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Farming in Kediri Indonesia: analysis of cluster k-means

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Abstract. Beef cattle farming is a source of income preferred by the people of Kediri Regency to fulfill their daily needs. Various components related to beef cattle business in Kediri Regency need to be assessed to understand the real facts related to the business. This study aims firstly to analyze the density cluster of cattle and the second perception of beef cattle breeders in Kediri Regency regarding the components of strength, weakness, threat, and opportunity in the beef cattle business. The research was conducted in June - December 2019. Data collection was carried out through a survey of 150 breeders and FGD (Focus Group Discus) involving 15 experts was conducted. The data obtained were then analyzed by using the K-means cluster. The results of the first study regarding the density level of cluster 1 (one) solid category with successive central values (13239, 7658, 88190, 4759), there are 6 (six) districts. Cluster 2 (two) with moderate category with central value (9966, 1870, 59872, 3618) totaling 17 (seventeen) districts. Cluster 3 (three) categories rarely consist of three districts. The second result is based on the perception that the strength component of the government support aspect must be optimized, small amount of farmer capital became the weakness aspect of the business. The increasing demand for beef was the opportunity aspect. The rampant slaughter of productive female cattle was the threat aspect of this business. Based on the results of the K means cluster analysis, it is concluded that the beef cattle business in Kediri Regency is very potential to be developed because of the dominance of the area in clusters 1 and 2. The Kediri Regency Government and its stakeholders are actively involved in the success of the beef cattle breeder business. The results show that the strength component of the government support aspect must be optimized.

1. Introduction

In determining the development of beef cattle business in rural areas, it is necessary to have a mapping based on the similarity of characters possessed by the community and factual conditions. Various components will be linked to one another. The complexity of the problem is important to study using an approach that focuses on the perspective and the level of importance expected. Heterogeneity of opinion is deemed necessary to be classified in order to suppress the spread of the problem, grouping is indispensable with the aim of making it easier to take action.

Internal factors (strengths, weaknesses) and external factors (threats, opportunities) are an important part that must be considered in determining the progress of a business, especially beef cattle farming. A strong internal factor component can become the farmer's strength to solve problems caused by external factors. In the beef cattle business, it is important to identify internal and external factors as a SWOT unit, referring to [1] [2] [3] [4] strategic decisions can be obtained if strengths, weaknesses, opportunities, and threats are known. Indicators that are part of each component are then formulated to analyze the real conditions felt and expected by beef cattle breeders and stakeholders.

K means cluster analysis is a statistical analysis that aims to determine complex data structures by placing the similarities of observed objects into one group. K means cluster analysis is used as a tool



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to facilitate grouping and the tendency of many perceptions. Research [5] [6] [7] [8] [9] illustrates that strategic decisions are made based on grouping according to known cluster data. Not many have used it in the animal husbandry sector, the use of analysis can be an alternative to 1) knowing segmentation and determining potential areas, 2) knowing the positioning and determining the business of beef cattle development in Kediri Regency.

Kediri Regency is one of the regions in East Java that contributes (producers) to beef cattle. Referring to [10] as the basis for area and livestock development is the authority of each region. Mapping of livestock density in the area needs to be taken into consideration so that the decisions taken can be an effective solution. Areas with different cattle populations require different treatment measures. The varied socio-economic characteristics of breeders also influence the breeders' perspective on the various internal and external components that affect the progress and development of beef cattle breeders, especially in Kediri Regency.

2. Materials and Methods

The research focuses on examining 2 (two) important things, first about the density of cattle in the Kediri district by grouping them into cluster 1 (dense), cluster 2 (medium), and cluster 3 (rare), secondly about breeders' perceptions of strengths, weaknesses, opportunities, and threats in beef cattle business. The analysis used is the K means cluster analysis as a decision-making tool. The k-mean cluster analysis step or using a partitional clustering approach, each cluster is associated with a centroid value (center point).

Each point is placed in a cluster with the closest centroid. calculate the distribution of each component, in this case the researcher uses the Excel microsof application by = SQRT (first data in column and row 1 minus the centroid 1 value) to the power of 2 (two) plus (data in row 1 column 2 minus the value of centroid 2) to power 2, so on until the nth data. After knowing the results, it is continued with repetition (iteration 1, 2, etc.) to find out the new cluster by first calculating the centroid (central value) until there is no change in the cluster.

