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Estimation of Natural Increase of Hissar Cattle: Case Study in Sumbawa Regency, West Nusa Tenggara Province, Indonesia

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ABSTRACT

This study aims to obtain an overview of the population structure of Hisar cattle and the potential for natural increase. The study was conducted in Sumbawa Regency, West Nusa Tenggara Province, Indonesia. Data were obtained from 65 respondents from Hisar cattle breeders. The research method used was a survey method with data collection through interviews with Hisar cattle breeders. The variables collected in this study were the number of mature males, mature females, young males, young females, male calves, and female calves, birth rates, mortality rates, and natural increase (NI). Data analysis used descriptive statistical analysis and presented as percentages. The results showed that the Natural Increase Value (NI) of Hisar cattle in Sumbawa Regency, West Nusa Tenggara Province, was 17.7%. The need for replacement cattle for females was 6.54%, while for males it was 3.20%. The availability of replacement cattle was 4.76% for males and 12.94% for females. Based on calculations according to age information, when the cow is 3 years old, 6.54% of female cattle and 3.20% of males are needed, so there is an excess availability of female cattle (6.40%) and male cattle (1.56%).

KEY WORDS: cattle, hissar, natural increase, NTB, Indonesia

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1. INTRODUCTION

Nusa Tenggara Barat Province (NTB) is located in the Nusa Tenggara archipelago and is bordered by the Java Sea and Flores Sea to the north, the Indian Ocean to the south, the Lombok Strait and Bali Province to the west, and the Sape Strait and Nusa Tenggara Timur Province to the east. NTB comprises two large islands, Lombok and Sumbawa, along with 378 smaller surrounding islands. Sumbawa Island is one of the national center for cattle production, where livestock farmers typically employ an integrated system combining livestock and agricultural land to provide animal feed (Hilmiati, 2019). In 2017, the cattle population was recorded at 1,234,640 heads, with 531,058 (43.01%) on Lombok Island and 703,582 (56.99%) on Sumbawa Island (Statistics of NTB Province, 2024).

Beef cattle, particularly Bali cattle and Hisar cattle, in Sumbawa Regency have adapted well and thrived under traditional extensive livestock systems. The cattle roam freely throughout the day without requiring special attention from farmers and are tolerant of relatively hot environments and low-quality feed. The largest populations of Hisar cattle are found in Moyohilir District (24,213 head) and Moyohulu District (21,477 head). Sumbawa Regency is also one of the key areas for the development of Hisar cattle (also known as Sumbawa cattle). According to the Sumbawa Regency Animal Husbandry Service (2023), the Hisar cattle population in Sumbawa Regency in 2023 was 6,826 head.

Biologically, Hissar cattle are classified as ruminants within the Bovidae family, the genus Bos, and the Bos indicus species group. Hissar cattle typically have a white or gray coat, especially in males, with coloration concentrated on the head, ears, and tail tip. Other coat variations include a mix of black and reddish-yellow hues (Dilaga, 2021). Additionally, Dilaga (2021)

describes Hissar cattle as having a relatively large, long, strong, and calm body structure. Their skin is thick and smooth, featuring numerous elastic folds on the neck. The neck is long, relatively large, and tapers toward the head. The rump is large and humped, particularly in males, with the hump located above the shoulders near the neck. These cattle also possess a long dewlap extending from below the chin to the chest. A distinctive characteristic is that female Hissar cattle have longer horns than males.

To increase livestock populations, reproductive efficiency is a critical factor to consider, as the rate of population growth in a region largely depends on it. One way to assess livestock population growth is by calculating natural increase (Sumadi et al., 2004). Natural increase is defined as the percentage of calf births relative to the population within a year minus the percentage of deaths relative to the population within the same year (Sumadi et al., 2004).

Beef cattle productivity in a region can be assessed by the number of cattle available. Estimating output is essential to prevent excessive livestock costs and to ensure the sustainability of the existing population. Based on this, a study is needed to estimate the availability of Hissar cattle in Sumbawa Regency, NTB Province, Indonesia.

II. MATERIAL AND METHODS

Research Materials

The materials used in this study were Hissar cattle from the Moyo Hulu, Moyo Hilir, and Moyo Utara sub-districts in Sumbawa Regency, NTB Province, Indonesia.

Research Method

Survey area

The research method used a survey. The location was determined using purposive sampling, which is a deliberate selection of locations while considering various aspects of the study (Sugiyono, 2012). The primary consideration was the size of the Hissar cattle population, representing dense, medium, and sparse populations. Cattle population data was obtained from the local Animal Husbandry Office. Based on predetermined criteria, three sub-districts were selected: Moyo Hulu, Moyo Hilir, and Moyo Utara. Respondents were selected using simple random sampling. In each sub-district, 65 respondents were selected based on the following criteria: having raised cattle for at least 5 years, having at least 3 females, and having given birth.

