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## Reproductive characteristics of female swamp buffalo reared under *Kalang* production system in South Kalimantan

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**Abstract.** Swamp buffalo has been an integral component of society in the swamp area in South Kalimantan. The system is characterized by 2-5 farmers rearing herds semi intensively in one shared *kalang*, a traditional wooden shelter on swamp area. This study was aimed to determine the reproductive characteristics of female swamp buffalo under *kalang* systems in Hulu Sungai Selatan Regency, The Province of South Kalimantan. The data of reproductive characteristics and farming systems were collected through interviewing 21 farmers in 4 *kalang* groups who kept 351 buffaloes (153 of them were females). The observed parameters were average of productive females ages, age at first mating, calving interval, *post-partum estrus* (PPE), percentages of pregnant and lactating cows. Results showed that the average of productive female buffalo ages was  $9.9 \pm 0.99$  years; female swamp buffaloes were first mating at 51.4 months; first calving at 63.4 months; calving interval was  $16.5 \pm 0.70$  months; PPE was  $4.9 \pm 0.64$  month; gestating and lactating cows were 21.6% and 60.1%, of the productive female population, respectively. We concluded reproductive characteristics of female swamp buffalo under *kalang* production systems can be enhanced through improvements of the production system, including pre-weaning calf management, feed supplementation, and health care practices.

### 1. Introduction

Swamp buffalo (*Bubalus bubalus carabanensis*) is an important farm animal for people in South East Asia, including Indonesia. The swamp buffaloes are mainly used for agricultural labor, meat source and also kept as additional income for farmers [1]. Unfortunately, their value and production have declined in the last decades due to increased farm mechanization [2]. However, shortages in red meat sources urge Government to look at swamp buffalo as a potential red meat producer, especially in a certain area in which cattle farming is not feasible.

Kalimantan buffalo is a type of swamp buffalo which are kept in an extensive or semi-extensive production system in wetland and also mountainous areas of South, East and Central Kalimantan, Indonesia. Referring to their habitat, 64% of these buffaloes were kept extensively in swamp areas [3]. *Kalang* rearing system (a wooden structure in the middle of the swamp) is regarded as the local wisdom of native people who live in lowland Kalimantan in utilizing their environment for their livelihood [4]. However, the buffalo population tend to decrease in the last decades, as well as in South Kalimantan



that drop 33% in the last 5 years [5]. This decline is suspected due to diseases, reproductive issues and also the decrease in feed resources and their grazing areas [6].

*Kalang* system is an example of traditional buffalo farming in Indonesia. To increase buffalo contribution to the red meat supply, many efforts have to be carried out to increase buffalo production and population, including breeding and reproduction efficiency. Therefore, this survey was conducted to investigate the reproductive characteristics of swamp buffalo reared under *kalang* system and to describe buffalo reproduction performance under this production system.

## 2. Methods

The survey was conducted in Daha Utara sub-district of Hulu Sungai Selatan District (HSS), South Kalimantan. There were 6 farmer groups (*kalang*) in the area which 5 of the groups being respondents in this study. Respondents included farmers, buffalo owners, and government field officers. Secondary data were collected from the Agriculture and Livestock Service of HSS district. Data were analyzed both statistically and descriptively.

## 3. Results

### 3.1. Population structure

According to Badan Pusat Statistik [7], the buffalo population in HSS districts was 1058 heads that were raised in sub-districts Daha Utara (596 heads) and Daha Barat (462 heads). In this study, a survey was carried out in 5 of 6 buffalo farmer groups that exist in Daha Utara. Our field survey showed there are 153 females (43.6%) out of 351 buffaloes raised in the observed groups. That population consisted of 92 lactating buffalo (60.1%), 33 gestating buffalo (21.6%) and 28 dry buffalo cows (18.3%). A high number of lactating and pregnant buffalo indicated the herds from observed groups are relatively productive because they will result in more than 50% calf crop per year. However, data in this survey showed the pre-weaning calf is only 47.7% that will result in less than 50% of the calf crop.

**Table 1.** The characteristic of buffalo population under *kalang* production system in HSS

	Head	%
Buffalo population	351	
Adult female	153	43.6
Lactating female buffalo	92	60.1
Gestating female buffalo	33	21.6
Pre-weaning buffalo calf	73	47.7

Further interviews revealed that the mortality of buffalo calf is high in the *kalang* system. Farmers said there are 10-20 calves that died in *kalang* per year. A farmer reported three abortions have occurred at his *kalang* this year. Farmers explained several reasons for high calf mortality, those were disease, fall out, and being trapped in the *kalang* floor. A field officer of Agriculture and Livestock Service informed that liver worm (*Fasciola hepatica*) is the most common disease found in swamp buffalo and cause mortality both of young and adult buffalo.

