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Mapping the Potential of Dairy Cows in Jabung District, Malang Regency

Abimanyu Wicaksono*, Tri Eko Susilorini**,Puguh Surjowardojo**

* (Student of Postgraduate Program, Faculty of Animal Science, Universitas Brawijaya
Email : abimanyuwicaksono02@gmail.com)
** (Lecturers of Postgraduate Program, Faculty of Animal Science, Universitas Brawijaya
Email: triekos@ub.ac.id)

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Abstract:

The study aim to map and analyze the potential of dairy cows with the highest milk production in Jabung District, Malang. This study was conducted in three hamlets in the Jabung sub-district, namely Dempok, Gading Kembar, and Gunung Kunci, with a total of 91 observed livestock farmers.The study method used is a survey and variables observed included milk production, animal age, body weight, and Body Condition Score (BCS).The data that has been collected is analyzed using the hot spot method in GIS.The hotspot analysis carried out inDempok hamlet emerges as the primary milk production center, boasting the highest average output of 16.26±5.70 liters/head/day. Conversely, Gunung Kunci hamlet exhibits lower milk production levels, with an average output of 10.08±4.11 liters/head/day. These findings underscore the importance of various factors such as management practices, environmental conditions, and the physiological health of dairy cows in influencing milk production outcomes.

Keywords **—Dairy Cows, milk production,geographic information system**

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I. INTRODUCTION

The dairy industry is a vital component of livestock economies, providing essential nutrients and contributing significantly to rural development. In Indonesia, the potential for dairy farming is vast, given the country's diverse agro-climatic conditions and extensive livestock land. Jabung District in Malang Regency, East Java, stands out as a region with considerable promise for dairy cow farming. The district's favorable climate and abundant natural resources make it an ideal environment for developing the dairy industry.

Jabung District's geographical and climatic conditions are conducive to dairy farming, offering an optimal environment for raising healthy and productive dairy cows. The district is characterized by moderate temperatures, adequate rainfall, andabundant forage sources, all of which support the growth of high-quality fodder [1]. These factors are crucial for maintaining the health and productivity of dairy cows, directly impacting milk yield and quality.

This study endeavors to explore the potential of dairy cows in Jabung sub-district through the lens of GIS (Geographic Information System). GIS software enables users to analyze spatial data, facilitating informed decision-making and resource management [2].In this study, GIS is employed to analyze crucial determinants, such asanimal age, body weight, and BCS (Body Condition Score). Jabung sub-district, situated within a diverse agricultural landscape, presents a unique opportunity to investigate spatial variations in dairy cow potential and milk production capacity.

By utilizing GIS capabilities,the study aim to map and analyze the potential of dairy cows with the highest milk production. Through a comprehensive examination of milk production, age structure, and physiological parameters such as body weight and BCS, we sought to uncover spatial

patterns and identify areas with untapped dairy farming potential.

This study not only contributes to the empirical understanding of dairy farming dynamics but also provides actionable insights for stakeholders involved in agricultural planning, resource allocation, and livestock management in Jabung sub-district. By elucidating the spatial determinants of milk production potential, we pave the way for targeted interventions and sustainable strategies to enhance dairy productivity and bolster the agricultural economy of the region.

II.   MATERIALS AND METHODS

A.   Research Materials

This study was conducted in three hamlets in the Jabung sub-district, namely Dempok, Gading Kembar, and Gunung Kunci, with a total of 91 observed livestock farmers.

B.   Research Methods

This study utilized a survey research method.

C.   Research Procedures

Study procedures involved a systematic approach to data collection, analysis, and interpretation. Initially, a survey method was used to collect data from breeders in three hamlets in Jabung District, namely Dempok, Gading Kembar, and Gunung Kunci. This data includes information regarding livestock conditions,milk production, age of livestock, body weight, BCS, as well as coordinates of the location of each farmer. The collected data was subjected to hotspot analysis, a spatial analysis technique, to identify high and low value clusters related to the potential of dairy cows and milk production factors.

D.   Research Variables

The study encompasses key variables essential for assessing the potential of dairy cows in the study area. These variables include milk production, animal age, body weight, and Body Condition Score (BCS). Through comprehensive analysis, the study aims to understand how these factors interact and influence milk production potential. By examining the distribution of dairy cows across different age groups, assessing their body weight variations, and evaluating their BCS, study seek to provide insights into the dynamics of dairy farming and inform strategies for optimizing milk production in the region.

