



# Reproduction Performance Of Female Swamp Buffalo Reared By Smallholder Farmers In Napu And Lindu Plains, Central Sulawesi, Indonesia

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## Abstract

This study was aimed to explore the reproduction performance of female swamp buffalo (*Bubalus bubalis*) in Napu plain, Poso district and Lindu plain Sigi district, Central Sulawesi Indonesia. This study was carried out in two districts as the most density buffalo population in Central Sulawesi. The method employed in this study was survey to collect primary and secondary data. A direct interview techniques to the owner of buffaloes was done to collect primary data. While the secondary data were collected from relevant institutions (Poso and Sigi districts). Total of 98 swamp buffaloes cows and 30 buffalo owner in Napu plain and 92 swamp buffaloes cows and 26 buffalo owners the in Lindu plain were observed and interviewed. The results showed the average of puberty age, estrus length, estrous cycle, first calving, calving interval, service per conception and conception length, for Napu and Lindu plain were  $2.0 \pm 0.13$  and  $2.0 \pm 0.18$ ; years,  $20.19 \pm 1.09$  and  $20.18 \pm 1.08$  hours,  $21.8 \pm 1.06$  and  $21.6 \pm 1.04$  days,  $3.0 \pm 0.24$  and  $3.0 \pm 0.26$  years,  $18.20 \pm 3.60$  and  $18.4 \pm 3.20$  months;  $2.0 \pm 0.62$  and  $2.0 \pm 0.84$ ,  $11.30 \pm 0.52$  and  $11.28 \pm 0.54$  months, respectively. It was concluded that reproductive performance of female swamp buffalo in Central Sulawesi is still in quite good condition and also shows that there were no difference between two locations (districts).

**Keywords:** Reproductive performance, Buffalo, Napu plain and Lindu plain

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## Introduction

Buffalo (*Bubalus bubalis*) play a prominent roles in the agricultural socio economic of rural society in Indonesia. This is because this large ruminant is often used as draught animal, as a sources of milk, meat, meat product, horns, skin, saving, sacrificial ritual animal and social status. Although the buffalo population in the world has increased, on the contrary in Indonesia the buffalo population has actually decreased. The buffalo population in Indonesia in 2017 was 1.32 million heads, in 2021 the buffalo population decreased to 1.19 million heads (LAHS, 2021). Many factors have contributed to the continue decrease of buffalo population in Indonesia. Praharani et al. (2010) noted that reduced land for grazing, cutting of male and productive female, lack of feed during dry season,

calf mortality and low reproductive performance buffalo under small holder farmers. Almost 100% of buffalo farms in Indonesia are kept by smallholder farmers with a low input and extensive system in unimproved pastures. Furthermore, many authors (Praharani et al., 2010; Neverauskas et al., 2015; van der Heijden et al., 2020) suggested that the decline of buffalo populations was mainly caused by some factors such as low heat resistance, low birth rate, low reproductive performance and decreased economic value.

Reproductive performance is the primary factor affecting productivity in female buffalo, which could affect the population. Modi et al. (2011) reported that buffalo cows often experience reproductive disorder such as delayed puberty, anestrus or poor estrus signs, longer postpartum

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ovarian quiescence, and, most importantly, lower conception rates, under smallholder management system. Some authors (Barile, 2005; Qureshi et al., 2007) pointed out that low reproductive performance of buffalo can be improved through proper nutrition along with good management and genetic selection strategies.

Indonesia government through the Directorate General of Livestock and Animal Health, has launched a programs to accelerate beef and buffalao meat self-sufficiency. This program require increasing population of beef cattle and buffalo. Central Sulawesi province is one of the areas that has the potential for the development of buffalo. Total buffalo population in this province was 3.086 head (LAHS 2021). This province is supported by grazing large and have a low human population. Farmers keep swamp buffalo to produce meat and use for drought animal to support the agricultural sector. Napu plain located in the Poso district and Lindu plain located at Sigi district of Central Sulawesi are the most potential areas of buffalo development and breeding.

Reproductive performance is crucial parameter in increasing the buffalo population (Nasr, 2017; El Debaky et al., 2019, Hedge, 2019; Rizal et al., 2020). It is known as the ability of buffalo to produce offspring and the functioning of the process. The buffalo productivity is affected when reproductive performance is not accomplished. However, there is a little information available regarding to the reproductive performance of swamp buffalo reared by smallholder farmers in Napu and Lindu Plains of Central Sulawesi. Therefore, a study need to be conducted to collect information and data regarding the reproductive performance of buffaloes, especially in the Napu and Lindu plains of Central Sulawesi.

