

The milk production of recovered dairy cows from foot-and-mouth disease in the Medowo Village, Kandangan Subdistrict, Kediri

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Abstract

The outbreak of Foot-and-Mouth Disease (FMD) has caused a crisis for Indonesian farmers, particularly dairy cattle in Medowo village. The FMD outbreak affected the whole dairy cow population in Medowo, resulting in major losses defined by high mortality rates and a halt in milk production during the cows' FMD infection. Dairy cows, which are essential for maintaining milk production and providing an economic foundation for Medowo's farmers, led our team to execute community service from January to August 2023. Socialization and data collection on farmers and their cows were followed by laboratory testing for mastitis identification and treatment. The outreach events focused on mastitis care for cows, promoting talks to solve farmers' issues, particularly in livestock health. Farmers were instructed on how to report subclinical mastitis instances to appropriate authorities, were trained on how to prepare fermented feed/silage with probiotics to improve feed quality, and were monitored for overall evaluation. The milk production data collected showed that morning yield produce higher quantity than afternoon yield. The lowest milk production occurs in September, while the highest is observed in November. Overall, data from dairy cow milk production in Medowo Village after FMD outbreak show a satisfactory result, illustrating the success of community service programs. Future initiatives should include collecting data on a regular basis to allow for ongoing evaluation and continued improvement in milk production.

Keywords: Dairy Cow; Foot-and-Mouth Disease; Mastitis; Milk Production

1. Introduction

Foot-and-Mouth Disease (FMD) has spread in Indonesia and become a national disaster for farmers. The FMD outbreak has affected dairy cattle in the Medowo village area since February 2022. The entire population of dairy cows in Medowo Village has been affected by the FMD outbreak. The losses incurred due to this FMD outbreak are significant and detrimental to farmers due to the high mortality rate and the absence of milk production while the cows are suffering from FMD. Dairy cows are essential assets for the sustainability of milk production and are an economic foundation for farmers in Medowo village.

As is commonly known, Foot and Mouth Disease (FMD) is a contagious viral infection (from the Picornaviridae family) that manifests acutely and affects cloven-hoofed animals. FMD is not transmissible to humans and does not qualify as a zoonotic disease. Clinical symptoms become evident shortly after the initiation of viremia. Cattle typically display a high fever, and within a span of 12 to 24 hours, distinct vesicles or blisters emerge on the tongue, muzzle, nostrils, mouth, and hooves. Excessive salivation occurs, and affected cattle may exhibit reluctance to stand or experience difficulty in walking. The majority of cattle recover within approximately two weeks. Throughout this period, the healing of tongue

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or hoof lesions generally takes place within 30 days post-infection, usually discernible during post-mortem examinations [17].

Over the initial three months post-infection, a segment of carrier animals, with a residual amount of FMD virus persisting in their throats, may comprise up to 50% of the recovered animals. This proportion diminishes over time, and the remaining carrier percentage after two years post-infection is generally minimal. Vaccinated cattle, when exposed to the FMD virus, can become carriers without displaying clinical symptoms. This aspect is significant as the recuperation of dairy cows from FMD may not consistently correlate with an upswing in milk production. Instead, it triggers multifaceted consequences, such as reproductive disturbances, mastitis, diminished milk production, compromised milk quality, and a reduced pregnancy rate. Indirectly, FMD can contribute to the occurrence of mastitis in dairy cows, thereby impacting the economic aspects for farmers, [2]; [19];[4].

Mastitis, in general, is caused by various types of bacteria, including *Streptococcus agalactiae*, *S. disgalactiae*, *S. uberis*, *S. zooepidermicus*, *Staphylococcus aureus*, *Escherichia coli*, *Enterobacter aerogenes*, *Pseudomonas aeruginosa*, as well as *Mycoplasma sp.*, *Candida sp.*, *Geotrichum sp.*, and *Nocardia sp.* Based on its clinical symptoms, mastitis can be classified into clinical and subclinical mastitis. Clinical mastitis can be detected through abnormalities in the physical quality of milk, such as blood mixing, thickening, and visible clotting. Clinical mastitis also exhibits symptoms such as swollen udders, warmth upon touch, a reddish color, increased body temperature, decreased appetite, and discomfort during milking. In contrast, subclinical mastitis has different characteristics from clinical mastitis because it does not show any physical abnormalities in milk or udders. Subclinical mastitis can only be detected through specific tests such as the Californian Mastitis Test (CMT), milk chemical tests, and bacterial culture [18]; [20].

Currently, the FMD outbreak in Medowo village has been overcome, and dairy cows affected by FMD are starting to recover. However, the recovery of dairy cows from FMD is not accompanied by an increase in milk production. Instead, it has complex side effects such as reproductive disorders, mastitis, decreased milk production, reduced milk quality, and low pregnancy rates. The high incidence of mastitis post-FMD outbreak requires serious attention as it significantly affects milk production and farmer income.

