



Production Performance and Output Estimation of Madura Cattle in Ganding and Lenteng Districts, Sumenep Regency

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Abstract. This study aims to determine the production performance and output estimation of Madura cattle in Sumenep Regency. The study was conducted in Ganding and Lenteng Districts. Data were collected by interview method with 227 farmers consisting of 111 farmers from Ganding District and 116 farmers from Lenteng District. The parameters measured were calf crop, natural increase, net replacement rate, and output estimation. The study was descriptive analysis with survey method. The results showed a birth rate of 15.02%, a mortality rate of 1.41%, a natural increase of 13.60%, a calf crop of 33.73%, a net replacement rate for males of 105.19%; a net replacement rate for females of 472.73%, and an output of 13.60%. The conclusion of the study is that the output value of Ganding and Lenteng Districts has the same value as the natural increase value in each district, so it can be interpreted that the population of Madura cattle in both areas remains balanced if livestock are removed for slaughter and sent to a region.

Keywords: Madura Cattle, Output Estimation, Natural Increase.

1 Introduction

Sumenep Regency is one of the main areas in the development of national beef cattle on Madura Island. This potential is shown by the submission of several sub-districts in Sumenep Regency as candidate areas for Madura cattle seed sources. This step was taken to preserve the genetic resources of Madura cattle and prevent cross-breeding that could threaten the genetic purity of the cattle population. The beef cattle population in Sumenep Regency was recorded at 388,090, which contributed 7.65% to the total beef cattle population in East Java Province [1]. However, most of the livestock maintenance systems in this area are still traditional, which results in various problems, such as inefficient maintenance management and low livestock productivity. This level of productivity will later affect the success of the output value or the number of cattle that can be removed from the area. Output estimation is important to prevent population decline. Livestock output in an area is influenced by natural increase, birth rate and livestock mortality. The output value will be high if the birth rate is high and the death rate is low, so that it is able to provide a large number of

replacement livestock in the area [2]. Output estimation is important to avoid excessive spending, so that the livestock population in an area is not depleted. To find out whether the availability of replacement livestock in an area can cover the needs of replacement livestock, it is necessary to calculate the Net Replacement Rate value. The study on Aceh cattle showed that with a Natural Increase (NI) of 19.08% and a Net Replacement Rate (NRR) of 240.08% for males and 173.33% for females, the availability of replacement stock exceeded the replacement needs, indicating a high output potential [3]. Based on this background, this study aims to determine the reproductive performance and output of Madura cattle in the prospective seed source areas of Ganding District and Lenteng District, Sumenep Regency.

2 Materials and Methods

2.1 Materials

This study was conducted in Lenteng and Ganding Districts, Sumenep Regency, East Java Province (Figure 1). Respondents in this study were 227 female Madura cattle breeders consisting of 111 breeders from Ganding District and 116 breeders from Lenteng District.

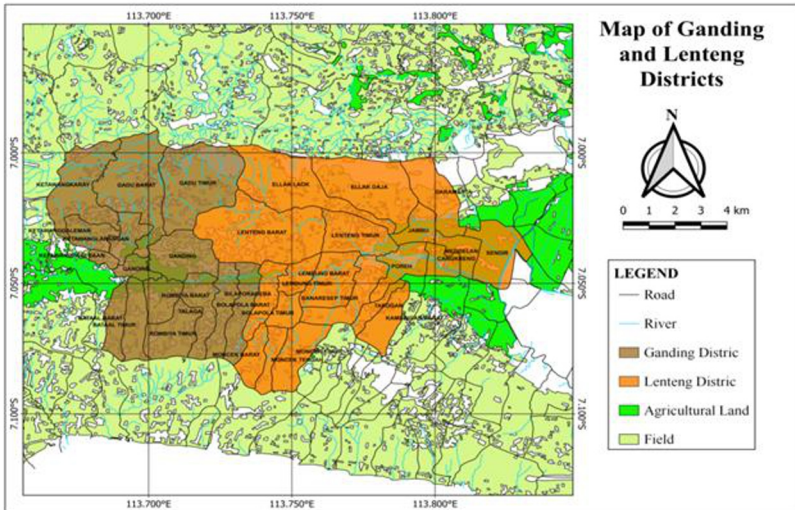


Fig. 1. Map of Studi Area

Ganding District and Lenteng District are located in the western region of Sumenep Regency. Ganding District encompasses an area of approximately 53.97 km² and lies at the geographical coordinates of 7.041273° South Latitude and 113.690098° East Longitude. In comparison, Lenteng District covers an area of approximately 71.41 km² and is situated at coordinates 7.027974° South Latitude and 113.784986° East Longitude. Sumenep Regency is characterized by a tropical climate, with two

distinct seasonal patterns: the rainy season and the dry season. The rainy season typically extends from October to April, whereas the dry season occurs from April to October. The region experiences an average annual temperature of 30.6°C and a relative humidity level of approximately 74%.

2.2 Method

The method used in this study is a survey method. Data were collected through direct interviews with respondents including the number of births, deaths, and livestock mutations.

