The estimation of stock availability and population dynamics on ongole grade and limousin-ongole grade cattle in Tuban Regency, East Java Province

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Abstract. Tuban Regency is well known for the center of beef cattle in the East Java Province. The objective of this study was to estimate natural increase value, population dynamics, and potential output production of beef cattle. The study was conducted from April to July 2019. The materials used in this study were 446 farmers as respondents having beef cattle. The research method used was survey in which the location was determined by using purposive sampling. Respondent samples were taken from three sub-districts that were chosen one village per sub-district which have low, medium, and high population of beef cattle. Data were collected by interviewing livestock farmers as respondents. The result was analyzed descriptively. The results showed that the natural increase (NI) value of Ongole Grade and Limousin-Ongole Grade cattle were 45,48% and 19,82% respectively, net replacement rate (NRR) of female Ongole Grade and Limousin-Ongole Grade cattle were 94,00% and 642,57% respectively. Ongole Grade cattle output was low category 10,90%, and Limousin-Ongole Grade cattle output was high category 44,55%. Estimation of population dynamics on beef cattle in Tuban Regency from 2018 to 2022 will increase 6,118 head or 1.77% per year. In conclusion Tuban Regency was appropriate to be source of Limousin-Ongole Grade cattle stock.

1. Introduction

Beef cattle plays an important role in Indonesia as a source of animal protein. The meat demand increases in every year, but the cattle population tends to decline. The local cattle development program is needed to support meat self-sufficiency in Indonesia. The first step that must be done to support the program is the development of livestock breeds. Indonesia has potensial local and crossed cattle breeds, some of which are Ongole Grade and Limousin-Ongole Grade cattle. They are spread in several regions in Indonesia, one of which is Tuban Regency, East Java Province.

Tuban Regency is one of the sources of beef cattle in East Java Province. Information about the growth of cattle populations in the area needs to be studied. The uncontrolled number of slaughtered cattle and released cattle causes the population to decline. Several studies on stock availability and population dynamics have been carried out such as in Kebumen Ongole grade cattle [1-2],Pesisir cattle [3] and Bali cattle in the Yapen Islands [4]. Therefore this kind of research needs to be done on Ongole

Grade and Limousin-Ongole Grade cattle in Tuban Regency. The objective of this study is to estimate the stock availability and population dynamics on Ongole Grade and Limousin-Ongole Grade cattle in Tuban Regency, East Java Province as a source of livestock breeding resources. The estimation of stock availability and population dynamics is needed to maintain population balance.

2. Material and Methods

2.1 Material

The study was conducted for four months in three selected sub-districts in Tuban Regency from April to July 2019. Four hundred and fourty six respondents and a set of questionnaires were used to collect data.

2.2 Methods

We use a purposive sampling method to determine the location of the study. The research location was chosen from 3 sub-districts based on high, medium and low population. The three sub-districts are Kerek (28,097 head), Palang (15,501 head), Tuban (5,085 head). Data collection is done by surveys through direct interviews with respondents using questionnaires to collect primary data. To obtain secondary data, interviews were also conducted with related institutions such as the Tuban District Fisheries and Livestock Service.

2.3 Data analysis

2.3.1 Natural increase The measurement of natural increase = percentage of birth rate per year - percentage of death rate per year [5].

2.3.2 Net replacement rate Net replacement rate (NRR) is obtained from the number of replacement young cattle candidate divided by the needs of replacement cattle per year multiplied by 100% [5].

2.3.3 Population dynamics The estimation of population dynamics calculate by time series analysis with the following formula:

$Y = aX + b$

where Y: time series data; X: time (year); a: regression coefficient; b: intercept.

2.3.4 Cattle output rate Output is measured based on the number of culled cattle each year and the number of remain replacement with the following formula:

Output = Culled cattle + Remains of Replacement - Population Increasing Target [5].

3. Result and Discussion

3.1 Farmer's characteristics

The indications used to determine the ability to manage the livestock are respondent's identity, including age, livelihood, education level and length of maintenance experience [6]. The average age of respondents was 49.30 ± 2.45 years with experience of breeding for 23.50 ± 1.68 years. Most of the respondents' education level was elementary school (61.58%). The average profession of respondents was as a traditional farmer (89.23 ± 11.89%). The purpose of raising livestock was as a side job (96.22 ± 3.93%).

3.2 Natural increase (NI)

The NI value is obtained by reducing the birth rate with the death rate in a certain time, usually measured within one year [5]. The NI of this study is shown in Table 1.

