

Original Article

# The Relationship Between Price and Quality of Pure Cow Milk in Wonorejo Hamlet, Tulungrejo Village, Batu City

<sup>1</sup>Istis Baroh

<sup>1</sup>Lecturer at Agribusiness Graduate Program, University of Muhammadiyah Malang, Indonesia.

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**Abstract:** *The problem discussed in this research is that the selling price of pure cow's milk from farmers by KUD tends to fluctuate. Why does this happen, and is there a link between the price and the quality of pure cow's milk. This research aims to analyze 1). Price of pure cow's milk in Wonorejo Hamlet, Tulungrejo Village, Batu City 2). Causes of fluctuations in the price of pure cow's milk 3). Is there a relationship between price and the quality of pure cow's milk? The sample used in this research was dairy farmers who sold their cow's milk to the local KUD (30 farmers) and KUD officers (3 people). The data collection technique is to conduct interviews with breeders and KUD officers using a questionnaire. The research uses qualitative and quantitative approaches to analyze prices the causes of price fluctuations, and analyze the relationship between prices and the quality of pure fresh cow's milk. The research results showed that there were fluctuations in the price of pure cow's milk due to the unstable quality of pure cow's milk produced by farmers, as assessed by KUD officers. Assessment of the quality of pure cow's milk is based on specific gravity, fat content and the number of bacteria present in pure cow's milk. There is a relationship between price and the quality of pure cow's milk.*

**Keywords:** *Milk Quality, Pure Cow's Milk, Price Fluctuations.*

## I. INTRODUCTION

Livestock farming is a very important subsector because it can support the economy of rural communities by absorbing rural workers [1]–[3]. The livestock sector encompasses a wide range of activities, including nutrition, animal health, animal care, livestock maintenance, and the process of preserving animal products [4]. One promising livestock business is dairy farming because dairy cows produce daily milk production so they can create a stable income for farmers. The superior product in the dairy farming business is milk [5]. Dairy farming also plays a significant role in the development of the domestic milk processing industry because it acts as a supplier of raw materials. Dairy farming plays a crucial role in establishing a mutually dependent relationship between the livestock sector and the milk processing business [6]–[8]. Hence, fostering the growth and fortification of these two industries in tandem can significantly contribute to both economic expansion and the production of sufficient dairy products for the populace. Milk naturally contains important nutrients, such as various vitamins, protein, calcium, magnesium, phosphorus and zinc [9], [10].

Milk contains high-value nutrients that are needed for the lives of people of all ages to maintain growth, health and intelligent thinking [11]–[13]. Milk is so important that it can be said that to build an intelligent and healthy nation, providing milk for the community is absolutely essential [12]. In addition to being an abundant source of nutrients, milk serves numerous purposes and is vital to human health. Supplying the body with the essential nutrients required for growth, development, and health preservation is a critical function of milk. Cattle are the predominant and most utilized provider of milk worldwide [14], [15]. The numerous benefits of cow's milk establish it as the primary source of dairy products. Table 1 presents the progression of cow's milk output in Indonesia.

**Table 1: Cow's Milk Production in Indonesia 2010-2021**

Year	Production (Tons)	Increase/Decrease	
		(Tons)	(%)
2010	909,533	-	-
2011	974,694	65,161	7.16
2012	959,732	-14,962	-1.54
2013	786,871	-172,861	-18.01
2014	800,751	13,880	1.76
2015	835,125	34,374	4.29
2016	912,735	77,610	9.29



Year	Production (Tons)	Increase/Decrease	
		(Tons)	(%)
2017	928,108	15,373	1.68
2018	951,004	22,896	2.47
2019	944,537	-6,467	-0.68
2020	946,913	2,376	0.25
2021	946,388	-525	-0.06