Our fieldwork confirmed that in the *kalang* system, adult buffaloes are released for grazing in the swamp in the morning, while the pre-weaning calves stay in the *kalang*. Unfortunately, the farmers are not sufficiently feeding calves with grass or concentrate feed. Therefore, the body condition of calves is poor and weak. Even though buffaloes are more a less susceptible to the same most common diseases and parasitic infestations observed in domestic cattle, buffaloes with poor nutrition and health conditions are prone to be affected with diseases, especially buffalo calves which are less resistant to diseases than adult buffaloes [2].

### 3.2. Reproductive characteristic

Similar to other traditional management systems, there was no recording in the *kalang* system. Data on reproductive characteristics were based on farmers information (Table 2).

First calving depends on sexual maturity or puberty that determines the first mating of the buffalo. This study indicated a very late first mating and first calving of buffalo under the *kalang* system (51.4 and 63.4 months, respectively). Puberty in buffalo is delayed compared to the cattle. There is a large variation in age at puberty in different countries and breeds of swamp buffaloes. Barile [8] reviewed that mostly swamp buffalo exhibit first estrous at 21-25 months and a bodyweight of 300 kg at sexual maturity. The Vietnamese swamp buffalo exhibited puberty at 30-36 months, while in the Australian swamp buffalo occurs between 14 and 19 months of age. Earlier puberty of swamp buffalo occurred with improvements in feeding and common practices. Reswati *et al.* [9] reported swamp buffalo under better management practices and more comfortable climate conditions had earlier first calving (45.7 months) than the less one (51.6 months).

**Table 2.** Reproductive characteristics of female buffalo under *kalang* system

Characteristic	Average	SEM
First mating (month)	51.4	0.66
First calving (month)	63.4	0.66
Postpartum estrus (month)	4.9	0.12
Calving interval (month)	16.5	0.15
Body condition score	3.5	0.11

The calving interval was reported as 16.5 months in this *kalang* system. This interval is slightly longer than the optimal calving interval for swamp buffalo reported by Diwyanto and Subandriyo [10], namely 13-15 months. However, this calving interval is much shorter than reports of Reswati *et al.* [9] for buffalo reared under the semi-intensive system in West Sumatera that ranging from 24 to 27 months.

Calving interval is influenced by the service period, which is affected by postpartum estrous, service per conception and weaning time. Postpartum estrous in this study was 4.9 months, a normal period for swamp buffalo, 3-6 months, according to Perera [11]. The postpartum estrous period is varied according to some factors such as nutrition and body condition, weaning management and climate [12]. In the *kalang* system, artificial insemination is not possible to be applied, thus mating occurs naturally. Farmers said that natural mating is possible occurred in grazing areas during the day or in *kalang* during the night. Natural mating might result in a higher conception rate than artificial insemination for some reasons, such as detection of heat buffalo, the timing of mating, and the semen quality [13].

Our field works also observed the body condition score of female buffaloes were on the average of 3.5, that an ideal score for a productive female. These findings indicated adult buffaloes in the study area have sufficient nutrient intake that results in good body score condition, a normal postpartum estrous period and finally calving interval. In other swamp areas of South Kalimantan, it was reported to have declined in feed availability due to swamp conversion into oil palm plantation, water polluted by domestic wastes, and golden snail (*Pomacea canaliculate*) invasion [6,14].

The reproductive characteristics of buffalo in the study area were at optimum condition, except for the first mating and first calving variables. Moreover, the population structure indicated the population have high reproductive female but the calf crop is low. Our fieldwork revealed the poor management practices for pre-weaning and buffalo calves. This resulted in high mortality and poor body condition. Inadequate feed and less farmer attention to calves and pre-weaning buffaloes not only result in high mortality but would delay puberty age since puberty is determined by body condition and body weight. Even though buffaloes have been well known for their delayed puberty and long anestrous period compare to cattle, but they have significant reproductive superiority over the cattle, namely longer reproductive longevity [2].

The performances and profitability of riverine and swamp type buffaloes are significantly higher under intensive production system compared to the extensive system [15]. To increase swamp buffalo population and productivity, improvements should be carried out in the *kalang* system, especially in calf management, health and feeding practices.

#### 4. Conclusion

Buffalo cows in the observed *kalang* have a high reproductive structure, but the calf crop is low. Farming practices in the *kalang* system can result in a normal postpartum estrous, calving interval and body condition score, but the first mating and first mating is very delayed. This study revealed high mortality of buffalo calf that in the later result in low calf crop. The delayed first mating and first calving in the *kalang* were caused by poor pre-weaning practices, especially inadequate nutrition and health treatment. Therefore, to increase buffalo population and production, improvements in the *kalang* system has to be initiated, especially in pre-weaning management, feed supplementation and health care practices.

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