Data Collection

The data required for this study was collected using a prepared questionnaire. The questionnaire focused on obtaining data and information related to livestock reproduction, knowledge about Hissar cattle breeding, and the breeding process. Primary data is data obtained directly from respondents, while secondary data is obtained from the institutions related to this research.

The variables studied

The population structure of Hissar cattle, including the number by age and sex. Furthermore, mortality rates, infertility rates, birth rates, and duration of rearing, pre-weaning mortality, and natural reproduction were also analyzed.

Data Analysis

The data obtained were then analyzed descriptively using percentages and average values. Then, an estimate of the availability of breeding Hissar cattle in Sumbawa Regency was calculated using the method of Hardjosubroto (1994). Natural increase and the birth rate were used to calculate the availability of breeding Hissar cattle using the formula: NI = % Calf Births to Sample Population - % Cattle Mortality.

III. RESULTS AND DISCUSSION

Population Structure of Hissar Cattle at the Research Site

The results of observations of the Hissar cattle population structure at the research site can be seen in Table 1. Of the 385 head, 217 (56%) were mature females, 36 (9.35%), and 18 (10.5%) were mature males. Therefore, the ratio of mature males to females is 6.03 females to one bull, an ideal ratio for optimal NI.

The population structure within a region significantly determines the population growth of that region (Samberi *et al*., 2010). Furthermore, population structure is crucial in determining the status of livestock farming practices in a given region based on the existing parent population structure (Martodjo, 2003).

Table 1. Population structure of Hissar cattle

Group (Months)	Number (Heads)	(%)
1. Calf <6 months		
a. Male	21	5.45
b. Female	57	14.81

2. Young 6 – 12		
a. Male	38	6.23
b. Female	58	7.79
3. Mature > 12		
a Male	36	9.35
b. Female	217	56
4. Total	385	100

Source: The results of this study (2025)

With the population structure of mature female and male cattle as shown in Table 1, assuming 70% of mature females give birth annually according to the Indonesian National Standard (2024), then each year there will be 70% x 217 mature females = 151 calves available. The livestock population structure in a region can provide an overview of the comparative distribution of livestock populations by age and sex. Furthermore, it can be used as baseline data for analyzing potential population development and dynamics in a particular region.

The results of this study indicate that the population structure of Hisar cattle at the research site consists of 21 male calves (5.45%), and 57 female calves (14.81%). The number of young cattle obtained was 38 (6.23%) young males and 58 (7.79%) young females. The number of mature males was 21 (9.35%) and mature females was 57 (55%). The size of the livestock population is influenced by various factors, including: the number of slaughters, livestock deaths, livestock exports, and the high or low natural increase.

The higher percentage of female cattle compared to male cattle may be due to some breeders in the study area preferring to sell male cattle due to their higher price compared to female cattle. Another reason is that breeders also believe that male Hissar cattle are difficult to tame due to their more aggressive nature than females. Conversely, leaving female cattle to raise and produce calves suggests a better prospect for developing the Hisar cattle population in the study area. This is evident in the significantly greater availability of mature females compared to mature males, supported by the presence of a substantial population of young females and calves.

Availability of Hissar Cattle

The availability of Hissar cattle is determined by NI, which is calculated based on the annual birth rate minus the annual death rate (Sumadi *et al*., 2001). The NI value provides an overview of the availability of a livestock species in a specific region and time (Sudrana *et al*., 2014). The purpose of calculating the NI value is to determine the fluctuations in the livestock population in a region. The natural increase of Hissar cattle at the study site is presented in Table 2.

Table 2. Natural Increase Hissar cattle

No	Parameter	Heads	%
1	Population number	385	100
2	Mature male	36	9.4
2	Mature female	217	56
	Calving rate		
3	Of population	78	20
4	Calf mortality rate	9	2.3
5	Natural Increses	69	17.7

Source: The results of this study (2025)

The number of Hisar cattle at this research site was relatively high, due to farmers' awareness of retaining mature and young females to replace unproductive females. Meanwhile, many mature and young Hisar cattle were sold to meet the needs of the farmers' families. Damy (2014) also explained that the livestock population structure is usually dominated by females because females are often used as breeding stock, while males are more likely to be sold due to their high selling price.

The results of the calculation of the natural increase of Hissar cattle obtained at the research location were 17.7% (Table 2) and the birth ratio was 26.92% males and 73.08% females. The natural increase was calculated based on the number of calf births divided by the population multiplied by 100% minus the mortality rate. Samberi (2010) stated that, NI values ranging from 0 to 5% are classified as low, NI >5,1% to 8,0% are classified as moderate, and >8,0% are classified as high. Conversely, Afriani *et al*. (2019) stated that the NI value of cattle was 17.64% and Sulistia (2007) that was 18.18% is included in the medium category. Therefore, the NI in this study is included in the moderate category.