3. Result and Discussion

Kediri Regency is one of the districts that has contributed to providing the needs of cattle in East Java and Indonesia. Kediri Regency ranks 6th in producing beef cattle in East Java [11] supported by data from the Central Statistics Agency for Kediri Regency in 2018, which recorded a cow population of 223,213 with a distribution in 26 (twenty-six) sub-districts included in the administrative area of Kediri Regency. The distribution of the cattle population in each district is different depending on the trends of the population in the area.

Beef cattle business in rural areas is dominated by traditional small-scale breeders, because the beef cattle business is a side business and serves as a filler of the remaining time from the main job (farming, public, private, traders, coolies, etc.). Beef cattle business in the area of Kediri Regency is still popular with the community because it can increase income even though it is not too much. According to Solikin's research [12], social capital affects the development of beef cattle business. It is confirmed by [13] stating that the increase in income of cattle farmers can be obtained greater if they process existing natural resources as feed and fertilizer. The increase in farmer's income can be a leverage factor as well as a motivation for breeders to increase the livestock population.

Each sub-district with the character of the population, land area, and cattle population as shown in table 1. Referring to the data in table 1 by grouping cluster 1 (dense), cluster 2 (medium), and cluster 3 (rare). The initial cluster was determined randomly by having 3 districts as representatives of each cluster. In this stage, cluster 1 of Wates sub-district, cluster 2 of Plemahan sub-district, and cluster 3 of Ngasem sub-district were selected. After determining the value of each centroid, then calculating and repeating (iteration) until the cluster does not change. The distribution of beef cattle population, population, and land area in Kediri Regency is as shown in table 1 below:

Table 1. Distribution of beef cattle, population, land area in Kediri Regency

| No | sub-district | Number of beef cattle (tail) | Total population (soul) | Area (km ²) |
|-----|--------------|------------------------------|-------------------------|-------------------------|
| 1. | Mojo | 12.726 | 75.764 | 102.73 |
| 2. | Semen | 8.550 | 53.494 | 80.42 |
| 3. | Ngadiluwih | 7.394 | 77.551 | 41.85 |
| 4. | Kras | 8.793 | 59.351 | 44.81 |
| 5. | Ringinrejo | 8.943 | 52.287 | 42.38 |
| 6. | Kandat | 8.958 | 59.098 | 51.96 |
| 7. | Wates | 13.915 | 87.113 | 76.58 |
| 8. | Ngancar | 11.272 | 47.178 | 94.05 |
| 9. | Plosoklaten | 12.468 | 69.937 | 88.59 |
| 10. | Gurah | 13.142 | 81.234 | 50.83 |
| 11. | Puncu | 11.773 | 60.980 | 68.25 |
| 12. | Kepung | 7.108 | 81.841 | 105.65 |
| 13. | Kandangan | 3.579 | 48.304 | 41.67 |
| 14. | Pare | 6.630 | 101.861 | 47.21 |
| 15. | Badas | 3.724 | 62.081 | 39.21 |
| 16. | Kunjang | 6.689 | 34.297 | 29.98 |
| 17. | Plemahan | 10.475 | 58.721 | 47.88 |
| 18. | Purwoasri | 9.528 | 55.559 | 42.50 |
| 19. | Papar | 10.688 | 50.006 | 36.22 |
| 20. | Pagu | 9.482 | 38.635 | 24.86 |
| 21. | Kayenkidul | 11.635 | 44.529 | 35.58 |
| 22. | Gampengrejo | 2.474 | 34.054 | 16.76 |
| 23. | Ngasem | 3.295 | 67.310 | 21.83 |
| 24. | Banyakan | 4.966 | 54.848 | 72.55 |
| 25. | Grogol | 5.080 | 46.385 | 34.50 |
| 26. | Tarokan | 10.302 | 58.974 | 47.20 |
| | Jumlah | 223.213 | 1.561.392 | 1386.05 |

