

Correlation Between the Implementation of Good Dairy Farming Practices (GDFF) and Farmers' Income: A Case Study of Organic Dairy Farmers in Tutar District, Pasuruan Regency

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Abstract

East Java Province, particularly Tutar District, holds significant potential in the organic dairy farming sector, with a dairy cattle population reaching 31,851. The region supports the development of organic farming in line with growing public awareness of healthy and environmentally friendly products. This study aims to: (1) assess the level of Good Dairy Farming Practices (GDFF) implementation among organic dairy farmers in Tutar District; and (2) analyze the correlation between GDFF implementation and farmers' income. The research employed a survey method through observation and interviews using a total sampling technique. Data were analyzed using descriptive quantitative methods and Spearman's rank correlation test. The results showed that the overall implementation of GDFF was categorized as very good, with a score of 100.9. The Spearman correlation analysis indicated a moderate relationship between GDFF implementation and farmers' income in the aspects of animal health and animal welfare. This implies that higher GDFF implementation tends to lead to higher farmer income.

INTRODUCTION

East Java Province possesses significant potential in the dairy cattle farming sector. Based on data from the Central Statistics Agency (BPS) 2024, the dairy cow population in Indonesia reached 507,075 head in 2022, with a national milk production of 0.8 million tons in 2023. East Java Province contributes the highest production, totaling 0.4 million tons or 52.26% of the national milk production. However, domestic milk demand reaches 4.3 million tons (Directorate General of Livestock and Animal Health, 2024), which means domestic production only meets approximately 18% of the requirement, with East Java contributing only about 9%. This indicates that national milk production is still far from meeting the demand, resulting in a high reliance on milk imports from other countries.

Pasuruan Regency is a region located in East Java that has potential for dairy cow farming. Data from the Central Statistics Agency of East Java Province (2023) reveals that the dairy cow population in Pasuruan Regency was 100,080 head in 2022. The Pasuruan Regency Government (2018) noted that the dairy cattle distribution areas in Pasuruan Regency include Tutar, Grati, Purwodadi, Purwosari, Puspo, and Prigen Districts. The dairy cows developed in

Pasuruan Regency are the Friesian Holstein and Friesian Holstein Crossbred (PFH) types, with a production of 7–10 liters/day/head.

Tutur District has an elevation above 1,000 meters above sea level (masl), making it an ideal area for dairy cow farming. Based on data from the Tutur District Agricultural Extension Center (2023), the dairy cow population in this area reaches 31,851 head. Furthermore, the trend of organic agriculture and livestock farming is also starting to develop in this region, in line with the increasing public awareness of the importance of healthy and environmentally friendly products.

Organic dairy cows are managed under the principles of sustainability and animal welfare, strictly avoiding the use of synthetic chemicals and antibiotics in feed or treatment. Organic farming requires a strict management system, including cleanliness, sanitation, and adherence to organic standards. This necessitates that farmers possess good knowledge, motivation, and technical ability. Therefore, the implementation of Good Dairy Farming Practices (GDFF) is crucial to support the success of organic dairy farming.

Milk production and livestock productivity can be optimized by managing the farm business independently and professionally. This can be achieved through capacity building and skills enhancement of dairy farmers' human resources through mentoring, training, and technical guidance by experts, which is collectively obtained by farmers from cooperative services (Riswara, et al. 2015). Cooperatives play a vital role in fostering and educating farmers through training and technical assistance in implementing GDFF principles. With good management and strong farmer motivation, the implementation of GDFF is expected to increase milk production and, ultimately, impact the income increase of farmers, especially those operating in the organic sector.

Good Dairy Farming Practices (GDFF) is a guideline for operating dairy cow farming that encompasses all technical and economic activities, such as reproduction management, feeding systems, sanitation, and actions for disease prevention and control (Mardhatilla and Amini, 2022). According to IDF/FAO (2011), the implementation of GDFF principles can increase dairy cow productivity by 5% to 10% and can boost milk production between 10% to 20%. GDFF includes six main components: Animal Health, Milking Hygiene, Nutrition (feed and water), Animal Welfare, Environmental Management, and Social and Economic Management of the farm. In the context of organic farming, GDFF implementation not only affects production increase but also ensures the fulfillment of organic standards and business sustainability.