2.3 Data Analysis

The data analysis used was descriptive statistical analysis. The data generated is in the form of averages and percentages. The calculation of cattle production performance by recommendations of [4] as follows:

$$\text{Percentage of births to population} = \frac{\text{Number of calves birth rate}}{\text{population number}} \times 100\%$$

$$\text{Percentage of mortality to population} = \frac{\text{Number of cattle mortalities}}{\text{Population number}} \times 100\%$$

$$\text{Natural increase} = \text{Birth percentage} - \text{Mortality Percentage}$$

$$\text{Natural increase (NI) male\%} = \frac{\text{Number of male calves (heads)}}{\text{Total number of calves (heads)}} \times 100\%$$

$$\text{Natural increase (NI) female\%} = \frac{\text{Number of female calves (heads)}}{\text{Total number of calves (heads)}} \times 100\%$$

$$\text{Calf crop} = \frac{\text{Number of calf births} - \text{Number of cattle mortalities}}{\text{Number of cows} + \text{Number of mortality of cows} + \text{Number of cows out}} \times 100\%$$

The calculation of output estimation and net replacement rate for livestock is based on [5], as follows:

$$\text{Male replacement needs (\%)} = \frac{\frac{\text{number of adult male cattle}}{\text{population}}}{\text{The leght of time the use of bulls (years)}} \times 100\%$$

$$\text{Female replacement needs (\%)} = \frac{\frac{\text{number of adult female cattle}}{\text{population}}}{\text{The leght of time the use of cows (year)}} \times 100\%$$

$$\text{The remaining amount of male replacement(\%)} = \text{Natural increase male (\%)} - \text{Male replacement needs (\%)}$$

The remaining amount of female replacement (%) = Natural increase female (%) – Female replacement needs (%)

Culled male (%) = Male replacement needs (%)

Culled female (%) = Female replacement needs (%)

$$\text{Net Replacement Rate Male} = \frac{\text{NI male (heads)}}{\text{Male Replacement needs(heads)}} \times \text{NI}\%$$

$$\text{Net Replacement Rate Female} = \frac{\text{NI female (heads)}}{\text{Female Replacement needs(heads)}} \times \text{NI}\%$$

Output Value = The remaining amount of male replacement (%) + the remaining amount of female replacement (%) + culled male (%) + culled female (%).

3 Results and Discussion

3.1 Birth and Mortality Rates

The birth rate of calves is the most appropriate measure to determine livestock fertility. The percentage of the number of births to the population in four sub-districts, namely Ganding and Lenteng in Table 1 shows the total births of male calves 50.59% and female calves 49.41%, while the birth to population is 15.02%. This birth rate is relatively low when compared to the percentage of the population of Madura cattle that dominates the population. The low birth rate of cattle is caused by the lack of attention of farmers in the livestock mating and reproduction program. The birth rate in this study is lower than the study by [6] on Madura cattle in the Sapudi Island area which showed that with 58.45 percent of adult females available, the birth of calves to the population was 30.19%. As a candidate for a source area for seeds, this birth rate is very far from the Decree of the Minister of Agriculture Number 3735 / Kpts / HK.040 / 11/2010 which states that the birth rate of Madura cattle is $82.0 \pm 12.0\%$. Based on the results of the study in Table 1, the percentage of livestock deaths shows a low figure with a total percentage of deaths to the population of 1.21%. Based on research survey data the death of Madura cattle in the District was mostly caused by FMD. Madura cattle infected with FMD in Ganding District were 19.14%, while in Lenteng District 16.35%. The highest cases of FMD deaths occurred in Lenteng District, namely 11.63%. Specific clinical symptoms such as vesicle lesions and ulcerations in the oral epithelial area, nares, muzzle, and legs cause livestock to be unable to consume and chew feed. This disease causes increased mortality in young animals and increased abortion rates [7]. In addition, the foot and mouth disease (FMD) outbreak also has an impact on the birth rate of cattle due to decreased fertility in cattle, but is not directly visible during the outbreak [8]. [9] stated that the side effects of FMD vaccination cause delayed ovulation and decreased conception rates in cows.

Table 1. Calf crop dan natural increase of Madura cattle

Variabel	Lenteng	Ganding	Total
Percentage of births to population (%)	13.69	16.50	15.02
Calves birth			
Male (%)	55.56	46	50.59
Female (%)	44.44	54	49.41
Cows to population (%)	40.68	44.55	42.76
Percentage of mortality to population (%)	2.28	0.66	1.41
Natural increase (%)	11.41	15.84	13.60
Calf crop (%)	29.51	34.75	33.73

3.2 Calf Crop

Based on the data analysis in Table 1, the total percentage of Madura calf crop shows a figure of 32.18%. Lenteng District has the lowest calf crop percentage, namely 29.51. This condition is caused by the low birth rate in Lenteng District. According to [10], increasing the percentage of calf crop can be done by optimizing reproductive efficiency, namely by increasing genetic selection for fertility and fecundity, implementing the use of effective reproductive technology, and combining reproductive and nutritional management to optimize the possibility of reproductive success. The main factor that influences the calf crop value is the ability to make the calving interval 12 months. Generally, the gestation period of Madura cattle is 9 months, so if the desired maximum calving interval is 12 months, then the remainder is 3 months. The remaining days before the mother becomes pregnant again have a very important meaning, so intensive attention must be given to the mother so that her estrus can be detected and the mother can be mated immediately. This is in line with [11] that to maintain the annual calving interval (≤ 365 days), fertilization must occur within 80 days after calving, but the anestrus period after calving is often longer than 60 days. Natural Increase.