## Material and method

### Location of study

This study was conducted in the Napu plain (0°06'56" South and 123° 05' 25" East) and Lindu plain (1° 8' South and 119° 16' East) in Poso and Sigi districts, respectively. These locations were determined because of these two regions have highest of population of buffalo in Central Sulawesi.

### Research methods

The method used in this study was the survey method to obtain primary and secondary data. To obtain primary data, it was done through direct observation to the animal and interview the buffalo farmers based on a list of questions that have been prepared in the form of a questionnaire. Secondary data were obtained from relevant agencies in Poso and Sigi districts. This study included 98 buffalo cows and 30 farmers in Napu, Poso district, and 92 buffalo cows and 26 farmers in Lindu plain Sigi district. Parameters observed in this study were buffalo reproductive performances which includes: 1) puberty age 2) estrus duration, 3) estrus cycle, 4) first year of calving 5) calving interval 6) service per conception 7) gestation length. The parameters measured were defined and described according to Apori and Hagan (2014) and Miah et al (2018) as follows: Puberty age is the age at which the heifer had its first heat expressed in months. Estrus duration is period during the reproductive cycle when female buffalo become sexually receptive, with the sign that they are ready for mating. Estrus cycle is the period from one ovulation to the following ovulation, which each ovulation being accompanied by sign of estrus by animal expressed in day. First year calving is the age a cow had its first calf, expressed in months. Calving interval is the time interval between two successive calvings, expressed in months. Service per conception is the average number of services resulting in conception. Gestation period is the length of time between conception and calving expressed in days. In addition representative of forage samples were taken from both sites and analysed in the nutrition laboratory for dry matter (DM), organic matter (OM), crude protein (CP) and ether extract (EE) contents according to AOAC (1990). Forage samples were also analysed for neutral detergent fibre (NDF) and acid detergent fibre (ADF) using the method of Van Soest et al. (1991).

### Data analysis

To determine the performance of the swamp female buffalo reproduction, the data collected were processed, calculated on average, percentage and explained descriptively.

## Results And Discussion

### Management and Feed Nutrient Content

The buffalo cow grazed extensively on natural pastures during the day, without any supplements. Native grasses and forbs were the main diet component. The feed available within this system is likely to meet the nutrient requirements for production targets through most of the year. Additional nutrients are required by buffalo under this extensive system which walk during grazing and accessing drinking water activities. The nutrient contents of forage on natural pastures of both sites were presented in Table 1. The nutritive value of forage in both sites close to the data found by Marsetyo et al. (2012).

**Table 1.** Feed composition of forage taken from natural pasture in Napu and Lindu plains

Feed composition	Regions	
	Napu plain	Lindu plain
Dry matter (%)	30.29±0.54	31.03±0.47
Organic matter (% DM)	90.49±1.09	89.22±1.23
Crude protein (% DM)	7.84±0.38	8.03±0.27
Neutral detergent fibre(% DM)	63.87±0.87	62.25±0.84
Acid detergent fibre (% DM)	47.21±0.81	48.59±0.85
Ether extract (%DM)	1.12±0.08	1.09±0.06

### Puberty age, Estrus duration and Estrus cycle

The average puberty age of female swamp buffalo raised by farmers in the Napu and Lindu plains was  $2.00 \pm 0.13$  and  $2.00 \pm 0.18$  years, respectively (Table 2). This data showed a similar of puberty age between buffalo in the two different location. These heifers were mated by the owner for the first time when they showed estrous symptoms. The swamp buffalo heifers in the two study sites showed a puberty at younger age than swamp buffaloes heifers in Simeulue district, Aceh, Sumatra, Indonesia (Samsuandi et al., 2016). These authors found that buffalo heifers in their region reached a puberty at 2.5-3.0 years old. Moreover, in previous studies (Borghese et al., 1994; Borghese et al., 1996) reported that the puberty of buffalo heifers in different management system ranged from 1.34 to 3.33 years of age.

Many factors affected the puberty of buffalo include breed, season, climate, nutrition, management, social environment and disease (Borghese et al., 1994, Perera, 2011; Gaviraghi et al., 2013).

The average duration of estrus of buffalo cow in Napu plain was  $20.19 \pm 1.09$  hours, while the one in the Lindu plain lasted an average of  $20.18 \pm 1.08$  hours (Table 2). This shows that the duration of estrus of the buffalo in the the two sites were almost the same. Comparing to the results of Yendraliza et al. (2017), the estrus period of female buffalo in Kampar district, Riau Sumatra naturally lasted for  $15.80 \pm 2.5$  hours. However, the estrus of the buffalo cows in Napu and Lindu plains lasted longer than in the study of Yendraliza et al. (2017). Perera (2011) noted that the duration of estrus of buffalo cows vary, which is around 5-27 hours. This author suggested that in average the ovulation occurs 34 hours after the onset of estrus.