Medowo Village, Kandangan Sub-district, Kediri Regency, is a potential area for dairy cows and one of the regions in Kediri known for milk production. The potential of Medowo village is excellent for dairy farming, given its elevation and temperature that support the development of dairy cows. The population of dairy cows in this area is substantial, and it is supported by the formation of the Village Dairy Cooperative (KUD) that collects milk production from local farmers and sells it to the largest dairy companies in East Java. This situation has left farmers frustrated and traumatized, making them hesitant to raise dairy cows again. Regular examinations to identify clinical and subclinical mastitis are crucial to provide early treatment to prevent damage to the udder and ensure maximum milk production. The appearance of milk from dairy cows with early subclinical mastitis is indistinguishable from healthy cows, but it can be detected through mastitis screening. To address these issues, our team conducted community service activities in Medowo village for laboratory examinations into mastitis identification and treatment of cows positive for mastitis, both clinical and subclinical, to enhance milk production and improve milk quality.

2. Material and Methods

2.1. Time and Place

The community service activities were conducted for 50 farmers in Medowo village, Kandangan sub-district, Kediri from January to August 2023.

2.2. Target

The community service activities are directed towards farmers of dairy cows in Medowo village, Kandangan sub-district, Kediri.

2.3. Method Application

This community service is conducted through several stages. The first stage is the team conducted a socialization by collecting data on the names of farmers and the number of cows they own, and milk samples were taken from 5 hamlets, namely Sidomulyo, Medowo, Sidorejo, Mulyorejo, and Ringinagung, through interviews with each farmer. A total of 10 farmers from each hamlet were interviewed.

The Second stage is the team conducted an outreach session for farmers participating in the community service program on how to care for dairy cows affected by mastitis, followed by a discussion to address all the issues faced by farmers, particularly in livestock health. Afterward, the team collected milk samples from 5 hamlets as called screening mastitis. The samples were taken to the Microbiology Laboratory of the Faculty of Veterinary Medicine, Universitas Airlangga and treatments were administered to dairy cows already affected by clinical mastitis.

The third stage is team provided guidance to farmers to report cows affected by subclinical mastitis based on the examination results of milk to the relevant authorities. They also carried out mass and continuous treatment on cows affected by subclinical mastitis. Through these reports, the team participated in evaluating and monitoring the recovery rates of dairy cows after the treatment.

The fourth stage, the team trained farmers in making fermented feed/silage with the addition of probiotics as an effort to improve feed quality and digestibility.

The last stage is the team conducted monitoring and overall evaluation of the outreach activities for farmers in Medowo Village and prepared a final report summarizing the entire initiative.

3. Result and Discussion

The outcome of the community service activities in Medowo Village, which we have implemented, includes the presentation of documentation of the outreach activities conducted by professors and students from the Faculty of Veterinary Medicine, Airlangga University. Attached herewith is the documentation of the outreach activities to the community in Medowo Village, Kediri.



Figure 1 Documentation of dairy farmers in Medowo Village, Kediri.



Figure 2 Lecturers delivering content during the community service session of recovered

Dairy cows from Foot-and-Mouth Disease in Medowo Village, Kandangan sub-district, Kediri.

The collection of data on dairy cow milk production in Medowo Village spanned seven months, from May to November. The data were categorized into two groups: morning and afternoon milk production, as illustrated in **Table 1**. After the data had been analyzed, significant differences were observed between morning and afternoon milk production. Furthermore, the lowest milk production was evident in September, while the highest production occurred in November. Similarly, [6] and [3] also reports that dairy cow milk production in the morning is higher compared to the afternoon.

Table 1 Summary of Monthly Dairy Cow Milk Production in Medowo Village, Kediri

| Month | Morning (Liter) ^a | Afternoon (Liter) ^b | Total (Liter) |
|-----------|------------------------------|--------------------------------|---------------|
| May | 4550.40 | 2555.40 | 7105.80 |
| June | 4097.65 | 2422.75 | 6520.40 |
| July | 4097.85 | 2424.95 | 6522.80 |
| August | 4040.45 | 2346.70 | 6387.15 |
| September | 3164.30 | 1848.95 | 5013.25 |
| Oktober | 4613.20 | 2743.65 | 7356.85 |
| November | 4994.65 | 2886.75 | 7881.40 |

^aDifferent letters within each column indicate a significant difference ($P < 0.05$)

