in managing their business, so that dairy cattle cultivation technology controlled by farmers will increase. Furthermore, the support for the availability of adequate animal feed can increase the productivity of dairy cows, through the use of the types of fodder plants that grow around the location of the farm. Understanding the dairy cattle business can be focused on providing technology and innovation to farmers, it must be balanced with the ability of farmers. If the breeder understands the technology provided and is in accordance with the ability of the breeder, then the farmer can implement it well. On the other hand, if the technology provided to the farmer is not in accordance with the ability of the farmer, then the technology is not useful because it is not used.

The progress of the dairy cattle business in Tlekung Village can be seen from the increasing number of business scales, high milk production, high selling value of dairy cows and increased farmer income. Increased business capacity can be achieved through counseling support, mentoring, education and training for farmers as well as post-harvest handling. Empowerment of dairy farmers is a process that really needs to be considered, because at the forefront of the adequacy of animal protein originating from dairy cow's milk is the breeder. To increase the population of dairy cattle can be done by empowering the potential of the area. Economically, the feasibility of a dairy cattle business can be calculated through production costs and income. The daily production of dairy cows can be influenced by the supply of concentrate feed and good quality forage.

Dairy cow's milk production in Tlekung Village ranges from seven (7) liters to sixteen (16) liters per head per day. The low milk production of dairy cows is thought to be due to the lactation period which has not been and has been more than the ideal period. On the other hand, this low production is also caused by factors such as the administration of



concentrates, vitamins and drugs that are not adjusted to the main needs of lactating dairy cows.

Breeder Characteristics. The characteristics of the respondents that were observed consisted of the age of the breeder, the level of education of the breeder, and the length of time they had reared. This observation aims to assess the extent of understanding of farmers in increasing milk production of dairy cows. The results of the study are presented in Table 1.

Table 1 – Characteristics of Respondents

Characteristics of Respondents	Frequency (Person)	Percentage (%)
Age		
23-42	36	72,0
43-62	12	24,0
63-81	2	4,0
Total	50	100,0
Education		
SD	18	36,0
SMP	16	32,0
SMA	10	20,0
S1	6	12,0
Total	50	100,0
Long Livestock		
0-10	36	72
11-20	10	20
21-30	4	8
Total	50	100

Source: Data processed, 2022.

Based on Table 1, it is known that the age range of breeders in Tlekung Village ranges from 23 years to 78 years. Most of the breeders in Tlekung Village aged 23-42 years amounted to 36 people (72.0%); almost half of the breeders have an educational background at the elementary level, totaling 18 people (36.0%); and most of the farmers with 0-10 years of dairy farming were 36 people (72.0%). The age of breeders in Tlekung Village is dominated by productive age. This can be the basis for farmers to increase the productivity of dairy cattle. The level of education of farmers who are still low is not a major problem in livestock business. The length of rising is a key factor in the livestock business. This is because the longer the farmer runs the livestock business, the greater the experience he has so that the farmer can accept and adopt innovations to increase internal productivity (Sidik, R. 2004).

Dairy Cattle Business Income. The income of the cattle business is a picture of the profits in the dairy cattle business. The costs calculated in the dairy cattle business in Tlekung Village use cost data during the one month expenditure period. The amount of dairy cattle business income is determined based on the role of input costs and milk production results.

Table 2 – Dairy Cattle Business Income in Tlekung Village

Cost component	Total	Average
Reception	475.918.500	9.518.370
Expenditure	201.115.000	4.022.300
Income	274.803.500	5.496.070

Source: Data processed, 2022.

Table 2 shows that the total revenue from cow's milk production during the month was IDR 475,918,500 with an average of IDR 9,518,370; expenditure in dairy cattle business in Tlekung Village is Rp. 201.115,000 with an average of Rp. 4,022,300. Income from livestock business is Rp. 274,803,500 with an average of Rp. 5,496,070. The amount of income received by farmers in Tlekung Village is strongly influenced by the number of lactating cows owned. The more number of lactating cows owned, the more milk production of dairy cows.



On the other hand, the amount of milk production of dairy cows is largely determined by the age of lactation. Dairy cows will have high milk production at the ideal lactation age of ten (10) months. Expenses for cattle business in Tlekung Village consist of concentrate feed; vitamins and drugs; artificial insemination (IB); pregnancy checks and water costs (Mukhtar, A. 2006).

Research Instrument Test. Validity test is a measure that shows that the measured variable is really the variable that the researcher wants to examine. Therefore, the results of the test of the validity of the determinants as a measuring tool for milk production of dairy cows are presented in Table 3.

