

# Determining Factors for Dairy Income in Ngantang District, Malang Regency

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## Abstract

Smallholder dairy farms in Indonesia are still traditional in nature, where breeding management is simple and productivity is low, so that income is also small. This study aims to analyze the determinants of dairy cow business income. Population in this study were all of the dairy farmers from 3 (three) villages in Ngantang District. Sample was determined using a simple random sampling of 100 dairy farmers. Data analysis method used is multiple linear regression. The results showed that factors that had a significant effect on income of dairy business in Ngantang District, Malang Regency were breeding management, number of livestock, experience of raising livestock and medicine / vaccine costs.

**Keywords:** Milk, quality, production factor, income.

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## Introduction

Dairy farm is one part of the livestock subsector which is very potential to meet the needs of animal protein, and currently very high demand. The high demand is an excellent opportunity for dairy farmers in Indonesia to develop their business. Dairy cows in Indonesia generally take the form of community farming. The total population of people's

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dairy farms is around 90% of the entire population of dairy cows in Indonesia. People's dairy farms in Indonesia are still traditional in nature with conventional breeding management and low productivity of dairy cows. On the other hand, milk consumption has not been fulfilled over a long period of time, so Indonesia must import it to fulfill it. According to (Pudjiastuti et al., 2013), (Pudjiastuti, 2014), (Pudjiastuti & Kembauw, 2018) will disrupt Indonesia's trade balance, if allowed to continue.

Management of dairy cattle breeding is very important for sustainability of dairy farming business. Poor management of it will produce low milk, both in terms of quality and quantity. According to (Susilorini et al., 2008), domestic dairy cow production of 3,660 liters/lactation was only half of Dutch production native FH dairy cows that could reach 6,350 liters/lactation. This striking difference in production can occur because maintenance management in the Netherlands is well done and modern.

Total solid (TS) content of dairy cow's milk determines the price and decision to receive milk in the milk processing industry. High TS has an impact on high the prices for dairy farmers. Milk with TS less than 11% will be rejected by cooperative, milk with TS 11-11.2% will be received with a warning, while the milk with TS above 11.2% will get a price bonus (Utami et al., 2014). TS and milk quality were determined based on the Indonesian National Standard (SNI) for fresh milk, namely specific gravity of 1,027 g/ml and 3% fat content equivalent to TS 10.815% (BSN, 2011).

As a highly nutritious food ingredient, milk is an excellent medium for growing and developing microorganisms. Therefore, milk will be easily damaged and unfit for consumption if not handled properly (Mennane et al., 2007). If the total plate count (TPC) is very high, the price of milk will be set low, even it can be rejected by the industry. According to (BSN, 2011), the TPC standard in fresh milk according to SNI is one million CFU/ml, while antibiotic residues of penicillin, tetracycline, amino-glycoside and macrolide groups must be negative. If one of these antibiotics is detected in the milk, it will be rejected.

Generally, people's dairy farms were dominated by farmers with education levels from elementary to junior high. There were highly educated farmers, but only a few. This led to limited adoption of knowledge about maintenance management, feed management, health of dairy cows and development of livestock businesses.

Dairy cows ownership at community farms between 2-5 head also contributes to business efficiency. Business small scale has resulted in people's farming not being a main business for the village community. For a small number of cows, maintenance of dairy cows becomes less efficient due to high production costs per unit.

High demand for animal feed, especially forage, was a community farms problem because of the limited ownership of animal feed growing areas. As a result, cost of forage feed was high. Farmers must find and/or buy it to other areas and traders. In addition, concentrate feed which depends on suppliers and manufacturers made from raw materials of imported wheat pulp, is susceptible to exchange rate fluctuations. In production process of milk, the food need reaches 70% of all production costs so it is crucial to determine profits.

Other costs needed are medicine and vaccines. It was smaller than feed cost if dairy cows are in healthy condition. However, cattle production and health are also very dependent on the feed quality and quantity.

Length of raising experience is one factors that influence business endurance. Someone who has a longer experience of raising animals will be more responsive in decision making, because it is a guideline in their business activities (Sulistiyati et al., 2013). It is also relates to maintenance management and handling of health and reproduction of dairy cows.

Half of total national milk production comes from East Java. Malang Regency is one of dairy cow centers in East Java Province which has a high population of it. Dairy farming centers in Malang Regency are in Districts of Pujon, Ngantang, Kasembon, Jabung, Karangploso, Lawang, Bantur, Gondanglegi, Poncokusumo and Kalipare (BPS, 2016) and (Anonim, 2018). Management of dairy business in Ngantang District has not yet seriously considered the determinants of milk prices, so that their income is not yet optimal. This study aims to analyze factors that determine to business income of dairy cattle in Ngantang District, Malang Regency.