Some Hisar cattle breeders in the research location crossbred their Hisar cattle with Bali cattle. If all breeders crossbred their Hisar cattle with their own Hisar cattle, the NI of 17.7% would potentially increase. If the availability and demand for breeding stock can be estimated, the remaining supply is potential for development in other areas. Supply can be calculated by calculating the birth rate, duration of use, mortality rate, and infertility rate, as shown in Table 3. The natural increase in livestock in a region depends on the number of births and deaths. A high natural increase indicates a high increase in the cattle population in that region (Putra *et al*., 2015).

The percentage of NI values for beef cattle breeds obtained by (Afriani *et al*., 2019) were 16.86% for Pesisir cattle, 21.37% for Bali cattle, 18.08% for SimPes cattle, 15.15% for SimPO cattle, and 6.67% for Brahman Cross cattle. Therefore, the NI of Hisar cattle from this study is still within the normal range.

Table 3. Birth ratio, duration of use, mortality rate and pregnancy rate

No	Parameter	Heads	(%)
1.	*Birth ratio*		
	a. Male	21	26.92
	b. Female	57	73.68
2.	*Length of use (years)*		
	a. Male	12	-
	b. Female	3	-
3.	Mortality rate	9	2.34
4.	Infertility rate	17	4.42

Source: The results of this study (2025)

To analyze the availability of Hissar cattle, parameters such as calving rate, duration of use, mortality rate, and infertility rate are required. The study results showed that the birth rate was 26.92% male and 73.08% female. This contrasts with the results reported by Arman *et al*. (2006) which showed that the birth rate was 49.74% male and 50.26% female.

For comparison, the birth rate for Bali cattle, as reported by Rijoly (2012) and Badjak (2017), was 94.43% and 84.35%, respectively. However, the results obtained at this research were very good, as they were above the minimum Indonesian National standard range for reproductive potential of the bull for pregnancy rates of 60–70%. This is supported by Badjak's (2017) opinion that a good pregnancy rate for beef cattle farming in Indonesia is between 60–70%.

Table 4. Proportion of male and female Hissar cattle based on length of use

Sex	% of cattle by age group									%
(%)	3	4	5	6	7	8	9	10	11	
Female	19.54	21.01	19.61	9.24	4.89	4.67	4.67	4.24	3.94	87,33
Male	6.20	3.43	3.07							12,67

Source: The results of this study (2025)

The results of this study indicate that the duration of use of female cattle in breeding is 11 years, while males are 5 years. The results of the study obtained are longer than Samberi *et al*. (2010) which is 5.27 years. The mortality rate is the number of cattle that die each year expressed as a percentage. The mortality rate obtained in this study is 2.3%, while the infertility rate obtained is 4.24%. The population structure of Hisar cattle obtained in this study is different from the results of the study of Tanari *et al*. (2011) in North Pamona District, Poso Regency, Indonesia, which obtained the percentage of mature cattle (70%), young cattle (15%) and calves (15%). These results show a difference with the study of Putra *et al*. (2015) in Pesisir Selatan Regency, West Sumatra Province, Indonesia, which is 48.77% mature cattle, 24.56% young cattle and 26.67% calves.

The analysis results obtained the need for replacement cattle for females is 6.54% while for males 3.20%. The availability of livestock is calculated by multiplying the NI (17.7%) by the ratio of male births (26.92%) or females (73.08%), resulting in a figure of 4.76% males and 12.94% females. Based on calculations according to age information when the cow is 3 years old, the need for females is 6.54% and males is 3.20%, resulting in an excess availability of male livestock seeds (1.56%) and females (6.40%).

IV. CONCLUSION

The Natural Increase value for Hisar cattle in Sumbawa Regency, West Nusa Tenggara Province, is 17.7%. The need for replacement cattle for females is 6.54%, while for bulls it is 3.20%. The availability of replacement cattle is 4.76% for males and

12.94% for females. Based on age-specific calculations, at 3 years of age, the need for females is 6.54% and for males is 3.20%, resulting in an excess supply of females (6.40%) and males (1.56%).

There were no significant differences in physiological responses based on the number of fetuses in the womb, as indicated by changes in respiratory rate, pulse rate, and rectal temperature during the last trimester of pregnancy. However, mothers carrying twins tended to exhibit higher values for all measured parameters compared to those carrying singletons.

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VI. DISCLOSURE

The author reports no conflicts of interest in this work.

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