

Productivity of swamp buffaloes under three production systems

(Daya pengeluaran kerbau sawah dalam tiga sistem pengeluaran)

Y. Nordin*, R. Abdullah Sani**, A.M. Rosalan* and M.S. Ghadzi*

Key words: swamp buffaloes, production systems, productivity

Abstract

The productivity of swamp buffaloes under three production systems namely intensive, semi-intensive and integrated with oil palm was evaluated. Birth, weaning, and yearling weights were 26.8, 85.7 and 137.4 kg for calves under intensive; 27.2, 125.2 and 217.2 kg for calves under semi-intensive; and 24.7, 118.9 and 205.3 kg for calves under integrated production systems respectively. The average daily gain from birth to one year old and preweaning calf mortality were 0.3 kg/day and 25.6% under intensive; 0.52 kg/day and 12.7% under semi-intensive; and 0.51 kg/day and 7% under integrated production systems respectively. Calving rate and calving interval of the dams were 57.3% and 481 days under intensive; 66.7% and 439 days under semi-intensive; and 47.2% and 496 days under integrated production systems respectively. Results of the study showed that reproductive performance of swamp buffaloes can be improved through semi-intensive production system and nutrition was implicated for the improved reproductive performance.

Introduction

For the past 20 years the swamp buffalo (*Bubalus bubalis*) population in Peninsular Malaysia has declined progressively. The number of buffaloes declined from 199 493 in the year 1980 (DVS 1984) to 79 387 in the year 2002 (DVS 2003) representing a decrease of 60.2% and a declining rate of 2.74% per annum.

There are several factors contributing to the decline in the population such as displacements of the buffalo with machinery for draft power in the rice growing areas and high extraction rate on the animal for beef. The problem is further aggravated by the animals' low reproductive efficiencies due to inadequate and inefficient husbandry practices (Wan Zahari and Ariff 2001). The swamp buffaloes are well known for their

long calving intervals and low calving rates and these have been the major drawback to the development of swamp buffaloes as beef animal.

With high emphasis on the development of cattles and low emphasis on the development of buffaloes as beef animals by government agencies and private sectors, the problem of reduced population in buffaloes is likely to persist. However, there is a prospect for the animal to be reared commercially if the reproductive efficiencies of swamp buffalo can be improved.

Most of the swamp buffaloes in the country were reared by the smallholders under traditional production systems characterized by low inputs. The buffaloes are usually allowed to graze on native

*MARDI Station, Bukit Ridan, P.O. Box 62, Bandar Muadzam Shah, Pahang, Malaysia

**MARDI Station, Kluang, P.O. Box 525, Kluang, Johor, Malaysia

Authors' full names: Nordin Yusof, Abdullah Sani Ramli, Mohammad Rosalan Awang and Mohamad Sheikh Ghadzi

E-mail: ndy@mardi.my

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pastures in the idle grazing reserves, low lying swampy areas, under plantation crops and along the riverbanks or irrigation/ drainage canals. Feed supplementation is rarely given to these animals. Under this production system, the productivity of swamp buffalo is at sub-optimal level (Cameons 1974). The productivity of swamp buffaloes is improved when the animals are managed under free grazing in open pastures (Liang et al. 1982; Ahmad 1983; Nordin et al. 1988).

The objective of this study was to evaluate the productivity of swamp buffaloes under three production systems, namely intensive, semi-intensive and integrated with oil palm plantation. The results of this study had been partly reported (Abdullah Sani et al. 1995; Nordin et al. 1997)

Materials and methods

A total of 90 swamp buffalo heifers aged around 2 years old were randomly assigned to three production systems: intensive, semi-intensive and integrated with oil palm. Each had two replicates (15 heifers and one bull per replicate). Under intensive production system, the animals were housed in two separate pens, each measuring 15 m x 12 m and fed ad libitum with cut guinea grass (*Panicum maximum*). Under semi-intensive production system, the buffaloes were allowed to graze on guinea grass in paddocks in the evening until the next morning. They were kept in their respective pens during the day. The animals under the integrated production system grazed on native pastures under 6-year-old oil palm trees with a carrying capacity of one animal per 2 ha. The buffaloes in all the treatments were supplemented with concentrate (consisting of 50% palm kernel cake, 48% rice bran, 2% vitamin premix and 1% salt and containing 90% dry matter and 14% crude protein) at the rate of 1.5 kg/head/day. All the animals had free access to drinking water and mineral-licks.