*Source: Directorate General of Animal Husbandry and Animal Health, 2022.*

Consumption/need for fresh milk and its derivative products is estimated to continue to increase in line with population growth, economic growth, improvements in education levels, nutritional awareness and changes in lifestyle both in quantity and quality. The quality of milk from local dairy farmers is generally still below standard, which has an impact on low selling prices at the cooperative level and the milk processing industry [16], [17]. Local dairy farmers frequently produce substandard milk for the following reasons: suboptimal farm management, unbalanced feed, unfavourable conditions of rearing facilities, inefficient resource management, technological limitations and ignorance, noncompliance with health and hygiene standards, and inadequate knowledge and technology. This circumstance is unsurprising, given that a considerable number of individuals continue to engage in conventional livestock or agricultural practices [18]. Enhancing the milk quality of local dairy farmers necessitates a comprehensive strategy encompassing farmer education, provision of advanced technology and information, and enhancement of overall farm management. Increasing national milk production needs to be balanced with optimal utilization so that it can be directly consumed by urban and rural communities. Due to its higher susceptibility to harm, milk requires careful and efficient handling compared to other cattle products [19]. If milk is not handled properly, it will create conditions where the number of bacteria in the milk can grow rapidly. Fresh milk is a perishable food ingredient (easily damaged) because it has a high water content of around 87% -90% [20]–[22].

Indonesian people's milk consumption, compared to milk consumption in other developing countries in Asia, is still very low [23], [24]. This is partly because the price of milk products at the consumer level is quite expensive, around 4-5 times the price of milk at the farmer level. The disparity in price between raw milk at the producer level and the retail price of processed dairy products is a result of the additional expenses incurred throughout the distribution and marketing process of dairy products [25], [26]. Collectively, these elements determine the ultimate price imposed on consumers. Major corporations do not exclusively oversee the production of cow's milk in Indonesia; instead, small-scale farmers often choose to sell their milk to Koperasi Unit Daerah (KUD) [27]. This is due to the fact that KUD will purchase milk from breeders without considering the quantity, unlike huge firms that have traditionally partnered with groups of breeders who have consistently produced large quantities of milk on a daily basis. Cow milk is obtained by farmers every day and can be purchased directly by the local Village Unit Cooperative so that dairy farmers do not need to look for buyers. The determinants of the price of cow's milk are the KUD / price maker and the farmer as the price taker. The applicable price is based on predetermined criteria so that the price of cow's milk may change every day (fluctuate) [28]. The price of milk is determined based on the quality of the milk produced. If the quality of the milk is good enough, the price will be according to the standard. However, if the quality of the milk is lower than the standard, then the price the farmer gets is a price below the standard price [19], [29]. It is then hoped that when the price of fresh milk rises, it will encourage farmers to increase the number of cattle they keep and improve the quality of their milk [29].

Based on this phenomenon, researchers took this theme. Research entitled the relationship between the price of cow's milk and the quality of pure cow's milk in wonorejo hamlet needs to be carried out. This research is a case study of communal drums in Wonorejo Hamlet, Tulungrejo Village, Batu District. This research aims to 1) Analyze the price of pure cow's milk in Wonorejo Hamlet, Tulungrejo Village, Batu City. 2) Analyze the causes of the price of pure cow's milk in Wonorejo Hamlet, Tulungrejo Village, Batu City. 3) Analyze the relationship between the price and the quality of pure cow's milk in Wonorejo Hamlet, Tulungrejo Village, Batu City.

## II. LITERATURE REVIEW

1. Milk is a white nutritious liquid produced by mammalian mammary glands, in this case milk produced by dairy cows. Dairy milk possesses a highly nourishing content, rendering it a crucial nutritional resource for humans. Milk contains a variety of essential nutrients necessary for the growth, development, and maintenance of overall bodily health. Pure cow's milk is expressed in Liters.
2. The amount of money that buyers must give sellers in order to obtain the products or services they wish to purchase is known as the price. As a result, the seller or service provider sets most prices. The price of pure cow's milk is expressed in rupiah/litre.
3. Milk price fluctuations are the rise and fall of the price of cow's milk produced by dairy farmers, expressed in litres per

day.

