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Feed Utilization Efficiency of Dairy Production In Ngantang District Malang Regency

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Abstract

At present, business of people's dairy cows in Ngantang District is still carried out traditionally. Commonly, the feeds provided are concentrates, additives and forages (elephant grass, corn stalks, field grass). This study aims to analyze efficiency of concentrate, additive and forage feed in the production of dairy cows in Ngantang District, Malang Regency. Population in this study were all dairy farmers from three villages in Ngantang District: Pandansari, Jombok and Waturejo Villages. Sample was determined by simple random sampling method of 100 farmers. Data analysis method used is multiple linear regression models. The results showed, the factors that had a significant effect on cow's milk production were forage and concentrate feed. NPMxi/Pxi = 1,704 (NPMxi/Pxi > 1) indicates that forage feeding has not been efficient so that forage feeding can be increased. NPMxi/Pxi concentrate feed is 0.053 (NPMxi/Pxi < 1), indicating that concentrate feed is inefficient so the amount must be reduced.

Keywords: Efficiency, concentrate feed, forage feed, milk production.

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Introduction

Development of dairy population, as well as national milk production, shows an increasingly well condition as indicated by the increasing number of dairy cows and production each year. However, (Asmara, 2012) revealed that growth rate of milk consumption is faster than production, where the trend of milk production only grew by 3.67% and milk consumption by 4.21%. Limited milk production is a major challenge facing national dairy farming. Production that has not met national milk needs, can be anticipated through import policies. (Daryanto, 2007) revealed that there were some losses that Indonesia gained from import of milk. The loss is depletion of national foreign exchange, opportunity loss arising from unemployment or not utilizing potential of existing resources for development of dairy agribusiness, and loss of potential revenue that should be obtained by government from taxes if the agribusiness is well developed domestically. Pudjiastuti (2014), (Pudjiastuti & Kembauw, 2018) and (Pudjiastuti et al., 2013) also stated that imports could disrupt Indonesia's trade balance.

In Indonesia, low productivity of dairy is thought to be due to sub-optimal management. According to (Anang et al., 2010) and (Misrianti et al., 2011), appearance of dairy production was determined by genetic factors (30%) and maintenance management up to 70%. (Aisyah, 2012) study shows that the people's dairy business has not yet reached an efficient condition. Policy of developing a dairy business should be based on the efficiency principle. Efficiency of livestock business will determine the farmers income. (Sarjana & Pertiwi, 2007) stated that household income from dairy businesses has not been able to meet farmers' cost of living.

Milk production is influenced by quality and quantity of feed consumed. (Sulistyowaty, 1999) reported that an increase in concentrate consumption was followed by an increase in milk production. Concentrate feed is food to supplement nutritional needs, which generally contain more than 20% protein and crude fiber less than 18%. Concentrate is usually given with forages to improve nutritional balance of the entire feed. According to (Tillman et al., 1991), concentrate functions as an additional energy supply and protein. Concentrated protein is mixed in the rumen with its forage protein.

Through increasing efficiency of animal husbandry business, it is expected to be able to realize an increase in milk production. In addition, by increasing efficiency of people's dairy business it is also expected to increase farmers' income.

Malang Regency has a considerable potential for dairy farming. Dairy production centers in East-North Malang (Dau, Pujon and Ngantang Districts), East-Southeast Malang (Pakis, Jabung, Tumpang, Poncokusumo and Wajak Districts) and Central Malang (Gondanglegi, Kalipare, Turen, Ngajum and Wagir District) .

Currently, management of people's dairy business in Ngantang District is done traditionally. Commonly, the feeds provided are forage which is elephant grass, corn stalks, field grass, and others. Concentrate feed provided is production of a dairy cow cooperative in the District of Ngantang. In addition, there are some farmers who still provide additional feed such as corn ampogs, CGF and others. This study aims to analyze efficiency of dairy business in Ngantang District, Malang Regency.

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Research Method

Research Locations

This research was conducted in Ngantang District because it is a center for people's dairy cattle in Malang Regency. An area is said to be a production center because it raises more than 13,000 dairy cows (Malang Animal Husbandry and Animal Health Service, 2018). The selected village were Pandansari, Jombok and Waturejo villages. These villages have largest population of dairy cows relative to other villages in Ngantang District

Sampling Method

Population in this study were all dairy farmers in Pandansari, Jombok and Waturejo Village, Ngantang District. Samples in each village are set by 30-40 farmers in such a way that total sample is 100 farmers. Sample selection uses simple random sampling method because scale of business was relatively homogeneous.