Table 3 – Validity Test of Determinants of Dairy Cow Milk Production

Defining factor	Sig	alfa	Information
Green Feed	0,86	0,05	Invalid
Concentrated Feed	0,05	0,05	Valid
Vitamins and Drugs	0,01	0,05	Valid
Drinking water	0,00	0,05	Valid
Lactation Period	0,01	0,05	Valid

Source: Data processed, 2022.

Table 3, the results of the questionnaire feasibility test using the person correlation method, it is known that the determinants of green feed have a significant value of 0.86 greater ($>$) than alpha (0.05), so it is concluded that the determinants of green feed in dairy cow milk production are not valid. On the determinants of milk production of dairy cows such as concentrate feed; vitamins and drugs; drinking water; and lactation period has a significant value for each factor smaller ($<$) than alpha (0.05), so that the determinants can be said to be valid/feasible.

The results of the reliability test on the determinants of milk production of dairy cows such as green feed; concentrate feed; vitamins and drugs; drinking water; and the lactation period has a Cronbach's alpha value of 0.542. This value explains that the determining factor in dairy cow's milk production is reliable with fairly reliable criteria.

Determinants of Dairy Cow Milk Production in Tlekung Village. The determinants used in measuring the milk production of dairy cows in Tlekung Village consisted of forage feed (X1), concentrate feed (X2), vitamins and drugs (X3), drinking water (X4), lactation period (X5). The data that has been collected is tested using the classical assumption test technique.

1. Data Normality Test. The results of the normality test of the data on the determinants of milk production in Tlekung Village based on the Normal Probability Plot display show that the data moves along a diagonal line. The distribution of data following the diagonal line can be explained that the data used is normally distributed. Testing the normality of the data using the residual value in the One Sample Kolmogorov-Smirnov Z (K-S) Test method, the probability value is 0.486 which is greater than the alpha value (0.05%), so it can be concluded that the data used is normally distributed.

2. Heteroscedasticity Test. The results of the heteroscedasticity test based on the scatterplot display indicate that the data on the determinants of milk production for dairy cows spread above and below zero (0) on the Y axis. It is concluded that the absence of heteroscedasticity in the regression model used is feasible, so the model can predict production. dairy cow's milk based on input of determinants such as forage feed, concentrate feed, vitamins and drugs, drinking water, lactation period.

3. Multicollinearity Test. Multicollinearity test was used to assess whether there was a correlation between variables in the regression model. The results of the multicollinearity test are presented in Table 4.

Table 4 shows that the tolerance value of forage feed, concentrate feed, vitamins and medicines, drinking water, lactation period is greater ($>$) than 0.1 and VIF value is less than ($<$) 10. It is concluded that there is no correlation or there is no multicollinearity so that the regression model is a good regression model.



Table 4 – Multicollinearity Test

Variable	Tolerance	VIF
Forage	0,576	1,736
Concentrated Feed	0,536	1,866
Vitamins and Medicines	0,871	1,148
Drinking water	0,775	1,29
Lactation Period	0,805	1,242

Source: Data processed, 2022.

Hypothesis test. Partial test was used to assess the effect of each determinant on milk production of dairy cows. The determining factors used include forage feed, concentrate feed, vitamins and medicines, drinking water, lactation period. The results of the partial test of the determinants of milk production for dairy cows are presented in Table 5.

Table 5 – Partial Test of Determinants of Dairy Cow Milk Production

Uji t			
Variable	B	t	Sig.
(Constant)	0,456	0,336	0,738
Forage	-0,1	-0,971	0,337
Concentrated Feed	0,174	1,834	0,073
Vitamins and Medicines	-0,35	-2,123	0,039
Drinking water	1,072	10,653	0,000
Lactation Period	-0,499	-1,046	0,301
Uji F			
Model	F	Sig	
Regression	38,766	0,000 ^b	

Source: Data processed, 2022.