3.3 Natural Increase

Natural increase is one of the indicators in assessing the efficiency of livestock reproduction in an area. Based on the data in Table 1, with 42.76% of available cows, births were obtained against a population of 15.02% and a death toll of 1.41%, the natural increase value was obtained at 13.60%. The natural increase value of Ganding District and Lenteng District is relatively low. According to [12], the standardization of the natural increase value ranges from 0 to 50% which is classified as low, >50% to 80% is classified as moderate and above 80% is classified as high. The low natural increase value is caused by the low number of female cows giving birth. An increase in natural increase will be obtained if all adult female cows in a population can give birth without dying [3]. The mutation factor of the parent that comes out also affects the number of mothers in the population. The sale of female Madura cattle is carried

out by farmers to support their economy. In addition, the suboptimal management of livestock maintenance by farmers, one of which is in the provision of suboptimal feed, especially in the provision of feed, can have an impact on livestock growth and reproduction. The main feed given is agricultural waste and dry grass, occasionally given herbal medicine mixed by farmers. This natural increase value needs to be continuously increased by reducing livestock mortality, increasing births, maintaining productive females and removing unproductive females.

3.4 Net Replacement Rate

The ability of a region to provide replacement livestock needs within a certain period of time can be determined by calculating the net replacement rate (NRR). The NRR value of male and female Madura cattle in Ganding District experienced a surplus of 282.35% and 402.96% respectively, while in Lenteng District only female cattle had a surplus NRR value of 460.75% (Table 2). Through these data, it can be identified that the need for replacement male cattle in Lenteng District is not met. The need for replacement livestock can be met if the NRR value is $>100\%$ [13]. Thus, the remaining stock of cattle used for replacement livestock and can be released as output does not disrupt the population balance [3]. Economic factors and limited availability of feed cause farmers to sell weaned calves, especially males, rather than for enlargement or fattening. Therefore, feed processing technology is very much needed in this area. The NRR value in this study was higher than the NRR value of Madura cattle on Sapudi Island, namely males and females were 96.18% and 126.41% respectively [6] and in Aceh cattle BPTU HPT Indrapuri males and females were 240.08% and 173.33% respectively [3].

Table 2. Net Replacement Rate.

Variabel	Ganding (%)	Lenteng (%)	Total (%)
Male			
Replacement needed (%)	1.87	0	1.00
Availability (%)	5.28	7.22	6.18
Net Replacement Rate	282.35	0	105.19
Female			
Replacement needed (%)	5.57	5.09	5.34
Availability (%)	22.44	28.52	25.27
Net Replacement Rate	402.96	560.75	472.73

3.5 Output Estimation

The output value is a description of the ability of Ganding and Lenteng Districts to produce or export Madura cattle without disrupting the natural growth of a population in the area. Predictions of livestock population output are useful as a reference in determining the amount of livestock exported from the area so that there is no popula-

tion depletion. Table 4 shows the output value of Madura cattle in Ganding District is 15.84% and in Lenteng District is 11.41%. The output value of Ganding District and Lenteng District has the same value as the natural increase value in each district, so it can be interpreted that the Madura cattle population in the two areas remains balanced if livestock is exported. According to [14] if the livestock output value is lower than the natural increase value, there will be an increase in population, while if the output value is higher than the natural increase value, there has been a population depletion. The results of this study are higher than [15] on beef cattle in Bayang District, Pesisir Selatan Regency, which is 13.28% and lower than several similar studies, namely the output estimation of Aceh cattle at BPTU HPT Indrapuri 19.08% [3], Peranakan Ongol cattle in Kebumen Regency of 39.73% [14], and Madura cattle in the Sapudi Islands conservation area of 30.75% [6].

Table 3. Output Value

Variabel	Ganding	Lenteng	Total
Culled male cattle (%)	1.87	0.00	1.00
Culled female cattle (%)	5.57	5.09	5.34
Replacement Remain of male (%)	5.42	6.34	5.88
Replacement Remain of female (%)	2.98	-0.02	1.38
Output Value (%)	15.84	11.41	13.60
Output Value (heads)	48	30	76

4 Conclusion

Based on the results and discussion, it can be concluded that Ganding District and Lenteng District have an overall output estimation value of 13.60% or 76 heads. The output value of Ganding District and Lenteng District has the same value as the natural increase value in each district, so it can be interpreted that the Madura cattle population in the two areas remains balanced if livestock are removed. The output estimates can be used in considering the potential for development and candidate areas for seed sources by increasing the birth rate and improving the management of Madura cattle maintenance.

Disclosure of Interests. The authors have no competing interests to declare that are relevant to the content of this article.

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