Method of collecting data

Data were collected consists of primary and secondary data. Primary data were obtained directly from farmers by interview, observation and questionnaire as a research instrument. Primary data types include: socioeconomic characteristics of farmer consisting of cattle ownership, farmers' experience, farmers' education and maintenance management, as well as utilization of forage, concentrate, supplementary feed and milk production. Secondary data were obtained by documentation method and literature study. Secondary data included astronomical and climatic locations, territorial boundaries and population situation of Ngantang District Malang Regency in 2019, the number of dairy farmers and their distribution in each village to compile population and sample frameworks.

Data analysis

Data were collected through interviews using a questionnaire that is equipped with observations, edited in the field, and tabulated. Data analyzed descriptively are presented in frequency and percentage tables, cross tables or graphs (Purwanto & Suharyadi, 2009).

In addition to descriptive analysis, data were also analyzed quantitatively with multiple linear regression models. Multiple linear regression analysis was used to analyze the effect of feed usage including forage, concentrate, supplementary feed, maintenance management and number of lactation cows towards milk production, both simultaneously and partially. Multiple linear regression equation model used (Supranto, 2006) is as follows:

$$Y = a + b1X_1 + b2X_2 + b3X_3 + b4X_4 + b5X_5 + e$$

Where:
Y : Milk production
a : Constants

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b   : Regression coefficient
X_1 : Forage feed
X_2 : Concentrate feed
X_3 : Supplementary feed
X_4 : Maintenance management
X_5 : Number of lactation cows
e   : Standard error

Suitability of model (goodness of fit model) is indicated by determination coefficient. According to (Gujarati, 2012), coefficient of determination is between zero and one. The closer to one, the more appropriate a regression model. Simultaneous tests (F Test) were carried out to prove whether forage feed, concentrate feed, supplementary feeds, maintenance management and number of lactation cows simultaneously influence milk production. If probability of significance (sig. F) > 0.05, then simultaneously, these variables significantly influence milk production. If it happens, then proceed with a partial test (t test). It was used to determine which variables had an individual significant influence towards milk production. Variables that have a significance value (p value) < 0.05, then these variables are said to individually have a significant effect on milk production.

Efficiency of feed usage. Efficiency parameter is a measure to determine whether input or production factors used in the dairy farming business are efficient or not. Efficiency used in this study is allocative efficiency (price). Price efficiency is achieved if the ratio between marginal productivity values (NPMx) is equal to cost of these inputs (Px). According to (Anindita et al., 2011), mathematically these criteria can be written as:

$$NPMx = Px \quad \text{or} \quad \textbf{\textit{NPMx}}/\textbf{\textit{Px}} = \textbf{1} \ \ldots\ldots\ldots .. (1)$$

Where :
b   = Elasticity
Y   = Production
Py = Price of production (Y)
X   = Number of production factors (X)
Px = Price of production factor (X)

If $(NPMx)/(Px) > 1$, then input x is said to be inefficient, so that the input utilization in question can be increased. If $(NPMx)/(Px) < 1$, then input x is said to be inefficient, so that the input must be reduced.

Results and Discussion

Pandansari, Jombok and Waturejo villages are three villages of dairy cow business centers in Ngantang District, where male population is more potential in terms of numbers than women. Climate condition of Ngantang District, which is at an altitude of 500-700 meters above sea level, is one of the supporting factors for dairy business. In addition, another supporting factor for sustainability of the business is characteristics of farmers themselves.

Characteristics of Dairy Farmers

Socioeconomic characteristics of dairy farmers in Ngantang District, Malang Regency were observed based on the number of livestock ownership, tenure business experience and farmer education (Table 1). (Antwi et al., 2016) said that socio-economic characteristics of farmers have a significant influence on farmers' behavior and decision making in farming.

Table 1. Distribution of Farmers by Socio-Economic Characteristics

Characteristics	Criteria	Frequency (person)	Percentage (%)
Number of ownership	1-5 tail	58	58,0
	6-10 tail	25	25,0
	> 11 tail	17	17,0
	Total	**100**	**100,0**
Farmer's experience	1-5 years	7	7,0
	6-10 years	11	11,0
	> 11 years	82	82,0
	Total	**100**	**100,0**
Farmer education	Elementary School	66	66,0
	Junior High School	32	32,0
	Senior High School	2	2,0
	Total	**100**	**100,0**
Livestock husbandry management	Very less	0	0
	Less	0	0
	Enough	57	57,0
	Good	43	43,0
	Very good	0	0
	Total	**100**	**100,0**

Source: Primary data 2019, processed.

Livestock ownership determines farmer's business scale, milk produced and farmer's income, ceteris paribus. Generally (58%) farmers have 1-5 dairy cows. Thus, the dairy business was a small business.