The implementation of Good Dairy Farming Practices (GDFF) is expected to boost milk production in Pasuruan Regency, particularly in Tutur District, thereby leading to an increase in farmer income. Based on this, it is important to ascertain the extent to which organic dairy farmers in Tutur District have implemented GDFF principles. Furthermore, it is also important to measure the level of farmer motivation in implementing GDFF and to design extension activities that can improve knowledge and encourage a more optimal GDFF implementation. This is expected to create a sustainable, healthy, and profitable organic farming system.

Based on the foregoing description, the authors chose the research title: "The Correlation Between the Implementation of Good Dairy Farming Practices (GDFF) and Farmer Income: A Case Study on Organic Dairy Farmers in Tutur District, Pasuruan Regency." GDFF implementation is expected to provide various important benefits for farmers, such as increased productivity in terms of both quality and quantity, ensuring animal welfare, maintaining animal

health, management practices that comply with standards, and providing a positive impact on the environment.

Based on this, this study aims to: (1) determine the level of GDFP implementation by organic dairy farmers in Tukur District; and (2) analyze the correlation between GDFP implementation and farmer income.

RESEARCH METHODOLOGY

This study utilized a survey method (observation and interview) on dairy farmers in Tukur District, Pasuruan Regency. A total of 38 farmers were the subjects of this study, obtained using a total sampling technique, where the entire population served as the sample.

Analysis of Good Dairy Farming Practices (GDFP) Implementation

The measurement of the GDFP implementation level was conducted through direct observation and interviews with farmers using a prepared questionnaire. The interview results were then summarized based on the implementation score using interval classes, as presented in Table 1.

Table 1. GDFP Implementation Score Interval

GDFP Score	Category
22 – 39,6	Very Poor
39,7 – 57,2	Poor
57,3 – 74,8	Sufficient
74,9 – 92,4	Good
92,5 – 110	Very Good

Analysis of Dairy Farmer Income

According to Aminah & Rondhi (2019), to determine dairy farmer income, both total revenue (TR) and total costs (TC) must be ascertained. The revenue source for dairy farmers in running their business is solely from milk sales. Farmer income was analyzed using the following formula (Soetriono, 2015 in Aminah & Rondhi, 2019):

$$\text{Income} = TR - TC$$

Notation:

Income : Dairy farming business income
TR : Total Revenue
TC : Total Cost

Analysis of the Relationship between GDFP Implementation and Dairy Farmer Income

The formula used to calculate the correlation coefficient is as follows (Mustofani and Hariyani, 2023):

$$r_{rho} = 1 - \frac{n\sum d^2}{n(n^2 - 1)}$$

Notation:

r_{rho} : Spearman Rank Correlation Coefficient

- n : Number of data points
 d : Difference in paired ranks

RESULTS AND DISCUSSION

Respondent Characteristics

The demographic characteristics of the population based on age showed that 94.7% of respondents were in the 25-60 age group (productive age). The educational level of the respondents is relatively high, with 50% of respondents being Senior High School graduate.

Table 2. Respondent Characteristics

Characteristic	Count (Person)	Percentage (%)
Age (years old)		
25-60	36	94,7
>60	2	5,3
Formal Education		
Primary School (SD)	2	5,3
Junior High School (SMP)	8	21,1
Senior High School (SMA)	19	50%
Bachelor's Degree	9	23,7
Number of Livestock (head)		
1-5	19	50
6-10	16	42,1
11-15	1	2,6
>15	2	5,3
Farming Experience (years)		
1-10	6	15,8
11-20	14	36,8
21-30	13	34,2
31-40	3	7,9
41-50	2	5,3

Good Dairy Farming Practices (GDFFP) Implementation

Animal Health

The GDFFP implementation score for the animal health aspect in this study was at the very good level with an implementation value of 18,3.

Table 3. GDFFP Implementation: Animal Health Aspect

Element	Score	Category
Developing disease resistance in the herd	5	Very Good
Disease prevention	4,1	Very Good
Menerapkan Implementing animal health management	4,2	Very Good
Disease treatment	5	Very Good
Total	18,3	Very Good

The element of developing disease resistance in the herd obtained a score of 5, categorized as very good. Dairy farmers in Tukur District, on average, select Friesian Holstein Crossbred (PFH) cows as breeding stock and calves because they are capable of adapting to the local environmental conditions. This aligns with the opinion of Hanggara and Surjowardojo

(2022) that PFH dairy cows inherit the ability to adapt to tropical environments while maintaining high milk production.

The element of disease prevention obtained a score of 4.1, categorized as very good. Although in the very good category, some farmers still do not implement quarantine for new livestock and directly introduce them to the communal pen with other dairy cows. Furthermore, some farmers have also not yet implemented biosecurity measures when entering and exiting the pen.

