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ESTIMATION OF REQUIREMENT AND SUPPLY RATE OF SWAMP BUFFALO (BUBALUS BUBALIS)BREEDING STOCK IN BANYUWANGI DISTRICT, EAST JAVA

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ABSTRACT:

This study was conducted to estimate the number of requirements and supply rate of breeding stock of swamp buffalo in Banyuwangi District, East Java. Based on a survey conducted in three districts, a sample of swamp buffaloes was divided into high, medium, and small populations. A total of 122 farmers as respondents and 384 heads of swamp buffalo were included. The sample livestock population was used as a significant population and calculated using a population composition approach based on age groups. Descriptive analysis was used to analyze the data and information. Results demonstrated that the estimated breeding stock proportions required for replacement were 4.94% for males and 9.89% females, the breeding stock of males was 6.03%, and for females was 6.51%. Therefore, it can be concluded that the estimated proportions of supply for a prospective breeding stock were +2.09% for males but −3.38% for females.

INTRODUCTION:

East Java province is one region in Indonesia with the highest buffalo population. Central Bureau of Statistics(BPS) estimated the population was 27,304 in 2016 (BPS, 2017). Banyuwangi District in 2011 was reported as one of important areas populated with these livestock animals, with a total of 4619 buffaloes. However, Central Bureau of Statistics (BPS) showed this area has a slightly high population decline to 4035 buffaloes in 2014 (BPS, 2014).

The causing factors of buffalo population decline in Banyuwangi District were the management of livestock raising, which is primarily carried out using an extensive maintenance system. The traditional maintenance system in Banyuwangi District tends to rely on feed available in grazing fields. It could affect the monitoring of buffaloproductivity. Lack of replacement breeds in an area effects on population effectiveness and of matingprocess. The causes of the population populations are births, deaths, and mutations of livestock. A high birth rate has a significant impact on young animalcomposition.

Understanding the dynamics of a buffalo population is a step to prevent population decline. The following points are benchmarks to increase the buffalo population by requiring good management, namely: 1) the main output is based on value of natural population, 2) replacement stocks, and 3) the potential birth rate as supply capacity of offspring.

MATERIALS AND METHOD:

Variables and data analysis: The variables observed in this study were animal mutation, population structure, reproductive efficiency, service per conception (S/C), conception rate (CR), natural increase (NI), and output of buffalo cattle in Banyuwangi District.The obtained data were then converted into percentages and average, standard deviation, and coefficient values of diversity, which were later analyzed descriptively. A descriptive analysis aims to systematically and factually describe the facts and relationship among the variables by collecting, processing, and analyzing data without making comparisons and relationships between variables. The natural increase (NI) was calculated by following calculation (Hardjosubroto, 1994):

NI (%) = Percentage of births (%) − Percentage of deaths (%),
Output = remaining replacement + male and female cattle that are rejected

RESULTS AND DISCUSSION:

Based on survey results at the research site, it was found that the structure of buffalo population consisted of young cattle (males and females) and adult animals (males and females). Table 1 shows the results.

TABLE 1. Population structure of swamp buffalo in Banyuwangi District

Component	Young (PI_0, PI_1)		Adult (PI_2, PI_3, PI_4, PI_5)		Total	
	Head	%	Head	%	Head	%
Male	45	11.72	65	16.92	110	28.65
Female	89	23.17	185	48.17	274	71.35
Total	134	34.90	250	65.10	384	100

Table 1 show that the adult female buffalo population was 48.17% and young female buffalo population was 23.17%. The values for adult males and young males were 16.92% and 11.72%, respectively. The adult proportion of females and males was 1:3, this means that one male can serve copulate with 3 females. Sex ratio of 1: (8–10) is one male buffalo with good genetic quality when used for mating with 8–10 buffaloes can improve the buffalo productivity performance. The ratio of males and females must be appropriate to achieve a good and efficient mating success rate. One method to analyze the population structure is by livestock age grouping. Table 2 shows the composition of livestock in according to the age group.

TABLE 2. Population structure based on age group (%)

No	Age		PI_0	PI_1	PI_2	PI_3	PI_4	PI_5	Total
1	Male	Head	30	15	19	21	19	6	110
		(%)	7.81	3.90	4.94	6.03	4.94	1.56	28.6
2	Female	Head	42	47	38	25	70	52	274
		(%)	10.93	12.23	9.89	6.51	18.23	13.54	71.4