Tabel 1. Natural increase of Ongole Grade and Limousin-Ongole Grade cattle in Tuban Regency, East Java Province 2019

Variable	Ongole Grade	Limousin-Ongole Grade
Cows percentage to population (%)	70,21	31,64
Birth rate to cows (%)	65,15	64,37
Birth rate to population (%)	45,74	20,36
Death rate to population(%)	0,27	0,55
Natural increase (NI) (%)	45,48	19,82

The NI value of Ongole Grade and Limousin-Ongole Grade cattle was 45,48%, and 19,82% respectively. The results of this study was medium category. NI of Ongole Grade cattle was higher than NI Ongole Grade in Kebumen at 40,78% and 44,68% [1-2], Pesisir cattle at 29,46% [3] and Pesisir cattle in Banyuasin Regency at 24,39% [7]. NI of Limousin-Ongole Grade was higher than Bali cattle in the Yapen Islands Papua Province at 18.18% [4]. NI of Limousin-Ongole Grade in this research was over the percentage of cows percentage to population. It was happened by artificial insemination where Ongole Grade female was mated to frozen Limousin semen.

3.3 Net replacement rate (NRR)

The NRR is obtained from the comparison of the number of young cattle candidate with replacement needs per year multiplied by 100% [5]. The NRR Ongole Grade and Limousin-Ongole Grade cattle in Tuban Regency, East Java Province in 2019 are shown in Table 2.

Tabel 2. Net Replacement Rate value of Ongole Grade and Limousin-Ongole Grade female in Tuban Regency in 2019

Variable	Ongole Grade	Limousin-Ongole Grade
Female		
Replacement stock necessary (%)	6,79	3,48
Availability of stock (%)	6,38	22,36
NRR (%)	94,00	642,57

The NRR on Ongole Grade female was <100%. It means that the needs of replacement stock were insufficient. NRR Limousin-Ongole Grade female was high because the natural increase was high and the result of cross breed artificial insemination. It means that Tuban Regency appropriate to source of Limousin-Ongole Grade cattle.

3.4 Cattle output rate

The output of beef cattle in an area is the number of livestock that can be released that can be sent out or slaughter from a certain area and time without disturbing the balance of the livestock population [8]. The results of the Ongole Grade and Limousin-Ongole Grade cattle in Tuban Regency, East Java Province in 2019 were presented in Table 3.

Tabel 3. Output of Ongole Grade and Limousin-Ongole Grade in Tuban Regency, East Java Province, in 2019

Variabel	Culled cattle (%)			Availability stock (%)			The rest of replacement (%)			Output (%)
	Male	Female	Total	Male	Female	Total	Male	Female	Total	
Ongole Grade	2,23	6,79	9,02	4,52	6,38	10,90	2,29	-0,41	1,89	10,90
Limousin-Ongole Grade	9,75	5,08	14,83	30,46	11,17	41,62	20,71	6,09	28,80	41,62

The output value of Ongole Grade cattle in this study was lower than some previous research where the output of Ongole Grade cattle in Kebumen Regency were 39,73% and 44,11% [1-2]. On the other hand, the output of Limousin-Ongole Grade was higher than the output of Pesisir cattle in Pesisir Selatan Regency was 28,35% [3] and Pesisir cattle in Banyuasin Regency was 24,30% [7]. It was a high rate because of high birth rate, low death rate, low the needs of replacement per year, and the result of cross breed artificial insemination.

3.5 Population dynamics

Population dynamics estimation of beef cattle in Tuban Regency, East Java Province, in the period of 2018 to 2022, is shown in Table 4 below. The result showed that beef cattle population estimation in Tuban Regency, East Java Province increase 1,77% per year on average from 2018 to 2022. Population dynamics describe the reproductive performance of beef cattle. The better reproductive performance of beef cattle will further accelerate the increase in livestock population. It can be conducted with selection on young cattle and improvement of reproductive disorders.

Tabel 4. The estimation of Population dynamics of beef cattle in Tuban Regency, East Java Province 2018-2022

Year	Population (head)	Growth (%)
2018	340.772	1,98
2019	346.762	1,76
2020	352.752	1,73
2021	358.743	1,70
2022	364.733	1,67
Avarage	322.801	1,77

4. Conclusion

Tuban Regency, East Java Province, is appropriate to be used as a source of Limousin-Ongole Grade cattle because the NI, NRR, and Output are high and the population dynamics of beef cattle will increase from 2018 to 2022.

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