The average estrous cycle of buffalo cows in Napu and Lindu plains are  $21.8 \pm 1.06$  and  $21.6 \pm 1.04$  days, respectively (Table 2). Jainudeen and Hafez (1993) suggested that the duration of the estrus cycle is relatively similar between buffalo and cattle at the range 17-26 days, with mean value approximately 21 days. The variation of estrus cycle in buffalo are mainly influenced by factors such as adverse environmental conditions, nutrition and irregularity in secretion of ovarium steroid hormones (Kaur and Arora, 1982; Nanda et al., 2003).

### Service per conception and gestation length

The number of buffalo observed from their mating was approximately 40% (39 heads) and 50% (46 heads) of the total population in the Napu and Lindu Plains, respectively. Most buffaloes mate naturally when they were in the grazing area. Furthermore, the average service per conception (S/C) of buffalo cow in Napu plain was  $2.0 \pm 0.62$ , while that at the Lindu plain was  $2.0 \pm 0.84$  (Table 2). This implies that the buffalo cows in these research sites mated twice in order to gestate. This present study is similar with the study of Komariah et al. (2014), who reported 2.0 S/C in swamp buffalo in Kutai Kartanegara District, East Kalimantan. However other study conducted by Harun-Or-Rashid et al. (2019) showed that S/C of local, cross, Nilli and Murrah buffalo in Bangladesh is  $1.64 \pm 0.78$ ,

1.78 ± 1.26, 1.88 ± 0.70, and 1.71 ± 0.68, respectively, which were less rate than the the present study. The greater rate of S/C might be due to some factors such as improper detection of heat, postpartum problem of the buffaloes, and management. Juneja and Arora (2006) suggested that the buffalo fed low protein diet required a greater S/C than those maintained under protein rich diets.

After mating either naturally in the pastures or with the assistance of owners, the buffalo cows exhibited a similar gestation period in both research sites. The average gestation period of buffalo cows was 11.30 ± 0.52 and 11.28 ± 0.54 months in the Napu and Lindu plains, respectively (Table 2). The duration of gestation for female swamp buffalo in West Simeuleu District was 310-330 days or 10-11 months (Samsuandi et al., 2016). Azriwiko et al. (2019) stated that the swamp buffalo in Central Kuantan District had an average gestation period of 11.09 months.

### Age of First Calving and Calving Interval

Getting females buffalo to reach their first calving younger should be prioritized in order to reduce costs related to feeding and increased the income from milk and calf production. In Napu plain, buffalo cows reached first calving at 3.0 ± 0.24 years of age, while in Lindu plain the first calving was reached at 3.0 ± 0.26 years of age. (Table 2). This study showed that the buffalo cows in Napu and Lindu Plains had first calving at younger age than the ones from Kuantan Singing district, Riau Sumatra (Azriwiko et al., 2019). These authors recorded that the first age of calving of buffalo in their study was between 3.5-4.5 years. Similarly, the swamp buffalo in Simeuleu district Aceh Sumatra, had an average age of 3.7 years (Samsuandi et al., 2016). In Venezuela, Trujillo et al., (2020) reported that buffalo cow had first calving at 3.24 years old. This indicated that buffalo cows had better first year of calving.

One of the main constraint in buffalo breeding is the long calving interval. The calving interval of buffalo cows in the Napu and Lindu plains were 18.2 ± 3.60 and 18.4 ± 3.20 months, respectively (Table 2). This period of calving intervals in the current study were longer than buffalo cows in Malang, East Java which is at 16.6 month (Suhendro et al., 2013). However the data of calving interval in the current study

is relatively similar to Guzman et al. (1980) which is 18 months. Barile (2005) pointed out that the period from calving to the function of ovaum is longer in buffalo when compared with cattle. Many factors influenced the process from postpartum ovarian activity resumption to conception in buffalo. These factors include breed, nutrition plan, milk yield, suckling, uterine involution and season of calving.

**Table 2.** Reproductive performances of swamp Buffalo cows in Napu and Lindu Plains, Central Sulawesi Indonesia (mean ± standard error)

Reproduction parameters	Regions	
	Napu plain	Lindu plain
Puberty age/first oestrus (year)	2.00±0.13	2.00±0.18
Estrus length (hours)	20.19±1.09	20.19±1.09
Estrus cycle (day)	21.80±1.06	21.60±1.04
First calving (year)	3.00±0.24	3.00±0.26
Calving interval (month)	18.20±3.60	18.4±3.20
Service per conception (S/C)	2.00±0.62	2.00±0.84
Conception length (month)	11.30±0.52	11.28±0.54

### Conclusions

The reproductive performance of female in Napu and Lindu plains, Central Sulawesi is good condition and showed no different in both sites.

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### Conflict of interest

None.

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