THE POPULATION STRUCTURE ANALYSIS IN SUMBAWA BUFFALOES (*Bubalus bubalis*) OF INDONESIA

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Received: 11 December 2019
Accepted: 20 September 2022

ABSTRACT

Buffalo is the important livestock in Indonesia as meat-milk productions and drought animals. This research was carried out to estimate the output of Sumbawa buffalo (*Bubalus bubalis*) in West Nusa Tenggara (WNT) province of Indonesia. The records data of animals population was collected from Department of Livestock and Animal Health (DLAH) of WNT Province year 2019. This study showed that calf crop, calving rate and natural increase (NI) of animals were 58.15%, 22.76% and 20.18% respectively. Hence, the NI value in Sumbawa buffaloes included of moderate category (15%<NI<30%). In addition, the total animals output at year 2018 was 24.70% (29,671 heads). The net replacement rate (NRR) in total animals was 414.42% and indicated that this population had surplus number of young animal for requirements animal replacement. Unfortunately, the average of growth rate in Sumbawa buffalo was -2.30% per year. Buffalo population in WNT province capable to produce 5,045 heads (male) and 10,703 heads (female) for seedstok. The findings in this study can be used by government and stakeholders as the basic information for monitoring Sumbawa buffaloes in the future.

Keywords: *Bubalus bubalis*, buffaloes, Sumbawa buffaloes, natural increase, net return rate, output estimation

INTRODUCTION

Buffalo is the important livestock in Indonesia for meat-milk productions, drought and cultural support (Dudi *et al*., 2012). Sumbawa buffalo was decided as one of Indonesian native buffalo through the decision of Ministry of Agriculture No: 2910/Kpts/OT.140/6/2011. The Sumbawa buffalo included of swamp buffalo (*Bubalus bubalis*) and adapted well in West Nusa Tenggara (WNT) province. Muthalib (2006) reported that the body weight of buffalo in WNT province (4 years age) was 350 to 500 kg. Total of buffalo in Indonesia at year 2017 was 1,395,191 heads and about 8.61% (120,072 heads) were kept in WNT province (DGLAH, 2017).

Unfortunately, the average growth rate of Sumbawa buffalo was decreased. The number of slaughtered animal is one factor that reducing the number of livestock. Moreover, low of animals number in a population increases the inbreeding risk and reducing of productivity traits of livestock

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risk and reducing of productivity traits of livestock (Praharani and Sianturi, 2018). Hence, the population structure analysis in Sumbawa buffalo is important to evaluate population potency. Unfortunately, there are few study in buffalo population of Indonesia. Previous studies were used the population structure analysis in buffalo at Southwest Maluku regency (Rudy e*t al*., 2014), Central Java province (Sumadi e*t al*., 2017), Poso regency (Marsudi *et al*., 2017), Padang Pariaman regency (Putra *et al*., 2017), Malang district (Budiarto and Ciptadi, 2018) and Timor Tengah Utara regency (Ikun, 2018).

This research was aimed to analyse the Sumbawa buffalo population based on the records data from Department of Livestock and Animal Health (DLAH) of WNT province. The results of this study is important as the basic information to prepare the breeding program for Sumbawa buffalo in the future.

MATERIALS AND METHODS

The population structure data was collected from Department of Livestock and Animal Health (DLAH) of West Nusa Tenggara Province year 2019 as presented in Table 1. Hence, the population structure data consisted of number of calf (0 to 1 years age), young (1 to 3 years age) and adult (>3 years age) animals. The population structure data was analyzed to obtain calf crop, calving rate based on population, natural increase, requirement of animal replacement, remains of young animal, number of culled animal, net return rate and output estimation values according to Samberi *et al.* (2010) as follows:

$$\text{Calf crop (\%)} = \frac{\text{Number of calf (heads)}}{\text{Number of adult female animal (heads)}} \times 100\%$$

$$\text{Calving rate (\%)} = \frac{\text{Number of calf (heads)}}{\text{Number of population (heads)}} \times 100\%$$