4. Farmers are dairy farmers who own dairy cows that produce fresh milk and sell it to KUD and KSU.
5. KUD (Village Unit Cooperative) and KSU (Multi-Use Business Cooperative) in this research are cooperatives operating in rural areas that provide community needs related to agricultural activities in Wonorejo Hamlet, Tulungrejo Village, Batu City. In this case, KUD and KSU receive deposits of cow's milk from farmers every day and pay the farmers at the price and time according to the agreement.
6. Time agreement is the length of payment given by KUD and KSU to farmers, which is expressed in the number of days calculated from the time the milk is deposited to KUD and KSU.
7. The quality of pure cow's milk is the quality of cow's milk deposited by farmers. It is a standard requirement for the quality of pure milk, including minimum specific gravity, fat content, and bacterial content in the milk.
8. A communal pen is a room in which several cattle are placed, freely without being tied up, which functions as a place for mating and rearing of calves until they are weaned or used as a pen for enlargement or fattening to produce good, quality cow's milk.

### III. METHODS

#### A) Method for Determining Research Locations

The determination of Wonorejo Hamlet, Tulungrejo Village, Batu City was carried out deliberately with consideration of 1). Wonorejo Hamlet is one of the hamlets that produces dairy milk, where most of the residents are dairy farmers and have communal pens. 2). Sales of milk products to local KUD 3). The prices received by farmers fluctuate. The research time will start in April 2022.

#### B) Data Types and Sources

Primary data were the sort of data used in this study. Direct data from the source is known as primary data [30], [31]. In this study it was obtained from 30 dairy farmers and KUD officers in Wonorejo Hamlet.

#### C) Sample Determination Method

The population in this study were farmers who produced milk in Wonorejo Hamlet, Tulungrejo Village. Based on information from the management of the Wonorejo Hamlet farmer group, the number of breeders in Wonorejo Hamlet is 30 people. If the population is less than 100 people, then the entire sample size is taken. The method used is a census (total sampling) [32], a sampling technique where all members of the population are used as respondents/providers of information. The data analysis method uses descriptive analysis to analyze prices [33], price determinants and the relationship between price and quality of pure milk.

### IV. RESULTS AND DISCUSSION

#### A) Respondent Characteristics

Several farmer groups in Tulungrejo Village, Batu City, accept and implement Communal Cages for raising their dairy cows, for example, the Gunung Harta Farmers Group and the Wonorejeki Farmers Group. The Gunung Harta farmer group has 21 group members and 14 group members who still raise dairy cattle. In comparison, the Wonorejeki Farmer Group has 30 group members and 16 group members who still raise dairy cattle. The number of members who are still raising livestock from the Gunung Harta farmer group and the Wonorejeki Farmer Group is 30 people, and this number was taken as research respondents.

**Table 2: Characteristics of Farmer Respondents**

Characteristics	Number of Respondents (person)	Percentage (%)
<b>Gender</b>		
Male	29	96,7
Female	1	3,3
Total	30	100
<b>Breeder Age (Year)</b>		
21-30	2	6,7
31-40	6	20,0
41-50	14	46,7
51-60	7	23,3
>60	1	3,3
Total	30	100
<b>Education Level</b>		
SD	17	56,7

Characteristics	Number of Respondents (person)	Percentage (%)
SMP	9	30
SMA/ sederajat	4	13,3
Total	30	100
<b>Breeding Experience (years)</b>		
1-10	15	54,2
11-20	10	41,7
21-30	5	4,2
Total	24	100
<b>Family Dependents (person)</b>		
1	1	3,3
2	7	23,3
3	10	33,3
4	8	26,7
5	4	13,3
Total	30	100
<b>Side job</b>		
Farmer	17	56,7
Laborer	1	3,3
Cattle farmer	12	40,0
Total	30	100

Source: Primary Data Processed, 2022

### B) Milk Prices

Pure cow's milk is rich in nutrients and good for health, which is really needed by humans; however, milk consumption should not be excessive because it can be dangerous for health [34], [35]. The research results show that adults should not drink more than 3 glasses or more than one litre of milk a day; excessive consumption can cause impaired kidney function. Limit milk consumption to limit potassium and protein content in the body [36].