Throughout the trial period, two dry spells lasting for 6–8 weeks were encountered, which resulted in acute shortage of grasses under the oil palm plantation. During these periods the buffaloes were allowed to graze on *Brachiaria decumbens* in the nearby paddock. In all the production systems, bulls with good serving ability were allowed to run freely with the females for natural mating and they were rotated between replicates within treatment. Yearly vaccinations against foot and mouth disease and haemorrhagic septicemia were given to the animals. Deworming was done twice a year.

Analysis of variance using SAS procedure for the effect of treatments on birth, weaning (6 months old) and yearling (12 months old) weights and calving intervals were performed and treatment means were compared using t-test. Data on calving percentage was analysed by Chi-square test.

Results

The birth, weaning and yearling weights of swamp buffaloes born under the three production systems are shown in *Table 1*. Calves born under intensive and semi-intensive production systems had higher ($p < 0.05$) birth weights than calves born under integrated production system. Weaning and yearling weights were lower ($p < 0.05$) in calves under intensive than those under semi-intensive and integrated production systems. Growth pattern of calves under semi-intensive and integrated production system from birth to 12 months old was more or less similar and reflected a higher growth rate than those calves under intensive system (*Figure 1*). The average daily gain (ADG) for calves under the intensive, semi-intensive and integrated systems from birth to 12 months old were 0.30, 0.52 and 0.51 kg/day respectively.

Prewaning mortality was highest in calves under intensive (25.6%) as compared to those under semi-intensive (12.7%) or

Table 1. Effect of production system on birth, weaning and yearling weights (mean \pm sd) of swamp buffalo calves

	Production system			Overall mean
	Intensive	Semi-intensive	Integrated	
Birth wt. (kg)	26.8a \pm 3.0	27.2a \pm 3.1	24.7b \pm 4.6	26.3 \pm 3.8
Weaning wt. (kg)	85.7a \pm 16.3	125.2b \pm 29.3	128.7b \pm 25.9	118.9 \pm 30.2
Yearling wt. (kg)	137.4a \pm 21.6	217.2b \pm 34.2	212.1b \pm 27.6	205.3 \pm 39.7

Means in the same row with different letters were significantly different ($p < 0.05$)

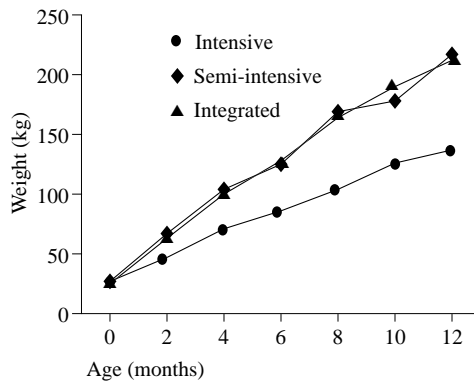


Figure 1. Changes in body weight from birth until 12 months old in swamp buffalo calves under three production systems

integrated (7.0%) production systems. Causes for preweaning mortality include drowning and getting stuck in the muddy swamp, emaciated body condition, heavy worm infestations, butted by the bull, trampling by the dam, refusal for suckling by the dam, stillbirth and meliodosis.