## **Research Method**

### *Research Locations*

This research was conducted in three villages in Ngantang District, Malang Regency. Those villages are Kaumrejo, Ngantru and Banturejo. The location was chosen because of similarity in area's topography, access to transportation, number of livestock ownership, as well as having a dairy cow population and a dense number of farmers.

### *Sampling Method*

Population in this study were all of dairy farmers in three villages in Ngantang District. In each village, a minimum of 30 dairy farmers was determined as a sample, such that the total sample size was 100 respondents. Sample was determined using a simple random sampling method with reasons of homogeneous number of dairy cattle ownership. According to (Sugiyono, 2019), sample was chosen to be representative of population.

### *Method of collecting data*

Data were collected consists of primary data and secondary data. Primary data were collected directly from dairy farmers using interviews with questionnaires and observations. Primary data include characteristics of dairy farmers (age, education, length of dairy farming), milk quality, dairy production and productivity, milk prices and dairy business income. In addition to interviews, direct observers were also conducted to farmers to match and know the performance of dairy businesses when the research was conducted as a comparison and complementary data.

Secondary data were collected by documentation method. Data collected includes astronomical location and climate, territorial boundaries, population of Ngantang District Malang Regency in 2019, number of dairy farmers. Data sources are village office and Ngantang District in Numbers.

### *Data analysis*

Data validity and reliability tests were performed first to ensure that the instruments can produce reliable data. Then, classic assumption test was performed so that regression model used is BLUE (Gujarati, 2012). Suitability of the model is checked with coefficient of determination. The closer to one, the more appropriate of regression model.

Multiple linear regression analysis was used to analyze effect of maintenance management, farmer education, number of cows, feed costs, livestock experience and medicine/vaccine costs on livestock income. The regression equation is:

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + e$$

Where:

- Y = Livestock income,
- X<sub>1</sub> = Breeding management,
- X<sub>2</sub> = Farmer education,
- X<sub>3</sub> = Number of livestock,
- X<sub>4</sub> = Feed cost,
- X<sub>5</sub> = Livestock experience,
- X<sub>6</sub> = Medicines and vaccines cost,
- a = constant,
- b<sub>i</sub> = regression coefficient,
- e = standard error.

### **Results and Discussion**

Ngantang District is astronomically located between 112.2149 to 112.22286 East Longitude and 7.4945 to 7.5603 South Latitude, is one of 33 districts in Malang Regency. Area of Ngantang District is 147.97 Km<sup>2</sup> or 4.96 percent of Malang Regency area. Kaumrejo, Ngantru and Banturejo Village are three villages where dairy cattle business centers are located, where male population number was more potential 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 cattle business. In addition, another supporting factor for sustainability of dairy farming business is characteristics of breeders themselves.

#### *Characteristics of Dairy Farmers*

Socio-economic characteristics of dairy farmers that is observed include the farmers education, amount of dairy ownership and experience of dairy farming. Distribution of farmers according to their characteristics was presented in Table 1. According to (Antwi et al., 2016), socio-economic characteristics of farmers have a significant influence on farmers' behavior and decision making in farming.

Most (63%) of farmers in Ngantang District only have elementary school. A person's education level will determine the ability to absorb information, knowledge, and innovation, as well as production efficiency. It is also shows that the employment of dairy farming does not require formal education. Knowledge about raising dairy cows was

obtained from their parents because it business was inherited. New knowledge and information about raising dairy cows is obtained through non-formal education (counseling). Farmers, in generally, become members of farmer groups, where they get infrastructure facilities from the government, private sector and other advanced farmers.

Most (58%) of farmers have > 4 dairy cows, however the dairy business was still classified as a small business. Owning dairy cows will determine business efficiency and optimal inputs utilization.

Most (82%) of farmers in Ngantang District, Malang Regency have been in the dairy business for more than 11 years. Farmers who have been involved in the business for a longer time will be better understand about existing problems and how to solve them. The problem that is often faced by farmers is basically fluctuating milk quality. Milk price is determined to vary depending on milk quality, so that farmers' income also depends on it quality. So, knowledge through non-formal education and long experience in raising livestock, will determine sustainability of dairy farming business.