Farmer's experience was a period that a farmer starts a dairy business until this research was carried out which was measured in years. Most (82%) of farmers in Ngantang District, Malang Regency have been experience in dairy business for more than 11 years. So, dairy farmers have understood how to manage and income from their businesses, or this business was an important source of their livelihood.

Education in question was a level of education that has been taken by farmers. Most (63%) of farmers only have elementary school education. Generally, level of education is related to ability to absorb information, knowledge, and innovation, as well as, efficiency of dairy production. This shows that formal education is not a requirement to become a dairy farmer.

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Management of maintenance carried out by 57% of farmers was classified as sufficient. This is closely related to farmer's education which is relatively low. Best maintenance management will bring up genetic potential that exists in dairy cows so that it can produce good quality milk and optimal amount. Observation results indicate that maintenance management has not been well.

Feed Utilization and Dairy Production

Feeding to animals is basically intended to meet biological needs of livestock, both for basic living needs and for production. Basic life necessities are needs to maintain body weight, while production needs to produce milk, growth, and reproduction. Feed usage and production of dairy business during the past month was presented in Table 2.

Table 2. Description of Feed Usage per Dairy per Month

Feed type	Max.	Min.	Average
Forage feed (kilograms)	1.050	1.470	1.271,40
Consentrate feed (kilograms)	233	400	301,33
Supplementary feed (kilograms)	6	69	19,26
Milk production (liters)	600	7.050	1.648,87

Source: Primary data 2019, processed

Forage is the main feed of dairy cows that contain high fiber. Types of forage divided into three categories: fresh forage, dry forage, and silage. Forage usage as dairy feed was recorded at 1,271.40 kg/head per month, while concentrate feed was 301.33 kg/head per month. Supplementary feed (ampog corn) was given at 19.26 kg/ head/month. Dairy milk production in Ngantang District is 1,648.87 liters/month.

Effect of Input Usage on Milk Production

Regression analysis produces a coefficient of determination (R^2) as an indicator of goodness of fit regression model. Determination coefficient shows how much percentage of forage feed (X_1), concentrate feed (X_2), supplementary feed (X_3), maintenance management (X_4) and the number of lactation cows (X_5) simultaneously explained cow's milk production (Y). Based on Table 3, R^2 was obtained 0.798. This value indicates that 79.8% of cow's milk production (Y) was influenced by forage, concentrate, supplementary feed, maintenance management and the number of lactation cows. The remaining 20.2% was explained by other variables not included in the model, for example quality of each feed. Thus it can be said that the regression model was appropriate for use in analysis.

Simultaneously, forage feed, concentrate feed, supplementary feed, maintenance management and the number of lactation cattle, influence cow's milk production. The indicator was sig. F by 0,000. Therefore, test can be continued with a partially test (t test).

Then, t test was used to prove which of the variables between forage, concentrate feed, supplementary feed, maintenance management and the number of lactation cows which

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individually have a significant effect on cow's milk production. In detail, the information in Table 3 was explained below.

Table 3. Regression Analysis Results

Model	Unstandardized Coefficients		t	Sig.
	B	Std. Error		
(Constant)	-2315,670	2411,121	0,960	0,339
Forage feed (X_1)	1,251	1,391	7,899	0,000
Consentrate feed (X_2)	0,822	3,637	6,226	0,000
Supplementary feed (X_3)	1,032	3,533	0,292	0,771
Maintenance management (X_4)	106,161	211,516	0,502	0,617
Number of lactation cows (X_5)	153,928	22,699	0,781	0,371
R^2 : 0,798 F Statistic : 10,243 Sig. F : 0,000 Dependent Variabel : Milk production (Y)				

Source: Primary data 2019, processed

1) Constants (a)

Constant is -2315,670. This shows that without forage feed (X_1), concentrate feed (X_2), supplementary feed (X_3), maintenance management (X_4) and the number of lactation cows (X_5) in dairy business, farmer will bear an equal loss in milk production about 2315,670 liters/month.

2) Forage Feed (X_1)

Regression coefficient value of forage (X_1) was 1.251. This shows, each increase in the use of forage as much as 1 kg used for dairy feed will increase milk production by 1,251 liters, ceteris paribus. Significance level of 0,000 < α (0.05) indicates that forage feed has a significant effect on milk production of dairy cows. Farmers must increase forage feeding to increase milk production.

3) Concentrate Feed (X_2)

Regression coefficient of concentrate feed (X_2) was 0.822. This shows, each increase in concentrate as much as 1 kg for dairy cattle feed will reduce milk production by 0.822 liters, ceteris paribus. Significance level of 0,000 < α (0.05) indicates that concentrate feed has a significant effect on milk production of dairy cows. Like forage feed, in order to increase milk production, concentrate feeds must be increased.