The effect of production system in the overall calving rate (calves born divided by number of dams \times 100) was significant ($p < 0.05$). For a 3-year calving period (year 2, 3 and 4) (Table 2), calving rate was highest in the semi-intensive (66.7%) followed by the intensive (51.3%) and the integrated (47.2%) production systems. The overall calving percentage was 55.4% and highest calving rate occurred in year 3. In all the three production systems, first calving occurred in all (100%) animals. The percentages of second calvers were 95.6, 61.5 and 64% for the semi-intensive, intensive and integrated production systems respectively and the percentages of third

calvers were 22.2, 11.5 and 8.3% respectively.

The calving intervals for the buffaloes in the three production systems are shown in Table 3. Calving interval was significantly shorter ($p < 0.05$) in buffaloes under semi-intensive (439 days) than under integrated (496 days) but was not significantly different from that under intensive system (481 days). The overall calving interval was 466 days. The distribution of calving interval at various lengths is shown in Figure 2. Proportion of calving intervals less than 400 days was higher in buffaloes under semi-intensive (45%) than those under intensive (16%) or integrated (23%) production systems, while proportion of calving intervals at more than 450 days was highest (71%) in the integrated and lowest (31%) in the semi-intensive systems.

Discussion

It is generally reported that swamp buffalo has low reproductive efficiencies, i.e. long calving interval (>500 days) and low calf crop ($<40\%$) (Cameons 1974; Jainudeen 1983; Nordin et al. 1988). However, as shown in Tables 2 and 3, there was a marked improvement in the reproductive performance of the swamp buffaloes especially under semi-intensive production system.

Factors contributing to the improved reproductive performance in buffaloes under semi-intensive system cannot be singled-out, but it could be due to several factors among which nutrition could have a major influence. It must be mentioned that variation existed in the quality and supply of

Table 2. Effect of production system on calving percentage of swamp buffaloes

Period	Production system			Overall calving (%)
	Intensive	Semi-intensive	Integrated	
Year 1	No calving	No calving	No calving	
Year 2	15.4 (4/26)	51.8 (14/27)	50.0 (12/24)	39.0 (30/77)
Year 3	80.0 (20/26)	81.5 (22/27)	75.0 (18/24)	77.9 (60/77)
Year 4	61.5 (16/26)	66.7 (18/27)	16.7 (4/24)	49.4 (38/77)
Overall %	51.3ab (40/78)	66.7b (54/81)	47.2a (34/72)	55.4 (128/231)

Figures in the same row with different letters are significantly different ($P < 0.05$)

Table 3. Effect of production systems on calving interval of swamp buffaloes

	Production system			Overall
	Intensive	Semi-intensive	Integrated	
No. observations	19	29	17	65
Mean \pm sd (days)	48ab \pm 79	439b \pm 88	496a \pm 93	466 \pm 89
Range (days)	356–667	343–681	366–658	

Means in the same row with different letters were significantly different ($p < 0.05$)

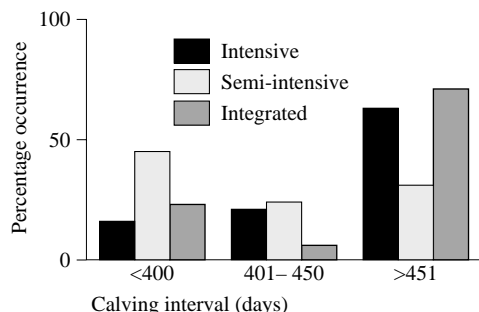


Figure 2. Distribution of calving intervals at various durations in swamp buffaloes under three production systems

roughage in the three production systems, which in turn affected the roughage dry matter intake. Under semi-intensive production system, the animals had free access to graze on younger swards, which were more nutritious. Since grazing time was more than adequate, feed intake was therefore not a limiting factor. Thus, the buffaloes were on better nutrition.

On the other hand, buffaloes under the intensive system might have insufficient and low quality roughage, which can affect the dry matter and nutrient intake. Similarly, buffaloes under the integrated system, even though on free grazing, might also have the

problem of roughage supply, especially during the long dry spell. The inadequate nutrition could have affected the buffaloes' productivity under the intensive and integrated systems. Inadequate nutrition particularly insufficient energy intake during postpartum could impair the reproductive activity of swamp buffaloes, such as delayed resumption of postpartum ovarian activity and this will prolong the calving interval (Nordin and Jainudeen 1995).

