



Analysis of Livestock Resources Potential for the Development of Beef Cattle in Mojogedang Sub-district, Karanganyar Regency

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Abstract. This study aims to determine the potential of livestock resources for the development of beef cattle in Mojogedang sub-district, Karanganyar Regency. The research was conducted in June-August 2022 located in Mojogedang Sub-district, Karanganyar Regency. The data used are primary data and secondary data. Primary data were obtained through interviews with 60 beef cattle farmers. Primary data were obtained from survey while secondary data were obtained from the Department of Agriculture and Livestock, the Central Bureau of Statistics and related agencies in Karanganyar Regency. The data collection technique in this research is data collection intentionally (*purposive sampling*). This research is a survey research with data analysis methods used are descriptive analysis, location quotation (LQ) analysis and the method of KPTR (Ruminant Population Increased Capacity). The results showed that there were 7 villages which were included in the base area of 12 villages in Mojogedang Sub-district. The two villages that have the highest LQ scores are Kedungjeruk and Ngadirejo villages. This shows that Kedungjeruk and Ngadirejo villages have better beef cattle population development potential than other villages. Based on the results of the calculation of the additional capacity for the population of ruminant livestock (KPTR), all sub-sub-districts in Karanganyar Regency have a positive KPTR value. The total value of KPTR in Karanganyar Regency is 1,049,957.92 Animal Units (AU). The conclusion that can be obtained is that the Karanganyar Regency can still provide animal feed in the form of grass and agricultural waste for the value of the KPTR with the current conditions.

Keywords: Potential analysis · beef cattle business · livestock resources

1 Introduction

The development of livestock has a very important role in the development of the national economy. This is reflected in the mission of livestock development, which among other things creates economic opportunities to increase income, helps create jobs, and conserves and utilizes natural resources supporting livestock [1]. Demand for livestock

products will continue to increase along with the increase in population, income, awareness of the importance of consuming nutrition from animal protein, especially meat [2]. The type of meat-producing livestock that is popular and much in demand by the public is large ruminants, namely beef cattle. Beef cattle are mostly kept by people on the island of Java, although their development is still not optimal [3]. This is because the island of Java has a good level of compatibility in the development of beef cattle, both from the availability of feed ingredients, topography, climate, and land availability [4].

The livestock sub-sector plays an important role in the rural economy in Karanganyar Regency. This is because most of the rural population in Karanganyar Regency is still dependent on agricultural and livestock products. In addition, in terms of the potential of the area, it is relatively easier to raise livestock. The environmental and climatic conditions are also very supportive for the development of beef cattle in addition to the availability of livestock land and adequate land for feed ingredients. These aspects can provide added value for beef cattle commodities to be developed. However, beef cattle business in Karanganyar regency generally still dominated by smallholder farming system integrated with other farms [5]. Animal husbandry is only done as a side business while the main business is farming [6]. The maintenance system used by farmers is called semi-intensive by using part of the time in the fields and part of the time is used for raising livestock using grass or rice straw waste [7]. Mojogedang District is one of the areas where the majority of the population work as farmers and breeders [8]. Mojogedang is one of the sub-sub-districts in Karanganyar Regency which is included as a center for beef cattle development, because of its close position to the market. In addition, based on the results of the analysis of the Livestock Concentration Index (LCI) of Karanganyar Regency, it shows that Mojogedang Sub-district has the potential as a barn for ruminants, especially beef cattle, which is 8,564 heads of the 52,192 heads of the total population in Karanganyar Regency[9].