Table 5 shows the following multiple linear regression equations:

$$Y = a + bX_1 + bX_2 + bX_3 + e$$

$$Y = 0,456 + (-0,1) + 0,174 + (-0,35) + 1,072 + (-0,499)$$

The regression equation can be interpreted as follows:

1. A constant value of 0.456 which means that if the determining factors such as forage feed, concentrate feed, vitamins and medicines, drinking water, lactation period are equal to zero (= 0) or there is no input the determining factor is known to produce 0.456 liters of milk;
2. The green feed variable coefficient (X1) is -0.1, meaning that every 1 kg addition of green feed will reduce milk production by 0.1 liters;
3. The variable coefficient of concentrate feed (X2) is 0.174; meaning that each addition of 1 kg of concentrate feed will increase milk production by 0.174 liters;
4. The variable coefficient of vitamins and medicines (X3) is -0.35, meaning that each additional 1 dose of vitamins and medicines will reduce milk production by 0.35 liters;
5. The variable coefficient of drinking water (X4) is 1.072, meaning that each additional 1 liter of drinking water will increase milk production by 1.072 liters;
6. The variable coefficient of lactation period (X5) is -0.499, meaning that if there is an additional 1 month lactation period, milk production will decrease by 0.499.

Table 5 for hypothesis testing is interpreted as follows:

1. The influence of green feed factors on milk production
The test results obtained a significant value of 0.337, greater (>) than 0.05. These results concluded that there was no effect of green feed factors on milk production of dairy cows. This is not in accordance with the hypothesis, so the hypothesis is rejected;
2. The influence of concentrate feed factors on milk production. The test results obtained a significant value of 0.073 greater (>) than 0.05. These results concluded that there was no effect of concentrate feed factors on milk production of dairy cows. This is not in accordance with the hypothesis, so the hypothesis is rejected;



3. The influence of vitamin and drug factors on milk production. The test results obtained a significant value of 0.039, less than ($<$) 0.05. These results concluded that there was an influence of vitamins and drugs on the milk production of dairy cows. This is in accordance with the hypothesis, so the hypothesis is accepted;

4. The influence of drinking water on milk production. The test results obtained a significant value of 0.000 less than ($<$) 0.05. These results concluded that there is an influence of drinking water on milk production of dairy cows. This is in accordance with the hypothesis, so the hypothesis is accepted;

5. The influence of the factor of lactation on milk production. The test results obtained a significant value of 0.301 greater ($>$) than 0.05. These results concluded that there was no effect of the lactation period on the milk production of dairy cows. This is not in accordance with the hypothesis, so the hypothesis is rejected;

6. Factors of forage feed, concentrate feed, vitamins and medicines, drinking water, lactation period simultaneously affect cow's milk production. The test results obtained a significant value of 0.000 less than ($<$) 0.05. These results concluded that forage feed, concentrate feed, vitamins and medicines, drinking water, lactation period simultaneously had a significant effect on cow's milk production. This is in accordance with the hypothesis, so the hypothesis is accepted.

Based on the above hypothesis testing, partially the amount of green feed, concentrate feed, and lactation period had no effect on dairy cow's milk production, while vitamins and drugs and drinking water had an effect on dairy cow's milk production. The provision of green feed to lactating dairy cows in Tlekung Village by farmers is suspected of not paying attention to the amount of green feed given. Excessive feeding of greens will not have an effect on milk production of dairy cows. According to Effendy, et al., (2013) the ideal amount of forage for lactating dairy cows is 8-10% of the body weight (BB) of dairy cows. Hidayat, et al (2018) emphasize that irregular green feed will result in stress for cattle, thereby reducing milk production for dairy cows.

Concentrate feeding did not affect the milk production of dairy cows. This is presumably because the amount of frequency of administration and the nutritional content of concentrate feed consumed by lactating dairy cows have been obtained from forage feed. This is confirmed by Soekartawi (2003) which states that inputs to fixed inputs will result in a decrease in output. In this condition, the nutrients contained in the concentrate have been met by forage feed so that the provision of concentrate feed that still does not have an effect on the milk production of dairy cows. Giving vitamins and drugs can increase cow's milk production. This is presumably because the amount given by the farmer has offset the needs of the livestock. This means that the vitamins and medicines given are in accordance with the needs of livestock consumption.

CONCLUSION

The level of livestock business income in Tlekung Village is Rp. 274,803,500 with an average income of Rp. 5,496,070 breeders.

The level of milk production of dairy cows in Tlekung Village is between 7-16 liters per head per day.

The partial test results showed that the amount of green feed, concentrate feed, and lactation period had no effect on dairy cow's milk production, while vitamins and drugs and drinking water had an effect on dairy cow's milk production.

Factors of forage feed, concentrate feed, vitamins and drugs, drinking water, lactation period simultaneously affect cow's milk production.

SUGGESTIONS

Breeders must pay attention to the amount of feed given so as to increase the amount of milk production of dairy cows. Giving vitamins and medicines to livestock needs to be adjusted to the needs of livestock.



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