Note: PI = Incisive Permanent

Table 2 shows the composition of male buffaloes was the highest (7.81%) in PI_0 (aged 1–2 years), whereas it was the lowest (1.56%) in PI_5 (aged >5 years). Regarding to females, the highest composition (18.23%) was observed in PI_4 (aged >5 years), whereas the lowest (6.51%) was observed in PI_3 (aged 4–5 years). Young animals that are used as substitutes for unproductive adult females must be given special treatment to optimize birth rates. It is important to estimate the composition of adult females categorized according to the age group so that the number of adult females that are productive or unproductive can be determined easily. Productive females must be maintained to produce offspring and maintain population in an area to increase the NI value. Budiarto et al. (2013) reported that for determining the NI value, it is important to collect some data on availability of adult females and birth and death rates in a population. The NI value would be more meaningful when a high birth rate is balanced by a low mortality rate, and when the calculation is done every year. A high NI value in a particular area indicates that there are several productive adult females and that their handling and management are good. The NI valueobtained during the first year of observation can be used as an evaluation material for determining the success of parent management in subsequent years. Wahyu (2016) stated that NI must be considered for the replacement of livestock reserves and remaining animals can be removed without disturbing the livestock population in that region. An increase in NI value in a livestock population in an area could be caused by an increase in population of offspring (not because of mutations), regardless of parent mating system. The results of performance of buffalo reproduction are shown in Table 3.

TABLE 3. Reproduction performance of swamp buffalo in Banyuwangi District

Description	Age			Average
	3–4 years	4–5 years	>5 years	
First mating (months)	29.89 ± 0.70	30.00 ± 0.53	30.00 ± 1.11	29.96 ± 0.06
Weaning (months)	8.22 ± 3.86	7.73 ± 3.18	8.78 ± 3.59	8.24 ± 0.53
Pregnant (months)	10.49 ± 0.38	10.61 ± 0.34	10.62 ± 0.35	10.57 ± 0.07
APP (months)	4.37 ± 2.11	4.82 ± 1.85	5.14 ± 2.21	4.78 ± 0.39

S/C (times)	1.32 ± 0.47	1.36 ± 0.49	1.22 ± 0.44	1.3 ± 0.07
CR (%)	67.57	63.64	79.57	70.26 ± 8.30
DO (months)	5.43 ± 2.02	5.91 ± 1.69	6.11 ± 2.13	5.82 ± 0.35
Efficiency Reproduction (%)	91.45 ± 3.19	54.28 ± 1.26	23.72 ± 7.85	56.48 ± 33.92

Note: The average age for first birth is 41.82 ± 0.22 months
The average interval is 16.39 ± 0.42 months

The success of buffalo breeding business can be determined from the reproductive characteristics. The reproductive performance of a livestock can be measured by parameters of service per conception, days open or long-time empty, breeding distance, and CR. In addition, the first age of mating, the first age of calf, and weaning age affect the reproductive performance of female buffaloes. The reproductive efficiency of female buffaloes is good whena female buffalo can produce a calf within a year. The reproductive performance at each age of a livestock can vary due to several factors, including genetics, sex, feed, climate, and weather. Reproductive efficiency can be increased by improving the overall maintenance management, including recording the number of mating, appropriately detecting the desire to mate, improving the quality and quantity of provided feed, and providing good sanitation and maintaining the health of livestock. One measure to indicate an increased reproductive efficiency of a female parent is an increase in birth rate of young ones. It is strongly influenced by the fertility rates of both the female and male parents during mating. Mating is considered to be efficient when a male mating with a femaleonly once to produce one pregnancy, which is also commonly known as service per conception. The higher the S/C value shows more inefficient the mating.

The average duration of female buffalo anestrus postpartum (APP) at the study site was 4.78±0.39 and DO 5.82±0.35 months. These results indicate that the mean DO and APP are consistent with the average reproductive performance of female buffaloes at the study site. The average buffalo first mated at the age of 29.96±0.06 months. This could be due to the conditions of livestockraising. It was difficult to observe the signs of mating desire and buffaloes with mild mating desire.

The average age at first birth was 41.82±0.22 months. The first age of female breeders is very closely related to the age of first mating and length of pregnancy of female parent. In case the female parent is not immediately mated when it is in estrus, it can affect the breeding cycle in next period. It is even possible that the female parent has difficulty in giving birth. Low suitable attention to the mating season can reduce the success rate of livestock births. This is because the breeding season is very closely related to the breeding capacity. Therefore, it should improve the mating management and reduce the failures that decrease the reproductive performance of buffaloes.

An estrus Postpartum (APP)

The study results showed that the average of buffalo APP is 4.78 ± 0.39 months. This duration is relatively high compared to Desinawati and Isnaini (2010) that the duration of APP in livestock generally lasts for 2 months because the female cattle experience uterine involution after birth, which takes approximately 45 days.

The longer the anestrus period will decrease the fertility and reproductive efficiency of these animals. Several factors can affect anestrus, such as age, pregnancy, lactation period, feed, season, environment, and chronic diseases. Ciptadi et al (2012) stated that the failure of mating

desire or anestrus in buffaloes is a major symptom among several other factors to affect the estrus cycle, like low-quality feed conditions, especially those that occur in grazing or extensive maintenance systems that lack feed

Days Open (DO)

The average duration of free period (days open) was 5.82 ± 0.35 months. This value study site was very high compared to that reported by Izquierdo et al. (2005) who mentioned an ideal duration of 90–120 days. The empty period is the time interval between the time when a female parent breeds and time when it mates again leading to pregnancy. A longer empty period affects the reproductive efficiency of female parent. Yulyanto et al (2014)described that days open (DO) was the time interval from birth until mating again and occurrence of pregnancy. The empty period can affect the success of breeding and breeding interval. Moreover, the duration of childbearing time interval is influenced by the length of pregnancy.