There are many important nutrients in milk that are very beneficial for heart health, one of which is calcium. Calcium consumed in sufficient quantities can reduce the risk of heart disease by reducing bad cholesterol levels and increasing good cholesterol levels in the body [9], [10].

Even though milk is rich in nutrients, the price of fresh milk is very affordable for the general public. In West Java, the price of pure raw cow's milk ranges from IDR 10,000 to IDR 20,000 per litre. Online the price of pure cow's milk starts from IDR 9,000 per litre for raw milk or IDR 18,000 per litre for ready-to-drink mature whole milk (tokopedia).

In Wonorejo hamlet, Tulungrejo Village, Bumiaji District, Batu City, prices are far below the prevailing prices above. Farmers do not directly get the proceeds from the sale of their cow's milk; however, every morning and evening, the farmer still has to deposit the milk they produce at the milk holding post. The price of dairy cow's milk varies depending on the milk production partner [37], [38]. The milk production containers in the Tulungrejo Village Communal Enclosure, Batu City, are KUD (Village Unit Cooperative) Batu and KSU (Multi-business Cooperative) Margi Rahayu. KUD Batu partners with PT. Nestle, while KSU Margi Rahayu partners with PT. Indolacto. PT Nestle and PT Indolacto will pay for milk deposited by farmers every 10 days based on the quality of the farmer's milk in terms of nutritional content and bacteria. The price range for milk at KUD Batu and KSU Margi Rahayu is different. At KUD Batu, the price range is IDR 5,500 to IDR 5,800 per litre, while at KSU Margi Rahayu, it is around IDR 5,000 to IDR 6,000 per litre. The price of milk deposited by KUD officers to farmers can be known by farmers after they receive payment (every 10 days).

Average milk production (liters/year) is 1,370 liters. Communal stable breeders in Tulungrejo Village, Batu City, have varying numbers of lactating cows from 5 to 7 heads. Cows are milked in the morning at 05.00 WIB and in the afternoon at 15.00 WIB. In the morning, the average milk production of cows (5 -7) is 25 litres, so each cow produces 4 -5 litres of milk; then in the afternoon, it is also the same, namely 25 litres (5 -7 cows), so 1 cow produces milk Estimate 4 -5 litres, so a month produces 1500 litres of cow's milk.

The amount of milk produced by each farmer varies depending on the number of lactating cows they own. The amount of cow's milk production is also influenced by age and body weight. The price of milk in Tulungrejo Village was once

affordable at Rp. 7000/liter. At the time the research was conducted, the maximum milk price was IDR 5,800 for KUD and IDR 6,000/litre for KSU.

### **C) Determinants of Milk Prices**

Based on the officer's explanation, the price of milk is determined by the condition (what the officer calls quality) of fresh cow's milk. The condition of fresh cow's milk from farmers often varies every day, so officers pay farmers according to these conditions [39], [40].

The condition of cow's milk is determined by factors from outside (external) and factors from within (internal) the cow itself [41], [42]. The external factors referred to here are the number of bacteria in pure cow's milk. The internal factors are indicated by the specific gravity and fat content in cow's milk, which comes from within the cow itself (cattle).

The specific gravity of the milk determines the quality of fresh cow's milk, the fat content in fresh cow's milk and the number of bacteria in fresh cow's milk produced by the farmer. The first two things can be known after carrying out laboratory tests on fresh cow's milk.

### **D) The Relationship between Milk Price and Quality**

One can use price as a gauge of a product's quality. Customers typically associate high product costs with superior quality; conversely, they tend to question the quality of a product that is inexpensive [43]. Price is frequently the first consideration for shoppers, followed by a few other elements. A product's price ought to be fair and suitable. The premium pricing must be commensurate with the advantages that the people who purchase it will experience. [44], [45]. If a product is priced too high, buyers will move to a similar product that is available for less money, and vice versa. If a product is priced too low, buyers will question the product's quality and put off making a purchase.