The element of implementing animal health management obtained a score of 4.2, categorized as very good. Regarding health recording, many farmers still do not implement it, such as documenting the dairy cow's disease history, which would facilitate a track record for health officials from the cooperative and the farmers themselves if they wish to sell the cow.

The element of disease treatment obtained a score of 5, categorized as very good. Dairy farmers in Tukur District are very cautious in using medicines and chemicals, and their use is compliant with the instructions and prescriptions suggested by the veterinarian or animal health officials from the cooperative.

Milking Hygiene

The GDFP implementation score for the milking hygiene aspect in this study was at the very good level with an implementation value of 13,9.

Table 4. GDFP Implementation: Milking Hygiene Aspect

Element	Score	Category
Ensuring that milking procedures do not injure or introduce contaminants into the milk	4,7	Very Good
Ensuring milking is conducted under hygienic conditions.	4,7	Very Good
Ensuring proper milk handling post-milking.	4,5	Very Good
Total	13,9	Very Good

The milking process generally involves three stages: pre-milking, during milking, and post-milking. In the pre-milking stage, dairy farmers in Tukur District clean the pen environment, such as removing cow feces and urine from the pen floor. Subsequently, they bathe the dairy cow thoroughly, especially the udder and teats, while checking for any disorders in those areas. During milking, farmers use lubricant, typically cooking oil, to prevent injury to the animal during the milking process. However, many farmers still do not wash their hands, only wiping them with a cloth or shirt when milking. In the post-milking stage, farmers perform teat dipping using eco-enzyme to prevent bacteria from entering the udder. For milk handling, farmers immediately deliver the milk to the cooperative's collection point.

Nutrition (Feed and Water)

The GDFP implementation score for the nutrition (feed and water) aspect in this study was at the very good level with an implementation value of 18,4.

Table 5. GDFP Implementation: Nutrition (Feed and Water) Aspect

Element	Score	Category
Maintaining the availability of feed and water.	4,8	Very Good
Ensuring adequate quantity and quality of feed and water for the animals.	4,6	Very Good
Controlling feed storage conditions.	4,6	
Controlling the flow of feed materials transported to the farm.	4,4	Very Good
Total	18,4	Very Good

The data in the table above show that dairy farmers in Tutar District ensure the availability of feed and water for their livestock. For forage, the average farmer grows their own grass and legumes used as animal feed. Forage provision by farmers is based on the size of the animal; based on observations, the average farmer provides forage of more than 40 kg/head/day. For concentrate provision, farmers give 5 – 10 kg/head/day, with water provided *ad libitum*.

Animal Welfare

The GDFP implementation score for the animal welfare aspect in this study was at the very good level with an implementation value of 23,7.

Table 6. GDFP Implementation: Animal Welfare Aspect

Element	Score	Category
Freedom from hunger and thirst	4,6	Very Good
Freedom from discomfort	5	Very Good
Freedom from pain, injury, and disease	5	
Freedom to express normal behavior	4,4	
Freedom from fear and distress	4,7	Very Good
Total	23,7	Very Good

Based on the observations, the implementation of this animal welfare aspect is inseparable from the cooperative, which provides education and guidance regarding the importance of implementing animal welfare for livestock. All respondent farmers in this study no longer install nose rings on their livestock, which keeps the animals free from injury and disease and allows them to express their behavior. The majority of farmers also have land for their livestock to graze, allowing them to express their natural behavior. However, some farmers still do not practice this due to land limitations.

Environment

The GDFP implementation score for the environment aspect in this study was at the very good level with an implementation value of 13.7.

Table 7. GDFP Implementation: Environment Aspect

Element	Score	Category
Implementing environmentally friendly farming systems.	4,5	Very Good
Implementing waste management systems.	4,4	Very Good
Ensuring the livestock business does not negatively impact the environment.	4,8	Very Good
Total	13,7	Very Good

Based on observations, most dairy farmers in Tukur District are already utilizing livestock waste as organic fertilizer for both their agricultural land and forage land. Other farmers are converting livestock manure waste into biogas. This is due to the cooperative's support in educating and assisting farmers to be more environmentally conscious by utilizing farm waste to reduce pollution.

Socio-Economic Management

The GDFP implementation score for the socio-economic management aspect in this study was at the very good level with an implementation value of 12.9.