Livestock resources that play an important role in the development of beef cattle are natural resources, human resources, technology, capital and institutions. The five resources must complement each other, because it will not produce something optimal if only one source is used [10]. To develop the livestock population in an area requires an analysis of regional development such as LQ (Location Quotient) and the value of the ruminant livestock population increase capacity (KPPTR), so that the potential for regional development can be identified accurately [11]. LQ analysis provides a comparison the relative capacity of a sector in a particular area with the capacity of the same sector or sub-sector in a wider area [12]. The availability of land resources, especially as a source of animal feed such as rice, corn, sweet potatoes, peanuts, green beans, soybeans can support the development of beef cattle farming [13]. The calculation of the capacity to increase the ruminant livestock population is useful for seeing how much an area has the potential to increase the ruminant livestock population based on the availability of forage in the region. The value of the ruminant livestock population increase capacity (KPPTR) in a district is calculated as the difference between the carrying capacity of food crop waste feed and the number of ruminant livestock present [14]. This study aims to determine the state of livestock resources in the Mojogedang Sub-district, both in terms of the characteristics of farmers and livestock cultivation, analyze the Mojogedang Sub-district whether it belongs to the base or non-base sector, analyze the capacity or regional

capacity in providing fodder in Mojogedang Sub-district, Karanganyar Regency. This study aims to (1) determine the state of livestock resources in the Mojogedang sub-district from in terms of the characteristics of breeders and livestock cultivation, (2) analyzing the base or non-base sectors in the Mojogedang sub-district, (3) analyzing the regional capacity in providing forage animal feed in Mojogedang Sub-district.

2 Methods

2.1 Sampling Methods

The population selected is beef cattle breeders in Mojogedang Sub-district, Karanganyar Regency. The first stage is taking purposive sampling of beef cattle breeders in Mojogedang Sub-district based on beef cattle population [15]. Determination area sample conducted by on purpose, because this sub-district has a high population of beef cattle in Karanganyar Regency. The data used in this study are primary data and secondary data. Primary data was obtained by conducting direct interviews with sample farmers who had been prepared in the form of a questionnaire and by direct observation in the field [16]. Primary data is used to determine livestock resources, namely: livestock, breeders, capital, technology and the environment that supports the effort to develop beef cattle.

Secondary data were obtained from relevant government agencies, namely from the Department of Agriculture and Livestock of Karanganyar Regency, the Central Statistics Agency (BPS) of Karanganyar Regency and related agencies. The variables used in this secondary data include the population of beef cattle, the population of all types of livestock, the area of land used, the number of residents and various sources that support the object of research (Tables 1, 2 and 3).

2.2 Data Analysis

a. *Descriptive Analysis*

Analysis in this study is used to describe the state of livestock resources in the Mojogedang Sub-district, both in terms of the characteristics of farmers and livestock cultivation.

b. *Location Quotion (LQ) Analysis*

The LQ method is used to analyze the state of an area whether an area is a basic sector or a non-base sector, in this case especially the beef cattle population in Mojogedang Sub-district, Karanganyar Regency. LQ is formulated as follows:

$$LQ = \frac{v_i/V_t}{V_i/V_t}$$

Notes:

v_i = Village Beef Cattle Population

v_t = Number of Village Family Heads

V_i = Beef Cattle Population of Sub-district

V_t = Number of Head of Sub-district Family

If the LQ of a sector is more than or equal to 1 (≥ 1), then the sector is a base sector, whereas if the LQ of a sector is less than 1 (≤ 1), then the sector is a non-basic sector [17].

Table 1. Value (k) for each type of grass-producing land

Land type	k
Meadow	Natural prairie area
fallow land	20% of the total rice field
Rice Fields	2.5% of the total paddy fields
Plantation	5% of the total plantation area
State Forest	country 's total forest area
People's Forest	3% of the total forest area people
Moor	1% of the total moor

Source: Ayuni (2005).

c. Method Ruminant Population Increased Capacity (KPPTTR)

The Ruminant Population Increased Capacity Method is an approach to demonstrate the capability or capacity of the region in providing fodder [18].

$$\begin{aligned}
 \text{KPPTTR (L)} &= \text{KTTR} - \text{Real Population} \\
 \text{Real Population} &= \text{Livestock that actually existed at the time of the study} \\
 \text{KTTR} &= \frac{(k \cdot Le \cdot 15 \text{ ton BK/ha/year}) + j Li (\text{ST})}{2.3}
 \end{aligned}$$

Notes:

k = coefficient of availability of grass-producing land

Le = area of grass-producing land (ha)

j = coefficient of forage production

Li = Forage-producing land for leftover agricultural products

15 tons/ha/year = average pasture production

2.3 = every 1 unit of ruminant (AU) requires forage 2.3 tons of BK/year

KPPTTR (L) = KPPTTR based on forage availability

Table 2. Value (j) for each type of straw-producing plants.