E.   Data Analysis

Hotspot analysis is utilized in the data analysis to pinpoint spatial clusters of high and low values related to dairy cow potential and milk production factors within the study area.
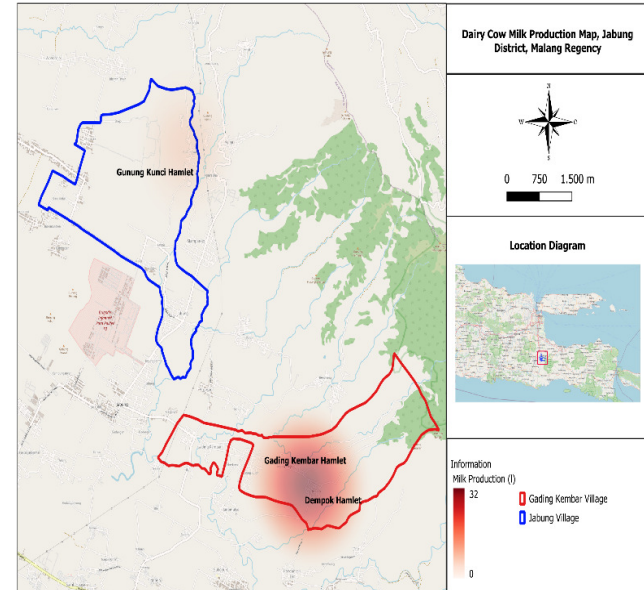
III.   RESULTS AND DISCUSSION

Fig. 1Map of Milk Production in Jabung Sub-District, Malang Regency

The hotspot analysis carried out in Dempok, Gading Kembar, and Gunung Kunci hamlets is depicted in Figure 1 which depicts the spatial distribution of potential milk production for dairy cows. The analysis results indicate that the highest potential for milk production is observed in the Dempok and Gading Kembar hamlets, where milk production exceeds 13 liters/head/day. Conversely, in the Gunung Kunci hamlet, milk production falls below 13 liters/head/day.Indeed, the variation in milk production among dairy cows across the three hamlets can be attributed to several factors, including the age of the animals, body weight, andBCS.The survey results from the three villages, as presented in Table I.

TABLE I
THE DATA POPULATION OF LACTATING DAIRY COWS IN THE STUDY LOCATION

Hamlets	N	Age (Year)	Milk Production (liters/head/day)	BCS	Body Weight (kg)
Dempok	91	2.5-12	16.26±5.70	2.55±0.38	431.41±44.17
Gading Kembar	31	2-8	14.67±3.91	2.52±0.25	414.52±31.59
Gunung Kunci	48	3-8	10.08±4.11	2.49±0.28	404.85±33.13

Dempok hamlet stands out as the largest milk production center with an average output of 16.26 ± 5.70 liters/head/day. This superior performance is primarily due to the productive age category of dairy cows, which predominantly fall within the 5 to 8yearold range, This aligns with the findings of [3], which state that Friesian Holstein dairy cows experience peak production during the fourth lactation, typically at the age of 5 to 6 years. Furthermore, effective management practices are evident from the average body weight and Body Condition Score (BCS) of dairy cows in this hamlet. However, it should be noted that according to standards set by [4], the ideal milk production based on an average body weight of 482.66 kg is 11.80 kg per day. Similarly, recommendations indicate that the optimal BCS to maintain optimal milk production is 3 [5].

From this comparison with the data presented in Table 1 for all three hamlets, it is apparent that the average body weight and BCS of dairy cows are slightly below the ideal standards considered necessary to achieve optimal milk production. Nonetheless, Dempok still demonstrates the highest milk production potential among the hamlets studied. Other factors influencing milk production in this hamlet include effective management practices, where efficient management is observed to enhance production outcomes.

Meanwhile, Gunung Kunci hamlet, despite having lower milk production at 10.08 ± 4.11 liters per head per day, faces different challenges. Survey results indicate that the availability of water is a major constraint resulting in below-standard milk production.Based on [6], drinking water plays a crucial role in milk production because milk consists mostly of water, about 87%. Additionally, around 50% of a cow's body is composed of water.

Adequate water availability is essential to maintain sufficient fluid balance in dairy cow's bodies, which in turn affects milk production [7]. When cows do not get enough water, their milk production may decrease because insufficient fluid in the body can disrupt the metabolic processes and physiological functions necessary for optimal milk production. Therefore, ensuring adequate water availability is a key factor in maintaining dairy cow milk productivity.

IV. CONCLUSIONS

Dempok hamlet emerges as the primary milk production center, boasting the highest average output of 16.26±5.70 liters/head/day. Conversely, Gunung Kunci hamlet exhibits lower milk production levels, with an average output of 10.08±4.11liters/head/day. These findings underscore the importance of various factors such as management practices, environmental conditions, and the physiological health of dairy cows in influencing milk production outcomes.

V. SUGGESTION

Enhanced management practices, including training programs for dairy farmers, and ensuring consistent water availability are essential suggestions to improve milk production efficiency and sustainability in the studied area. Collaboration with breeding programs and promoting sustainable farming practices can further contribute to long-term improvements in dairy farming outcomes.

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