Table 8. GDFP Implementation: Socio-Economic Aspect

Element	Score	Category
Running a business to ensure financial viability.	3,2	Good
Running farming activities safely and competently	4,7	Very Good
Farmers implementing effective and responsible human resource management.	5	Very Good
Total	12,9	Very Good

The data in the table above show that the GDFP implementation in the socio-economic management aspect received a total score of 12.9, categorized as very good. The element of running a business to ensure financial viability received the lowest score, 3.2, with a good category. This is because almost all farmers do not yet conduct financial records encompassing income and expenses for their farming business. This is attributed to limited knowledge about the importance of financial record-keeping, and many farmers believe that financial recording is not essential. This aligns with Yasa's (2021) view that farmers experience difficulties in performing financial record-keeping due to limited knowledge of accounting principles, complexity in the financial recording process, and the belief that financial statements are not important. Farmers with good financial knowledge will be able to make appropriate decisions in managing their finances, thus enabling them to face increasingly complex future challenges.

Analysis Of Dairy Farmer Income Production Costs

Dairy farmer production costs consist of fixed costs and variable costs. Production costs in dairy farming vary for each farmer, depending on the number of livestock owned. Monthly fixed costs incurred by dairy farmers account for 2.36% of total production costs, and monthly variable costs account for 97.63% of total production costs.

Revenue

Dairy farmer revenue in this study was solely derived from milk sales, as there were no livestock sales conducted by the dairy farmers during the research period. Manure was not sold because the dairy farmers utilized it as fertilizer for their forage and agricultural land. Milk from dairy farmers is sold to the cooperative at a price ranging from Rp 7,200 to Rp 9,000/liter. Therefore, the average monthly revenue for dairy farmers was Rp 14,415,158.

Income

Dairy farmer income is calculated by subtracting the total monthly costs incurred by the farmer from total revenue. Thus, the average monthly dairy farmer income was obtained as Rp 5,382,640.

Table 9. Average Monthly Financial Analysis

Description	Average
Production Costs	
Fixed Costs	
-Pen/Barn	Rp 160.636
-Equipment	Rp 52.577
Subtotal	Rp 213.213
Variable Costs	
-Concentrate	
-Forage	Rp 3.131.605
-Mineral	Rp 3.371.842
-Electricity	Rp 94.121
-Fuel/BBM	Rp 30.526
-Labor	Rp 314.211
Subtotal	Rp 1.875.000
Total Costs	Rp 8.817.305
Revenue	Rp 9.030.518
-Milk Sales	Rp 14.415.158
Total Revenue	Rp 14.415.158
Income	Rp 5.384.640

Correlation between GDFP Implementation and Farmer Income

Correlation analysis was performed to determine the relationship between GDFP implementation and dairy farmer income. Since the GDFP implementation variable was measured using an ordinal scale (1-5) and the income variable used ratio data (Rupiah), the Spearman Rank correlation analysis was employed because it is suitable for non-parametric data. This is consistent with the statement by Mustofani (2022) in Mustofani and Hariyani (2023) that Spearman Rank correlation analysis is used to determine whether there is a relationship or correlation between variables for ordinal data, where the data types between variables do not have to be the same.

Table 10. Correlation Between GDFP Implementation and Farmer Income

Aspek GDFP	Koefisien Spearman (ρ)	Sig. (2-tailed)	Interpretasi Hubungan
Kesehatan Hewan	0,480	0,002	Sedang, Signifikan
Hygiene Pemerahan	0,277	0,092	Lemah, Tidak Signifikan
Nutrisi (Pakan dan Air)	0,132	0,428	Lemah, Tidak Signifikan
Kesejahteraan Hewan	0,434	0,006	Sedang, Signifikan
Lingkungan	0,026	0,876	Sangat Lemah, Tidak Signifikan
Manajemen Sosial Ekonomi	0,081	0,627	Sangat Lemah, Tidak Signifikan

The results of the Spearman Rank correlation analysis showed a positive trend. Two aspects have a direct and significant relationship with farmers' income: animal health and animal welfare, both with a moderate strength of relationship. The other implementation aspects were at the very weak and weak levels and were not significant.

CONCLUSIONS AND SUGGESTIONS

The overall implementation of GDFP among organic dairy farmers in Tutar District, Pasuruan Regency, is categorized as very good with an implementation score of 100.9. The implementation of Good Dairy Farming Practices (GDFP) and the income of organic dairy farmers have a moderate-strength relationship in the aspects of animal health and animal welfare. This indicates that the higher the GDFP implementation in the animal health and animal welfare aspects, the greater the potential for increased farmer income.

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