Straw Type	j
Paddy	Harvested area (ha) x 0.23 (tons/ha/yr)
Corn	Harvested area (ha) x 10.90 (tons/ha/yr)
Cassava	Harvested area (ha) x 5.05 (tons/ha/yr)
Sweet potato	Harvested area (ha) x 1.20 (tons/ha/yr)
Soya bean	Harvested area (ha) x 1.07 (tons/ha/yr)
Peanuts	Harvested area (ha) x 1.44 (tons/ha/yr)

Source: Ayuni (2005).

Table 3. The development of beef cattle population in Mojogedang sub-district, Karanganyar regency in 2018–2021.

Year	Quantity (head)	Development (%)
2018	5,275	
2019	8,338	30.63
2020	8,770	4.32
2021	8,564	-2.06

Source: Results secondary data processing (2021).

3 Results and Discussion

The beef cattle population in Mojogedang District from 2019 to 2020 continues to increase and experience a slight decline in 2021. The highest increase in population occurred in 2019 to 2020, which was 30.63%. From 2020 to 2021, there will be a decline of 2.06%. The total population of beef cattle in Mojogedang sub-district is 8,564 heads in the Animal Unit (AU) spread over 12 villages. The population of beef cattle in Gentungan Village is 102 AU, Kedungjeruk Village is 701 AU and Ngadirejo Village is 1,486 ST. The results of the calculation of the population of beef cattle in livestock units with the assumption that the cattle are in mature condition.

Availability of feed is the main thing for beef cattle both for life, breeding, and daily production processes and is the basic capital for livestock development in an area. Forage is a staple food for livestock that must be available, whether in the form of grass, nuts or other agricultural waste in fresh form or after undergoing processing and preservation.

Forage which is widely available in Mojogedang sub-district includes elephant grass, field grass, and agricultural waste (rice, corn, cassava, sweet potato). In an effort to meet the needs of animal feed, farmers usually obtain it from farm land, plantation land, yards, or on the side of village roads. Based on the results of KPPTR calculations for forage production in Mojogedang District, the number of forages owned is 1,055,068 tons/year, with grass production 382,560.7 tons/year and straw production 672,507.9 tons/year. Beef cattle business also depends on the existing climate, because the availability of

Table 4. Base region with LQ value 1 in sub-district Mojogedang regency Karanganyar year 2021.

No	Village	Value (LQ)
1	Mojogedang	1.27
2	Buntar	1.27
3	Gebyok	1.39
4	Gentungan	1.42
5	Kaliboto	1.45
6	Kedungjeruk	1.67
7	Ngadirejo	1.73

Source: Results primary data processing (2021).

feed for livestock businesses is highly dependent on climate and rainfall. The climate in the Mojogedang sub-district is a tropical climate with high rainfall and fertile land and is supported by many rivers, so that most of the area is used for agricultural land [9].

3.1 Beef Cattle Development Base Area

The base area for beef cattle development in Karanganyar Regency is a sub-district that has a relatively higher beef cattle population than other sub-districts. According to the results of the *Location Quation* (LQ) calculation, out of 12 villages in Mojogedang Sub-district, only 7 villages are included in the base area. The seven villages are Village Mojogedang, Buntar, Gebyok, Gentungan, Kaliboto, Kedungjeruk and Ngadirejo. The livestock business population base area in Mojogedang Sub-district is presented in Table 4.