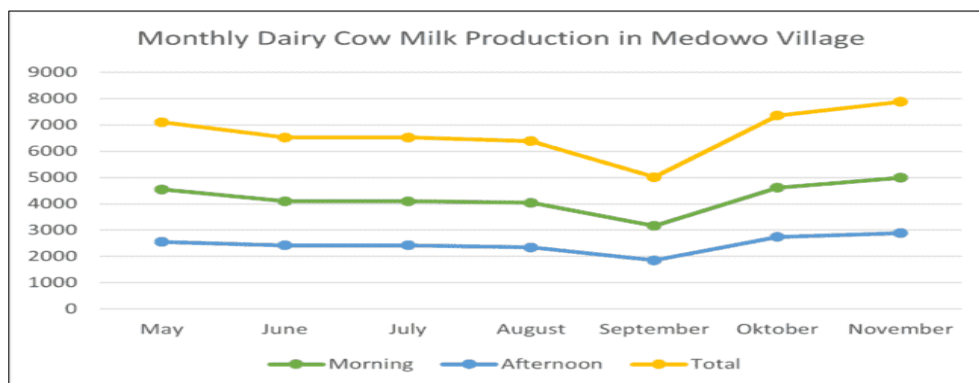


Figure 3 Graphic showing monthly dairy cow milk production in Medowo Village

The production of milk from dairy cows relies on diverse factors, including the genetic characteristics of the cattle breed and the environment [9], the milking interval, and the manner in which milking enhances milk production. At the farm or individual level, the immediate consequences of a Foot-and-Mouth Disease (FMD) outbreak, including morbidity, mortality, expenses incurred for disease treatment, and measures implemented to prevent further transmission, can significantly reduce farm incomes, especially in susceptible and highly productive animals. Animals that recover often sustain prolonged physical impairment, resulting in economic losses for livestock industries such as weight loss, reduced milk production, mastitis, calf mortality, and other related issues [5].

Parasitic infection is the leading cause of mastitis, and during a Foot-and-Mouth Disease (FMD) outbreak, animals may develop teat lesions due to FMD, exposing them to secondary bacterial infections and resulting in mastitis [15]. While mastitis is a concern for animal welfare, it is also viewed as a food safety issue, characterized by physical, chemical, and bacteriological changes in the glandular tissue of the infected udder [15]. This complex disease, primarily caused by various pathogens entering wounds from FMD lesions, shows significant differences in infection patterns [16], impacting both the quality and quantity of milk and causing economic losses for farmers [7].

During an acute FMD outbreak, milk loss can occur in two scenarios: lactating cows may experience decreased or halted milk production, and infected cows may stop eating due to pain from sores on the mouth, lip, and tongue [11]. This leads to reduced feed and water intake, lowering energy levels and negatively impacting milk production. Additionally,

lactating cows may dry off due to FMD-induced stress [8]. Other factors contributing to reduced milk during FMD include more cows exiting the herd and the discarding of milk from quarantined cows [12]. FMD lesions around the teats cause severe udder damage, rendering cows unable to produce milk, altering the milk's odor and color [14]. FMD often leads to mastitis, as mammary gland tissue is the primary site for viral resilience. If the virus persists for over 7 weeks, severe wounds around the teats occur, causing discomfort and pain to the cows. This is related to FMD lesions on the teats, increasing susceptibility to secondary bacterial infections, primarily environmental [10]. Additionally, the FMD virus replicates in the secretory epithelium of the mammary gland, leading to a reduction in milk yield in affected cows [13].

Mastitis holds the second position in economic importance in the dairy industry after FMD. Instances of mastitis result in losses through milk rejection, labor costs, and treatment expenses [7], directly impacting farmers' income. In smallholder farms, mastitis's impact poses a serious potential constraint to further developing the dairy industry and may contribute to poverty and starvation [1].

In this community service, it is evident that the production of dairy cow milk in Medowo Village, Kediri has shown promising results. This demonstrates the success of the community service efforts. To enhance milk production outcomes, collaboration among farmers and veterinary health professionals in the vicinity is necessary, involving the intensive implementation of the materials provided during the socialization process.

4. Conclusion

In general, dairy cow milk production data in Medowo Village post Foot and Mouth Disease (FMD) outbreak indicates higher yields in the morning compared to the evening, with the lowest milk production occurring in September and the highest in November. Overall, the milk production results are satisfactory. This demonstrates that the community service implemented have yielded positive outcomes. For future endeavors, it is advisable to conduct data collection again for dairy cow milk production to assess whether there is improvement or not. This will enable ongoing evaluation to enhance milk production.

Compliance with ethical standard

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Disclosure of conflict of interest

No conflict of interest to be disclosed.