$$\text{Natural increase (\%)} = \text{Calving rate based on population (\%)} - \text{Mortality (\%)}$$

$$\text{Requirement of animal replacement (\%)} = \frac{\text{Number of adult animal (\%)}}{\text{Breeding length (years)}}$$

$$\text{Remains of young animal (\%)} = \text{Number of young animal (\%)} - \text{Requirement of animal replacement (\%)}$$

$$\text{Number of celled animal (\%)} = \text{Requirement of animal replacement (\%)}$$

$$\text{Net return rate (\%)} = \frac{\text{Number of young animal (heads)}}{\text{Remains of young animal (heads)}} \times 100\%$$

$$\text{Output estimation (\%)} = \text{Remains of young animal (\%)} + \text{Number of celled animal (\%)}$$

Moreover, the population dynamic of Sumbawa buffalo was predicted using arithmetic equation according to Supranto (1993) as follows:

$$P_n = P_o [1 + (r.n)]$$

Where P_n is the number of animal after n^{th} year, P_o is the number of animal in early year, r is the average growth rate and n is the duration time (years).

RESULTS AND DISCUSSIONS

The natural increase (NI) of Sumbawa buffalo in this study was 20.18% as presented in Table 2. According to Samberi *et al.* (2010), the NI value consisted of three category of low (NI<15.00%), moderate (15.01<NI<30.00%) and high (NI>30.00%). Previous study reported that

Table 1. The population structure of Sumbawa buffaloes at year 2018*.

Sex	Group			Total (heads)
	Calf	Young	Adult	
Male	12,817	13,094	16,097	42,008
Female	14,523	16,577	47,017	78,117
Total (heads)	27,340	29,617	63,114	120,125

*Department of Livestock and Animal Health (DLAH) of West Nusa Tenggara Province (2019).

Table 2. The technical coefficient in population structure analysis of Sumbawa buffaloes.

Component	Value
Calf crop (%)	58.15
Calving rate (%)	22.76
Mortality* (%)	2.58
Natural increase (%)	20.18
Percentage of adult animal (%)	
Male	13.40
Female	39.14
Breeding length (years)**	
Male	2
Female	8
Sex ratio (male/female)	1/2
Number of population observed (heads)	120,125

*Directorate General of Livestock and Animal Health (DGLAH) of Indonesia year 2017; **Muthalib (2006).

Table 3. The results of population structure analysis of Sumbawa buffaloes at year 2018.

Component	Heads	Percent (%)
Number of young animal		
Male	13,094	10.90
Female	16,577	13.80
Total	29,671	24.70
Requirement of animal replacement		
Male	8,048	6.70
Female	5,874	4.89
Total	13,922	11.59
Remains of young animal		
Male	5,045	4.20
Female	10,703	8.91
Total	15,748	13.11
Number of culled animal		
Male	8,048	6.70
Female	5,874	4.89
Total	13,922	11.59
Output estimation		
Male	13,094	10.90
Female	16,577	13.80
Total	29,671	24.70
Net replacement rate		
Male	-	259.54
Female	-	154.88
Total	-	414.42

Table 4. The population dynamics of Sumbawa buffaloes.

Actual*				Predicted			
Year	**Heads**	**Deviation**	**Percent (%)**	**Year**	**Heads**	**Deviation**	**Percent (%)**
2008	161,450	0	0.00	2019	117,723	-2,402	-2.04
2009	155,307	6,143	3.96	2020	115,320	-2,403	-2.08
2010	155,904	597	0.38	2021	112,918	-2,40	-2.13
2011	141,150	-14,754	-10.45	2022	110,515	-2,403	-2.17
2012	144,261	3,111	2.16	2023	108,113	-2,402	-2.22
2013	138,393	-5,868	-4.24	2024	105,710	-2,403	-2.27
2014	129,141	-9,252	-7.16	2025	103,308	-2,402	-2.33
2015	124,808	-4,333	-3.47	2026	100,905	-2,403	-2.38
2016	125,122	314	0.25	2027	98,503	-2,402	-2.44
2017	120,072	-5,050	-4.21	2028	96,100	-2,403	-2.50
2018	120,125	53	0.04	2029	93,698	-2,402	-2.56
Average		-2,640	-2.27	Average		-2,403	-2.28

*Department of Livestock and Animal Health (DLAH) of West Nusa Tenggara Province year 2019.