Table 4 shows that Kedungjeruk and Ngadirejo villages have higher LQ values than other villages (1.73 and 1.67). This thing shows that Kedungjeruk and Ngadirejo villages have better beef cattle population development potential than other villages. The results of the calculation of LQ analysis, obtained non-basic areas that have beef cattle totaling 5 villages. Details of the non-base areas are presented in Table 5.

3.2 Ruminant Population Increased Capacity (KPPTR)

The capacity of increasing the population of ruminants is how much an area has the potential to increase the population of livestock based on the availability or capacity of forage fodder in the area. In general, the KPPTR value is influenced by the area of agricultural land, harvested area and the real population of ruminants (Sandy, 2008). The forage that is calculated is natural grass forage and agricultural waste. An area is said to be capable if the animal feed available in the area is greater than the livestock's living needs. The results of the calculation of the livestock population, and the stock of forage can be obtained the value of the capacity for the capacity of the forage [19]. According to [19] forage can be divided into two types, namely natural forage and forage

Table 5. Non-base regions with LQ value <1 in sub-district Mojogedang regency Karanganyar year 2021.

No	Sub-district	Value (LQ)
1	Munggur	0.15
2	Mojooroto	0.24
3	Pendem	0.66
4	Pereng	0.82
5	Pojok	0.99

Source: Results primary data processing (2021).

Table 6. KPPTTR value for each sub-district in Karanganyar Regency in 2021

No	Sub-district	Forage potential (tones/year)	Value KPPTTR (AU)
1	Colomadu	4.843,07	10.457,06
2	Gondangrejo	10.485,40	23.403,42
3	Jaten	6.301,20	14.102,76
4	Jatipuro	11.216,65	25.566,29
5	Jatiyoso	18.114,65	39.583,69
6	Jenawi	25.710,18	58.002,41
7	Jumapolo	29.890,59	63.974,36
8	Jumantono	14.520,55	18.466,26
9	Karanganyar	9.967,71	13.416,73
10	Matesih	17.501,36	24.377,13
11	Kebakkramat	11.203,20	19.279,36
12	Mojogedang	18.570,07	34.147,16
13	Karangpandan	23.939,31	46.515,41
14	Kerjo	40.601,44	87.730,31
15	Tawangmangu	261.735,07	595.749,66
16	Ngargoyoso	12.595,18	15.185,91
17	Tasikmadu	10.234,20	13.433,97
	Total	479.195,63	1.049.957,92

agricultural waste food crops. Natural forage such as field grass, while forage food crop waste consists of rice straw, corn, soybeans and beans. Natural forage is calculated based on land area; forage waste based on agricultural production of food crops.

Based on the results of the KPPTTR calculation, all sub-districts in Karanganyar Regency have a positive KPPTTR value. The total value of KPPTTR in Karanganyar

Regency is 1,049,957.92 AU (Table 6). This situation shows that with the current conditions, Karanganyar Regency can still provide animal feed in the form of grass and agricultural waste in the amount of the KPPTTR value, for example Mojogedang sub-district which has a KPPTTR value of 34,147.16 AU is still able to accommodate 34,147.16 units of ruminant livestock. Because it has a forage potential of 18,570.07 tons/year.

In line with that, the carrying capacity of the region for livestock is the ability of the region to optimally accommodate a number of livestock populations [1] classifies land use for livestock based on; a) land as a source of feed for livestock, b) all types of land suitable for feed sources, c) land use for livestock is defined as an effort to harmonize land use with agricultural systems, d) the relationship between land and livestock is dynamic.

4 Conclusions

The characteristics of respondents in Mojogedang District based on age are mostly included in the productive age group, the level of education of farmers is generally low but most of them have long experience of raising livestock. Generally, respondents still use simple technology in raising their livestock, using their own capital in livestock business, and animal husbandry institutions have not run optimally. The area which is the beef cattle population base area according to the calculation of the location quotient (LQ) analysis in Mojogedang District, Karanganyar Regency, there are 7 villages, while the non-base area beef cattle population is 5 villages. Regions in Karanganyar Regency have a positive KPPTTR value including Mojogedang District which is the sample research area.

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