Table 1. Distribution of Farmers by Socio-Economic Characteristics

Characteristics	Frequency (person)	Percentage (%)
<b>Education</b>		
Elementary school	63	63,0
Junior High School	34	34,0
Senior High School	3	3,0
<b>Total</b>	<b>100</b>	<b>100,0</b>
<b>Livestock ownership</b>		
1-3 tail	42	42,0
4-6 tail	32	32,0
>7 tail	26	26,0
<b>Total</b>	<b>100</b>	<b>100,0</b>
<b>Breeding experience</b>		
1-5 years	7	7,0
6-10 years	11	11,0
> 11 years	82	82,0
<b>Total</b>	<b>100</b>	<b>100,0</b>

Source: Primary Data 2019, processed.

### *Determinants of Dairy Cattle Business Revenue*

Instruments used in this study produced valid data (Table 2) and were reliable. The indicator is validity test results show  $r_{count} > r_{tables}$  for breeding management, farmer education, number of livestock, feed costs, livestock experience, medicine and vaccine costs, livestock business income. All variables were declared valid except for antibiotic

residues, so these invalid variables are not analyzed further. Data reliability was indicated by the Cronbach alpha value  $0.861 > 0.620$ . All data are stated as reliable.

Table 2. Test Results of Research Instrument Validity

No	Item	r table	r count	justify
1	Total solid content	0.195	0.798	Valid
2	Antibiotic residues	0.195	0.015	Not-valid
3	Number of bacteria	0.195	0.417	Valid
4	Specific gravity	0.195	0.447	Valid
5	Breeding management	0.195	0.224	Valid
6	Farmer education	0.195	0.211	Valid
7	Number of livestock	0.195	0.993	Valid
8	Feed cost	0.195	0.994	Valid
9	Breeding experience	0.195	0.415	Valid
10	Medicine and vaccine cost	0.195	0.993	Valid
11	Price of milk	0.195	1.000	Valid
12	Livestock business income	0.195	0.910	Valid

Source: Primary Data 2019, processed.

Data were used has fulfilled the classical assumptions (normality, heteroscedasticity, and multicollinearity). Data was said to normally because of the pattern of data distribution that approaches a straight line or diagonal, so that regression model meets assumption of normality. Data distribution does not have a clear pattern, and the points spread above and below 0 on Y axis, so it can be concluded that there is no heteroscedasticity. Multicollinearity also did not occur because the VIF value  $< 10$  (Gujarati, 2012). This information can be seen in Table 3.

Table 3. Multicollinearity Test Results

No.	Variable	VIF	Justify
1	Total solid content	1,120	No - multicollinearity
2	Number of bacteria	1,159	No - multicollinearity
3	Specific gravity	1,049	No - multicollinearity
4	Breeding management	1,035	No - multicollinearity
5	Farmer education	1,275	No - multicollinearity
6	Number of livestock	2,375	No - multicollinearity
7	Feed cost	6,583	No - multicollinearity
8	Livestock experience	1,287	No - multicollinearity
9	Medicine and vaccine cost	4,874	No - multicollinearity

Source: Primary Data 2019, processed

Coefficient of determination ( $R^2$  adjusted) of 0.928 indicates that regression model is appropriate. So, all of the variables (factors of production) that comprise regression model are able to explain phenomenon of dairy farmers' income by 92.8%.

The results of simultaneous linear regression analysis (F test) showed that all variables, namely breeding management ( $X_1$ ), farmer education ( $X_2$ ), number of livestock

( $X_3$ ), cost of feed ( $X_4$ ), breeding experience ( $X_5$ ) and cost of medicine/ vaccines ( $X_6$ ) significantly influence livestock business income (Y). Meanwhile, partially (t test), breeding management, number of livestock, livestock experience, medicine/vaccine costs have a significant effect on dairy cattle business income. The results of this analysis were presented in Table 4.

Table 4. Determinants of Dairy Farmer Income in Ngantang District, 2019

Model	Unstandardized Coefficients		t	Sig.
	B	Std. Error		
(Constant)	-968726,413	190910,275	-5,074	,000
Breeding management ( $X_1$ )	59721,732	57999,792	1,030	,006
Farmer education ( $X_2$ )	61056,009	58202,240	1,049	,297
Number of livestock ( $X_3$ )	71086,004	68304,840	0,049	,000
Feed cost ( $X_4$ )	0,013	0,107	0,118	,906
Livestock experience ( $X_5$ )	51173,761	3668,788	13,948	,000
Medicine and vaccine cost ( $X_6$ )	19,502	10,250	1,903	,004
R <sup>2</sup> : 0,924 F Statistic : 24,799 Sig. F : 0,000 Dependent Variable : livestock business income (Y)				

Source: Primary Data 2019, processed

Determinants of dairy business income in Ngantang District were formulated as:

$$Y = - 968.726,413 + 59.721,732X_1 + 61.056,009X_2 + 71.086,004X_3 + 0,013X_4 + 51.173,761X_5 + 19,502X_6$$

Multiple linear regression model that determines income of dairy business is explained below.