Table 5. The output estimation of Sumbawa buffaloes in the next five years with similar technical coefficients.

Parameters	Years				
	2019	2020	2021	2022	2023
Number of animal (heads)					
Male	29,431	28,830	28,230	27,629	27,028
Female	88,292	86,490	84,689	82,886	81,085
Total	117,723	115,320	112,918	110,515	108,113
Number of young animal (heads)					
Male (10.90 %)	12,832	12,570	12,308	12,046	11,784
Female (13.80%)	16,246	15,914	15,583	15,251	14,920
Total (24.70%)	29,078	28,484	27,891	27,297	26,704
Number of culled animal (heads)					
Male (6.70%)	7,887	7,726	7,566	7,405	7,244
Female (4.89%)	5,886	5,766	5,646	5,526	5,406
Total (11.59%)	13,774	13,492	13,211	12,930	12,649
Remains of young animal (heads)					
Male	4,944	4,843	4,743	4,642	4,541
Female	10,360	10,148	9,937	9,725	9,514
Total	15,304	14,992	14,679	14,367	14,055
Output estimation (heads)					
Male	12,832	12,570	12,308	12,046	11,784
Female	16,246	15,914	15,583	15,251	14,920
Total	29,078	28,484	27,891	27,297	26,704

high (NI>30.00%). Previous study reported that the NI value of buffaloe in many regencies of Indonesia were ranged from moderate to high such as Southwest Maluku (20.84%), Poso (33.25%), Padang Pariaman (23.66%), Jewa Tengah (20.69%) and 19.2% in Timor Tengah Utara (Rudy *et al*., 2014; Marsudi *et al*., 2017; Putra *et al*., 2017; Sumadi, 2017; Ikun, 2018). The NI value depends on the calf crop and mortality values. Increasing calf crop and decreasing mortality values will cause the increasing of NI value. Meanwhile, the average of calf crop in buffaloes at WNT province was 58.15% and lower than in Southwest Maluku (81.14%), Poso (36.84%) and Padang Pariaman (35.68%) regencies (Rudy *etal*., 2014; Marsudi *et al*., 2017; Putra *et al*., 2017).

The net replacement rate (NRR) value in Sumbawa buffaloe was 414.42% and included of 259.54% in male and 154.88% in female animals as presented in Table 3. The NRR value of more than 100% indicated that the animals population had surplus of young animals. Previous studies reported that the NRR value of buffaloes in Padang Pariaman (348.58%) and Central Java (253.75%) were lower than in this study (Putra *et al*., 2017; Sumadi *et al*., 2017). Otherwise, the NRR value of buffaloes in Southwest Maluku was 400% and close to this study. According to the Table 3, the maximum young buffalo (seedstock) that capable to produce by from WNT province was 15,748 heads (5,045 males and 10,703 females).

Despite, the growth rate in Sumbawa buffalo was -2.30% per year as presented in Table 4. So, the breeding program for Sumbawa buffalo is very important to increase animals population. According to the arithmetic model with similar technical coefficients, the number of Sumbawa buffaloes in year 2027 was showed less that 100,000 heads. Meanwhile, the remains of young animals was reduced about 312 heads every year (Table 5). It was concluded that the Sumbawa buffalo population in Indonesia under negative trend and must be increased with breeding program in the future. Controling the number of slaughtered animal, increasing the number of calf crop and reducing the mortality rate were important to increase animals population and must be supported by the government and stakeholders.

CONCLUSION

The NI value of Sumbawa buffaloes was 20.18% and inclded of moderate category. The maximum buffalo that allowed to export from WNT province was 15,748 heads. The number of Sumbawa buffalo with similar technical coefficients was less than 100,000 heads in year 2027. Hence, the Sumbawa buffalo population is important to increase through breeding program in the future.

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