The more acceptable calving interval in the buffaloes under semi-intensive system is an indication of earlier resumption of postpartum ovarian activity resulting from better plane of nutrition. In a much earlier study (Dalzell 1983), a yearly (for a 6-year period) calving percentage of 70.8 % was reported in swamp buffaloes raised under oil palm. These buffaloes were supplemented with palm oil sludge besides grazing on natural vegetations under the oil palm plantation. Other factors such as reduced heat stress, good health programme and bulls of good libido could have also contributed to the improved reproductive performance in buffaloes under the semi-

intensive production system and also in the other two production systems.

The lower ADG in calves under the intensive production system as compared to the other two production systems suggests that calves in the intensive production system were probably not getting proper nutrition. This might have resulted from feeding competition with adult animals and poor quality roughage. However, the ADG obtained under the intensive system was similar to that of buffalo calves raised under free grazing in open pasture (Nordin et al. 1988).

On the contrary, calves under the semi-intensive system can be regarded as having fulfilled their nutrition requirements because the calves can select and had free access to young guinea grass, which could lead to higher nutrient intake thereby resulting in higher growth rate. Similarly, calves under integrated system also had free access to young and more nutritious vegetations under oil palm and which can contribute to higher nutrient intake and resulting in higher ADG.

In addition, concentrate intake by calves is also likely to contribute to the higher ADG in the two production systems. In the intensive system the beneficial effect from concentrate intake could have been offset by the intake of poor quality roughage. The ADG of swamp buffalo calves under these two production systems was higher than those aged between 10–14 months and fed on oil palm frond (0.47 kg/day) and sago meal-based (0.44 kg/day) diets in feedlot (Shamsudin et al. 1995), but slightly lower than those fed on palm kernel cake based diets (0.59 kg/day) also in feedlot (Shamsudin et al. 1993).

The high pre-weaning mortality rate in calves under intensive system was not expected. Overcrowding due to lack of space might have aggravated the incidence. The chances to be trampled and butted by the adult animals, which caused serious injuries leading to death were high on calves under the intensive than in the other two production systems.

Conclusion

An improved productive and reproductive performance of swamp buffaloes can be achieved through semi-intensive production system. Adequate grazing, feed supplementation, disease control and good libido bull are incorporated into this system. However, an economic analysis of each production system should be carried out before any production system is recommended.

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Abstrak

Daya pengeluaran kerbau sawah dalam tiga sistem pengeluaran iaitu sistem pengeluaran intensif, separa intensif dan bersepadu bersama tanaman kelapa sawit dikaji. Berat anak kerbau semasa lahir, semasa disapih, dan pada umur setahun masing-masing ialah 26.8, 85.7 dan 137.4 kg dalam sistem intensif; 27.2, 125.2 dan 217.2 kg dalam sistem separa intensif; dan 24.7, 118.9 dan 205.3 kg dalam sistem integrasi. Purata kenaikan berat badan dari lahir hingga umur setahun dan kadar kematian anak sebelum disapih masing-masing ialah 0.3 kg/hari dan 25.6% dalam sistem intensif; 0.52 kg/hari dan 12.7% dalam sistem separa intensif; dan 0.51 kg/hari dan 7.0% dalam sistem integrasi. Kadar kelahiran dan sela beranak bagi induk betina masing-masing ialah 57.3% dan 481 hari dalam sistem intensif; 66.7% dan 439 hari dalam sistem separa intensif; dan 47.2% dan 496 hari dalam sistem integrasi. Keputusan kajian menunjukkan bahawa prestasi pembiakan kerbau sawah dapat ditingkatkan melalui sistem pengeluaran separa intensif dan faktor pemakanan dikaitkan dengan peningkatan prestasi pembiakan ini.