Birth Interval:

The average duration of spawning time interval in female buffalo was 16.39 ± 0.42 months. The calving time interval is affected by the time of reappearance of female's mating desire after birth and prolonged pregnancy. The longer the appearance of mating desire the longer the time interval of female mother breeds. Izquierdo et al. (2005) reported that the duration of calving time interval varies significantly in swamp buffalo based on all reproductive characteristics. Livestock raising can be considered as successful in terms of reproduction when it is reflected by the ability to produce offspring within a certain period.

Service per Conception (S/C)

Study result shows the average S/C was 1.3 ± 0.07. The reproductive performance of female buffalo parent demonstrated good results. Affandhy et al. (2003) reported that a normal S/C value range from 1.6 to 2.0. The lower the S/C values of a parent, the higher the fertility level, and vice versa. Several factors affect the level of S/C in ruminants, such as the mating systems, maintenance management, and reproductive disorders in livestock. Natural mating systems generally produce high S/C values. This is because the natural mating process of livestock does not require a repeat mating process. A high or low S/C value is one efficiency determinants of female parent reproduction. Farmers can consider the S/C value while selecting a livestock. Sulaksono, Suharyati, and Santosa (2012) stated that lower the S/C value showed the more efficient of mating system.

Mutation:

Mutation parameters are a percentage or proportion of a mutation component of livestock to the initial stock. Livestock population estimation indicates a large number of animals in an area. The mutation parameter (component) indicates the number of mutations in livestock population in a region at the beginning of year (BPS, 2017). Data on buffalo cattle mutations in Banyuwangi are presented in Table 4.

TABLE 4. Mutation (%)

Description	Male young		Male old		Female young		Female old		Total	
	head	%	head	%	head	%	head	%	head	%
Mutation	2	2.94	1	1.47	5	7.35	1	1.47	9	13.24

incoming										
Mutation	11	16.17	24	35.29	11	16.17	13	19.11	59	86.76
outcome										
Total	13	19.11	25	36.76	16	23.52	14	20.58	68	100

The mutation incoming rates are 2.94% for young males, 1.47% for adult males, 7.35% for young females, and 1.47% for adult females, and outgoing rates are 16.17% for young males, 35.29% for adult males, 16.17% for young females, and 19.11% for adult females. The total proportion of incoming livestock was 13.24%, and theoutgoing livestock was 86.76%. Table 4 shows that high percentage of outgoing cattle indicates that Banyuwangi District is a major buffalo producer. Putra et al. (2017) stated that higher percentage of outgoing livestock incoming cattle implies that the region is a better swamp buffalo producer. The NI in swamp buffalo is shown in Table 5

TABLE 5. Component natural increasecalculation

Description	Total (head)	%
Female productive	185	48.17
- births	73	19.01
- mortality	8	3.04
Natural Increase	65	16.93

The NI value of swamp buffalo in Banyuwangi District is 16.93%. It can be concluded that the high number is caused by the adult female domination at the study site. The NI value increases when productive females are maintained with good management, which can increase the birth rate and reduce the mortality rate in buffalo. The proportion of adult female buffaloes at the study site was 48.17%, which was obtained by comparing the number of adult females and total population sample. The NI value was categorized as moderate because it was in range of 15.01%–30.00%. This is in accordance with Putra et al. (2017) who reported NI values ranging 0.00%–45.90%, with a range of 0.00%–15.00% indicating a low class, 15.01%–30.00% indicating a moderate class, and 30.01%–45.90% indicating a high class. Hardjosubroto (1994) mentioned that the output is influenced by NI because the output is calculated based on difference between NI and need for livestock substitutes for one year. The output is the potential of region in removing the leftover livestock substitutes and rejected animals. Table 6 shows the detail composition of buffalo output.

TABLE 6. The output of animals (buffalo) in Banyuwangi District

No	Description	%
1	Natural increase	
	a. Male	7.11
	b. Female	9.81
2	Replacement	
	a. Male	4.94
	b. Female	9.89
3	Output	
	a. Young (male and female)	28.17

b. Old (male and female)	15.10
Total output	43.27

The NI values are 7.11% for males and 9.81% for females, whereas the need for livestock replacement for males is 4.94%, and proportion of female surrogates is 9.89%. The composition of buffalo cattle output (28.17%) in Banyuwangi District consisted of remaining young male and female livestock and oldest livestock comprising males and females. Thus, the total buffalo output in Banyuwangi District was 43.27%. Putra et al. (2017) reported that the output can consist of rejected (old) male and female cattle, and remaining young ones are used as substitutes for both males and females.

CONCLUSION:

Based on research results, the estimated proportion of bids for prospective male parents was + 2.09%, while for females −3.38%. This means that the number of productive females is low and their reproductive efficiency is also low. Therefore, the stock of buffalo in Banyuwangi District area is still insufficient.

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