1) Constants (a)

Constant is -968,726,413. This shows that without breeding management ( $X_1$ ), farmer education ( $X_2$ ), number of livestock ( $X_3$ ), feed costs ( $X_4$ ), breeding experience ( $X_5$ ) and medicine/vaccine costs ( $X_6$ ), the farmer will bear a fixed cost in amount of IDR 968,726,413.

2) Breeding Management ( $X_1$ )

Regression coefficient of breeding management variables is 59,721,732. This shows that the higher management, the business income of dairy cows will increase, ceteris paribus. The results of regression analysis (t test) showed that this variable significantly affected business income of dairy cows with sig. t of 0.006. This factor must be considered by farmers because it is not optimal until this research was conducted. The maintenance management carried out by breeders is indeed not quite good, the indication is the quality of milk (related to the parameters of total solid, number of bacteria and

specific gravity) produced relatively varied. This parameter becomes a basis for determining price of milk in Ngantang District.

### 3) Farmer Education ( $X_2$ )

Regression coefficient of farmers education variable is 61,056,009. This shows that the higher farmer's education, the higher livestock business income will be, *ceteris paribus*. The results of t test showed that this variable did not significantly influence business income of dairy cows with sig. t of 0.297. It indicates that labor market in the field of dairy does not require formal education. Knowledge and skills of farmers are obtained through non-formal education (counseling).

### 4) Number of Livestock ( $X_3$ )

Regression coefficient of livestock number is 71,086,004. This shows the more number of livestock, the livestock business income will increase by IDR 71,086,004, *ceteris paribus*. The results of t test showed that this variable significantly affected business income of dairy cattle with sig. t of 0,000. The intended cattle in this case are dairy cows during lactation period.

### 5) Feed Cost ( $X_4$ )

Regression coefficient of feed cost is 0.013. This shows that the higher costs incurred for animal feed needs of IDR 1000, -, then livestock business income will increase by IDR 13, -, *ceteris paribus*. The results of t test showed that this variable did not significantly influence income of dairy business with sig. t of 0.906. These findings indicate possibility of: 1) the amount of feed given has been optimal, 2) the feed given is generally forage feed obtained without sacrifice (not calculated financially), 3) income is not responsive to cost of feed because it involves production, production prices, input and input prices are proportional. It is in accordance with that stated (Anindita et al., 2011).

### 6) Livestock Experience ( $X_5$ )

The regression coefficient of the livestock experience variable is 51,173,761. This shows the longer the breeding of dairy cows, *ceteris paribus*. The results of t test showed that this variable significantly affected business income of dairy with sig. t of 0,000. This supports a calculation of non-formal education in dairy business, which is not only obtained from counseling, but can also be obtained from the experience of raising livestock.

### 7) Medicine and Vaccine Cost ( $X_6$ )

Medicine/vaccine regression coefficient is 19,502. This shows that if costs incurred for medicine/vaccines are increased by IDR 1, - then livestock business income will increase by IDR 19,502, *ceteris paribus*. The results of t test showed that this variable significantly affected business income of dairy with sig. t of 0.004. During the production process, dairy cows require vaccination so that they grow well and produce optimal production. Farmers are still possible to increase vaccinations or medicine usage, so that their income increases.

Breeding management, number of livestock owned, experience of breeding, and cost of medicine/vaccines are factors that have a significant effect on income of dairy farmers. This finding is different from the results of the study by (Kusnindar et al., 2019) that the experience of raising livestock is not a determining factor for the income of beef cattle farmers. However, amount of livestock ownership and cost of medicine/vaccines were equally significant. Other findings from this study were cost of feed has no significant effect. But, (Sulistiyorini et al., 2019), stated that the dairy cow business is still feasible to be developed despite an increase in feed by 5%. So the dairy cattle business continues to provide decent benefits for farmers.

## Conclusion

Production factors that affect the business income of dairy cattle in Ngantang District Malang Regency were breeding management, number of livestock, livestock experience and medicine and vaccine cost with regression coefficient of 59,721.732; 71,086.004; 51,173.761 and 19,502.

Income of dairy business in Ngantang District was still possible to be improved through improving existing breeding management, increasing the number of livestock, utilizing existing experience of raising livestock and increasing cost of medicine and vaccines.

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