4) Supplementary Feed (X_3)

Regression coefficient of additional feed (X_3) was 1.032. This shows that each additional use of 1 kg additional feed for dairy cattle feed will increase milk production by 1,032 liters, ceteris paribus. Significance level of 0.771 > α (0.05) indicates that the feed has no significant effect on milk production. Although it is positive, supplementary

feed does not need to be increased because the effect is not significant. Indeed, only some farmers provide it of which tofu dregs, rejected bread and other supplementary feed.

5) Maintenance Management (X_4)

Regression coefficient of maintenance management (X_4) was 106,161. This shows that the better management of maintenance in dairy business, will increase milk production by 106,161 liters, ceteris paribus. Significance level of $0.617 > \alpha$ (0.05) indicates that it has no significant effect on milk production. This figure shows that maintenance management in the villages has not been implemented properly, even though this factor will increase milk production by a large amount.

6) Number of Lactation Cows (X_5)

Regression coefficient of number of lactation cattle (X_5) was 153.928. It is shows, each increase of one cow lactation, will increase milk production by 153,928 liters, ceteris paribus. Significance level of $0.371 > \alpha$ (0.05) indicates that lactation cows does not significantly influence milk production. Not-significant effect of this variable towards increase in milk production is due to relatively small ownership of livestock.

Based on Table 3, multiple linear regression equations that show the effect of forage feed (X_1), concentrate feed (X_2), supplementary feed (X_3), maintenance management (X_4) and number of lactation cows (X_5) towards milk production (Y) was formulated as:

$$Y = -2315,670 + 1,251X_1 + 0,822X_2 + 1,032X_3 + 106,161X_4 + 153,928X_5$$

Production factors that have a significant influence on milk production were forage and concentrate feed. This finding was different from the results of a study by (Kusnindar et al., 2019), that maintenance management was important in the cattle business. Dairy milk production can still be increased by increasing the amount of forage and concentrate feed. Increased milk production of dairy cows will be able to increase the income of farmers as a result of the study of (Sulistyorini et al., 2019) that the dairy farming business is profitable.

Efficiency of Animal Feed Utilization

Allocative efficiency of production factors in dairy business activities was known by calculating ratio between marginal product value to price of production factors (NPMx/Px). Analysis of dairy feed was measured using regression coefficient of the Cobb-Douglass production function. There are three criteria related to efficiency: (1) if NPMx/Px > 1, meaning that the input used in livestock business activities is not optimal, so the production factors needs to be increased to achieve efficient conditions, (2) if NPMx/Px = 1, meaning inputs used in livestock business activities have been efficient, (3) if NPMx/Px < 1, meaning that the inputs used in livestock business activities are not efficient, so these production factors needs to be reduced to achieve efficient conditions.

Based on regression analysis, it was known that the inputs that significantly affect milk production were forage feed (X_1) and concentrate feed (X_2). Therefore, efficiency analysis was only done for these factors of production. Results of allocative efficiency

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analysis about milk production factors can be seen in Table 4. These findings were consistent with the results of a previous study conducted by (Aisyah, 2012).

Table 4. Results of Efficiency Analysis of Feed Usage of Dairy Business

Variable	Bi	Py	Xi	Pxi	NPMxi	NPMxi/Pxi	Justify
Forage feed	1,251	200	1.271,40	200	1590,52	7,953	No-efisien
Concentrate feed	0,822	3.150	301,33	3.150	247,70	0,079	In-efisien

Source: Primary data 2019, processed

NPMxi/Pxi of forage feed was obtained at 7,953. This figure shows that forage has not been efficient because of NPMxi/Pxi > 1. The implication was that the increase of forage in dairy business must be done if farmers want to increase milk production. NPMxi/Pxi of concentrate feed was obtained at 0.079. This figure shows that concentrate is in-efficient because NPMxi/Pxi < 1. The implication was that reducing concentrate feed in dairy business must be done if the farmer wants to increase milk production of dairy cows.

Conclusion

Factors that significantly influence milk production were forage feed with a coefficient of 1.251 and concentrate feed with a coefficient of 0.822. Other variables supplementary feeding, maintenance management and the number of lactation cows have no significant effect. Foraging for dairy cattle is still not efficient with NPMxi/Pxi = 7,953 (NPMxi/Pxi > 1). In-efficient concentrate feeding with NPMxi/Pxi = 0.079 (NPMxi/Pxi <1).

Suggestions based on the conclusions of this study are: (1) Farmers should focus on the forage and concentrate feed in their dairy businesses. This is also a major concern of the government, especially policy makers in order to develop policies to increase milk production of dairy cows, (2) To achieve efficient usage of feed in the dairy business, farmers should increase the amount of forage feed, and reduce the amount of concentrate feed.

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