Understanding product quality is a characteristic of the product in terms of its ability to fulfill predetermined and latent needs [46]. Product quality is the suitability of product users (fitness for use) to meet customer needs and satisfaction. Based on the definitions above, it can be concluded that product quality is a dynamic condition regarding a product that can satisfy customer desires.

Milk quality is the basis for paying milk prices. Milk payment provisions have continued to develop since August 2004; the price of milk is determined based on fat, solid non-fat (SNF), total solid (TS), total plate count (TPC) and antibiotic content. Milk that has a TS of less than 11% will be rejected by the cooperative, while milk that has a TS between 11-11.2% will get a penalty and milk that has a TS of more than 11.3% will get a bonus.

TPC below 106 cfu/ml will get a bonus, TPC above 15x10<sup>6</sup> cfu/ml will be subject to a penalty and milk that is positive for containing antibiotics will be subject to a penalty of IDR 200/kg. Farmers must pay attention to these provisions so that the quality of the milk produced is of a high standard, competitive and safe for consumption. The physical and chemical quality of fresh cow's milk is influenced by the breed of dairy cow, feed, feeding system, milking frequency, milking method, seasonal changes and lactation period [47]–[49].

Specific gravity of milk, fat content in fresh cow's milk and the number of bacteria in fresh cow's milk. The way to find out the number of bacteria contained in cow's milk is TPC testing. The Total Plate Count (TPC) test is intended to show the number of microbes contained in a product by counting bacterial colonies grown on agar media [50], [51]. The sum of all colonies growing on NA media is the total plate count. Between 25 and 250 bacterial colonies are counted on a petri dish. Next, the resulting amount is multiplied by the dilution. TPC is calculated as follows: dilution factor x number of bacteria in a petri dish.

The Microbiology and Biotechnology Laboratory for Agricultural Products, Faculty of Agricultural Technology, is a laboratory for testing agricultural products from a microbiological perspective. To calculate the number of microbes in product samples, a Total Plate Count (TPC) test is carried out. This test is usually followed by the product's shelf life. The product shelf life test is useful for seeing the development of the number of microbes in the product during storage treatment. Samples will be tested hourly, daily or weekly, depending on the type of product the researcher makes.

For the TPC test, Plate Count Agar (PCA) media is used, which is a media that contains agar so that after it cools the media will become solid [52]. This research aims to determine the effect of repeated heating of PCA media on product TPC tests and to determine the effectiveness of the media used when heated repeatedly.

From the research results, it was found that heating the media up to 3 times could still be used for the TPC test with results that were not significantly different from Banko media. For the next 4th heating and so on, the media is not recommended for reuse because the microbes that grow are not optimal in number and size. This is because repeated heating

too often can change/damage the nutritional content of the media because to grow and develop microbes need nutrients in the media. The medium is in the form of small molecules that are assembled to make up the components of the cell. The pH of the media is too acidic, resulting in less than optimal microbial growth because the optimum pH for microbial growth is neutral pH.

#### IV. CONCLUSION

Based on the results of research and discussion on the communal cage system in Tulungrejo Village, Batu City, the following conclusions were obtained:

1. There are fluctuations in the price of pure cow's milk every day for the same breeder, with the same cows in the Communal Cage of Wonorejo Hamlet, Tulungrejo Village, Bumiaji District, Batu City.
2. The cause of fluctuations in the price of pure cow's milk is the unstable condition/quality of pure cow's milk produced by farmers in the Communal Enclosure of Wonorejo Hamlet, Tulungrejo Village, Bumiaji District, Batu City.
3. There is a relationship between the price and the quality of pure cow's milk in the Wonorejo Hamlet Communal Enclosure, Tulungrejo Village, Bumiaji District, Batu City.

Based on the discussion description, the researchers' suggestions are:

1. Farmers must maintain the condition/quality of the pure cow's milk produced so that the price is stable (does not fluctuate).
2. There needs to be training for farmers so that farmers know the standard quality of pure cow's milk.

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