Source: BPS Kediri 2018

The results of the research on the existing conditions of beef cattle business density in Kediri Regency through two repetitions (iterations) obtained sub-district results for category 1 (one) with successive central values (13239, 7658, 88190, 4759) there are 6 (six) districts namely Mojo, Ngadiluwih, Wates, Gurah, Kepung, and Pare. Cluster 2 (two) medium categories with central values (9966, 1870, 59872, 3618) with a total of 17 (seventeen) districts namely Semen, Kras, Ringinrejo, Kandat, Ngancar, Plosoklaten, Puncu, Kunjang, Plemahan, Purwoasri, Papar, Pagu, Kayen kidul, Gampengrejo, Banyakan, Grogol, and Tarokan. Cluster 3 (three) rare categories consist of three sub-districts, namely Kandangan, Badas and Ngasem.

The difference in density for each region is an important factor that must be considered in implementing development strategies. One example in areas where the density category is urgently needed is increasing the speed of adding cattle weight by providing quality feed. The hope is that rapid weight gain will affect the cattle harvest period. In areas with rare densities, the strategy is to spur the increase in the population of cattle.

In addition to analyzing livestock density, this study also analyzes breeders' perceptions of the components of strengths, weaknesses, opportunities, and threats that are happening. The results were obtained as follows:

3.1 The results of the strength component cluster

On the strength component with indicators, farming experience, geographic location and land availability, farmer skills, and government support. The results showed that most of the breeders' perceptions knew that the position of the strength they had was very potential to develop a beef cattle business, especially if it was supported by the government to optimize mentoring and training for farmers in improving technical skills in processing agricultural waste as animal feed and waste. livestock as fertilizer that can be applied in farming. The results of the assessment are presented in table 2 below:

Table 2. The results of the cluster perceptions of the strength components

| strength components question items | Respondents | | | | | | | | | | | | | | |
|--|-------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| Breeding experience | 2 | 2 | 3 | 3 | 2 | 3 | 2 | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 2 |
| Geographical location and land availability | 2 | 1 | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Breeding skills | 3 | 4 | 2 | 3 | 3 | 4 | 3 | 3 | 3 | 3 | 2 | 4 | 4 | 4 | 3 |
| Government support | 4 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 3 | 3 | 3 | 4 | 4 |
| Sub total | 16 | 15 | 15 | 16 | 16 | 19 | 16 | 15 | 15 | 15 | 14 | 16 | 15 | 18 | 17 |

With the centroid value for cluster A: 15.25 and cluster B: 17.75, the results in table 2 show that 70 percent of respondents rated the strength component as not urgent to handle, meaning that Kediri Regency has the power to develop beef cattle business. There are 30 percent of respondents who fall into cluster B, with the perception that the strength in Kediri Regency is still urgent to handle, especially in relation to points of government support.

3.2 The results of the cluster component weaknesses

Weakness components include business capital, market access and prices, livestock control, availability of feed and feeder cattle, and access to capital. The centroid values for the weakness component were 19.5 and 22.5. The k-mean test for weakness component clusters was obtained by 30 percent of respondents in cluster A, which means that they think that the urgency value of weakness is not urgent or not problematic and 70 percent of respondents occupy cluster B, meaning that perceptions regarding the urgency of subscribing to the weakness component need to be subscribed. As in table 3 below:

Table 3. The results of the perception cluster component of weakness

| component of weakness question items | Respondents | | | | | | | | | | | | | | |
|--|-------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| startup capital | 4 | 3 | 2 | 4 | 4 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 3 |
| market access and prices | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | 3 |
| control of livestock | 4 | 4 | 3 | 4 | 4 | 4 | 3 | 4 | 4 | 4 | 3 | 4 | 4 | 4 | 3 |
| animal feed | 3 | 3 | 3 | 4 | 3 | 4 | 4 | 4 | 3 | 3 | 4 | 4 | 4 | 4 | 4 |
| feeder cattle | 3 | 4 | 3 | 3 | 3 | 4 | 3 | 3 | 4 | 4 | 3 | 4 | 3 | 4 | 4 |
| access to capital | 4 | 3 | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | 4 | 4 | 4 |
| sub total | 21 | 21 | 18 | 22 | 22 | 23 | 22 | 23 | 23 | 23 | 21 | 24 | 22 | 24 | 21 |

4 The results of the study based on the weakness component analysis show that the business capital of beef cattle breeders in Kediri Regency is relatively small. The breeder has a working capital ranging from IDR 15,000,000 - 20,000,000, this figure is equivalent to one male going 18 months. Limited business capital causes breeders to be unable to develop their businesses and the income they earn from raising cattle, especially if business is not a priority for their livelihoods. Strategies in business development through additional capital must find solutions by all stakeholders.