References

- [1] Abrahmsén, M., Persson, Y., Kanyima, B. M., and Båge, R. Prevalence of subclinical mastitis in dairy farms in urban and peri-urban areas of Kampala, Uganda. *Tropical Animal Health and Production*. 2014; 46: 99-105.
- [2] Adjid, A.R.M. Foot and Mouth Disease: an Exotic Animal Disease that Must Be Vigilantly Monitored for Entry into Indonesia. *Wartazoa*. 2020; 30(2): 61-70.
- [3] Bondan, C., J.A. Folchini, M. Noro, K. M. Machado, E. Muhls, and F.H.D. Gonzalez. Variation of cow's milk composition across different daily milking sessions and feasibility of using a composite sampling. *Ciência Rural*, Santa Maria. 2019; 49:06.
- [4] Cahyo, YD. Evaluation of Subclinical Mastitis during the Healing Period of Foot and Mouth Disease on Day In Milk and Dairy Farmer Income in Torong Rejo Hamlet. Thesis. Islamic University of Malang.2023
- [5] Dabasa, G. and F. Abunna. Review on Epidemiology of Foot and Mouth Disease (FMD) in Ethiopia. *J. Trop Dis*. 2020; 9:269.
- [6] Garantjang, S., M. Rusdy, M. Hatta, B. Nohong, and Sema. Effect of milking time on milk production and milk quality of dairy cow fed with fermented corn cob. *IOP Conference Series: Earth and Environmental Science*.2020;492: 012054.

- [7] Halasa, T. M., Nielen, A. P. W., De Roos, R., Van Hoorne, G., de Jong, T. J. G. M., Lam, T. van Werven, and H. Hogeveen. Production loss due to new subclinical mastitis in Dutch dairy cows estimated with a test-day model. *Journal of Dairy Science*/ 2009;92: 599-606.
- [8] Jemberu, W. T., Mourits, M. C. M., and Hogeveen, H. Farmers' Intentions to Implement Foot and Mouth Disease Control Measures in Ethiopia. *PloS One*. 2015; 10: 138-363.
- [9] Lateef M, Gondal KZ, Younas M, Sarwar M, Mustafa M I and Bashir M K. Milk production potential of pure Holstein Friesian and Jersey cows in the subtropical environment of Pakistan. *Sir. Vet. J.* 2018;28;9-12.
- [10] Lyons, N. A., Stärk, K. D. C., van Maanen, C., Thomas, S. L., Chepkwony, E. C., Sangula, A. K., and Fine, P. E. M. Epidemiological analysis of an outbreak of foot-and-mouth disease (serotype SAT2) on a large dairy farm in Kenya using regular vaccination. *Actatropica*/ 2015;143: 103-111.
- [11] Mazengia, H., Taye, M., Negussie, H., Alemu, S., Tassew, A. Incidence of foot and mouth disease and its effect on milk yield in dairy cattle at Andassa dairy farm, Northwest Ethiopia. *Agric. Biol. J. North Am.* 2010; 1:969–973.
- [12] Nampanya, S., Khounsy, S., Phonvisay, A., Young, J. R., Bush, R. D., and Windsor, P. A. Financial impact of foot and mouth disease on large ruminant smallholder farmers in the Greater Mekong Subregion. *Transboundary and Emerging Diseases*. 2015; 62:555-564.
- [13] Neelesh, S., Maiti, S. K., and Vijay, P. Sensitivity of indirect tests in the detection of sub-clinical mastitis in buffaloes. *Veterinary Practitioner*/ 2008; 9, 29-31.
- [14] Senturk, B., and Yalcin, C. Financial impact of foot-and-mouth disease in Turkey: acquisition of required data via Delphi expert opinion survey. *Veterinari Medicinapraha*. 2005; 50 :451.
- [15] Sharma, N., Singh, N. K., and Bhadwal, M. S. Relationship of somatic cell count and mastitis: An overview. *Asian-Australasian Journal of Animal Sciences*. 2011; 24:429-438.
- [16] Jingar, S. C., Mehla, R. K., Singh, M., and Singh, P. K. Effect of stages and level of milk production on mastitis incidence in cows and murrh buffaloes. *Journal of Biological Innovation*. 2014; 3: 117-123.
- [17] Sharma, V. B., Verma, M. R., Qureshi, S., and Bharti, P. Effects of diseases on milk production and body weight of cattle in Uttar Pradesh. *International Journal of Agriculture, Environment and Biotechnology*. 2016;9: 463-465.
- [18] Sudhan NA, Sharma N. Mastitis: An Important Production Disease of Dairy Animals. *SMVS' Dairy Yearbook. Jammu*. 2010; 72-88.
- [19] Surtina D, Sari RM, Astuti HT, Akbar SA, Hendri J, and Asri A. Increased Livestock Productivity through the Provision of Fermented Feed and Prevention and Control of Foot and Mouth Disease in the Sapakek Basamo Farmer Group, Solok City. *Community Development Journal*. Jun. 2022; 3(2):1168-1173.
- [20] Suwito W, Indarjulianto S. *Staphylococcus aureus* as the cause of mastitis in Etawah crossbred goats: epidemiology, clinical characteristics, pathogenesis, diagnosis, and control. *Wartazoa*. 2013;23(1): 1-7.