3.3 The results of the opportunity component cluster

Opportunity components consisting of beef prices, beef demand, government support, geographic location and availability of agricultural waste, the role of banks in providing loans, and the existence of a cattle market are analyzed using the k-mean cluster, the centroid values of 18 (A) and 20 (B) it is known that the responses of expert respondents were 30 percent including cluster A (bottom) and 70 percent cluster B (top). The dominant perception of cluster B shows that the business opportunity for beef cattle is wide open as a potential business option to be increased.

Table 4. The results of the opportunity component perception cluster

| Opportunity component Question item | Respondents | | | | | | | | | | | | | | |
|--|-------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| Price of beef | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 3 | 3 | 4 | 4 | 3 |
| Beef needs | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 4 | 3 | 4 |
| Government support | 4 | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 4 |
| Geographical location and availability of agricultural waste | 2 | 3 | 3 | 3 | 3 | 3 | 4 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 3 |
| The role of the Bank in providing credit | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 3 |
| Market presence | 2 | 3 | 3 | 2 | 3 | 3 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 |
| sub total | 17 | 20 | 20 | 20 | 21 | 21 | 21 | 19 | 17 | 17 | 18 | 19 | 20 | 19 | 20 |

The results show that the main opportunity component is the need for beef which continues to increase along with the population growth, which is a potential and promising situation for breeders in developing their business. This opportunity should be used as motivation for farmers to increase the scale of their business.

3.4 Results of the threat component cluster

Threat components include competition for substituted meat prices, market access, policy changes, land use change, livestock disease, and slaughter of productive females. The results of the k-means test for threat component clusters with centroid values of 13 (A) and 17 (B), it is known that the expert's view of the urgency of threat management faced in beef cattle development is 40 percent of respondents are included in cluster A (bottom) and 60 percent of cluster respondents. B (above). This means that most respondents think that the threat component should be considered as a determining factor for the development of the beef cattle farmer's business and conditions.

Table 5. Results of the threat component perception cluster

| threat component Question item | Respondents | | | | | | | | | | | | | | |
|--|-------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| Competition for substitute meat prices | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 4 | 3 | 3 | 2 | 2 | 2 | 3 | 2 |
| Market access | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 |
| Policy changes | 3 | 1 | 1 | 1 | 3 | 2 | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 2 |
| Change of land function | 1 | 1 | 1 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 2 |
| Farm animal disease | 3 | 3 | 4 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 4 | 3 | 3 | 3 | 3 |
| Productive slaughter of female cows | 2 | 3 | 4 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 3 | 3 | 4 | 4 |
| sub total | 15 | 13 | 15 | 13 | 17 | 15 | 15 | 15 | 15 | 15 | 16 | 13 | 14 | 16 | 16 |

The result of the calculation of the threat component shows that productive female slaughter items have the highest position in the threat component of beef cattle development. Cows are an asset that should be safeguarded, in order to keep reproducing so as to meet the needs of animal food in

Indonesia. The government has banned the slaughter of productive females in order to prevent a reduction in productive female cattle. Supervision in policy implementation needs to be improved.

4. Conclusion

The results of the study using K means cluster beef cattle business in Kediri Regency are: first, the density level of the cluster 1 (one) category is dense, there are 6 (six) districts. Cluster 2 (two) with medium category 17 (seventeen) districts. Cluster 3 (three) categories rarely consist of three districts. The second result is based on the perception that the strength component of the government support aspect must be optimized, the weakness aspect is the small amount of farmer capital, the opportunity aspect is the increasing demand for beef, and the threat aspect is the rampant slaughter of productive female cattle. Based on the results of the K means cluster analysis, it is concluded that the beef cattle business in Kediri Regency is very potential to be developed because of the dominance of the area in clusters 1 and 2. The Kediri Regency Government and its stakeholders are actively involved in the success of the beef cattle farmer business.

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