

Normal Growth from Birth to Yearling Age of Transhumant “Baggara” Cattle of Nuba Mountains Region in Sudan

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SUMMARY

Data collected on “Baggara” cattle, owned by transhumant tribesmen at Nuba Mountains of Western Sudan, were used to study the growth pattern of calves and to investigate the effects of sex, sire, year and season of birth on growth of these calves from birth to yearling age. The mean ($\pm$ SE) birth, 205-d, and 365-d weights for male calves were 18.4 ± 0.3 , 70.5 ± 0.7 and 90.6 ± 0.8 kg, respectively. The corresponding values for the females were 17.2 ± 0.3 , 64.4 ± 0.6 and 84.0 ± 0.8 kg, respectively. The pre-weaning ADG were 0.25 ± 0.05 and 0.23 ± 0.04 kg for males and females, respectively, and the corresponding post-weaning ADG for the two sexes were 0.19 and 0.18 kg respectively. Sex had a significant effect ($P < 0.05$) on birth, weaning, and yearling weights, and on pre-weaning ADG. Male calves were born heavier at birth, weaning and yearling ages and had higher pre-weaning ADG. Male and female calves were similar in post-weaning ADG. Sire effect was significant on birth weight ($P < 0.01$) but had no effect on weaning and yearling weights and on pre-and post-weaning ADG ($P > 0.05$). Year of birth had an effect ($P < 0.01$) on weaning and yearling weights and on pre-weaning ADG ($P < 0.01$) and post-weaning ADG ($P < 0.05$). Season of birth had an effect ($P < 0.05$) on birth weight, but no effect ($P > 0.05$) on weaning and yearling weights and on pre-and post-weaning ADGs.

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INTRODUCTION

The Sudan cattle can be classified into three group-types: Northern, Southern, and the Nuba Mountains cattle. This study was concerned with the Western or “Baggara” sub-type of the Northern cattle that inhabited the Southern Kordofan Province. Western cattle are representative of the transhumance cattle of the west of the Sudan and are primarily considered to be a beef breed and highly tolerant to diseases and drought. According to Bennett *et al.* (1954), these Northern cattle were derived from humpless African Shorthorn and Asiatic (long-horned) zebu (*Bos indicus*) cattle.

Cattle production is an important facet of agricultural production in South Kordofan. Seasonal migration is a common pattern of animal husbandry in this area. Mud and biting flies in the cracking clays of the south have compelled cattle owners to migrate to the north during the rainy season and back to the south during the late summer season. On their routes, they utilized the available pastures and water on the communal ranges.

Under beef production systems, growth rate is a trait of economic importance in both males and replacement heifers. Slow rates of growth could lead to having high percentage of unproductive cows in the herd and this may lead to economic losses. The environmental factors that may influence growth traits should be identified and their influence quantified. Therefore, the objectives of this study were to 1) examine the growth pattern of calves in Western cattle and to 2) determine some of the environmental factors that may influence their growth rates.

MATERIALS AND METHODS

Location of the experiment:

Kadugli Research Station was established in 1935 and was revived by the USAID and the World Bank in 1981 to function with more departments and to adopt the Farming Systems Research (FSR) approach in the Nuba Mountains area. The station falls in longitude 29 30' and latitude 11 10'. The elevation is about 500m above sea level. Soils consist of cracking clays with patches of sandy soils (gardud soils). The mean maximum and minimum temperatures fall within 41 and 22 °C, respectively. The mean annual rainfall is about 700mm mainly falls between June to October. The vegetation canopy is essentially tall grasses and has been intensively described by Bunderson (1981).

The experimental herd:

The herd was founded in 1982. Eighty-three cows, five breeding bulls, 13 growing bulls, and 15 calves were purchased from local markets from the “Baggara” tribes in the area. The herd was divided randomly into two sub-herds according to weight, physiological state, and sex of the cows. The two groups represented a typical transhumant herd. One herd was migrating north-south, the way the transhumant tribes do in the area, and the other herd was the sedentary herd at the research station farm on the cracking clays. This division was aimed to determine whether or not one herd performs better than the other under the open ranges. Fadlalla (1984) reported the results of this study.

The general management of the migratory herd (in which the study was performed) was structured to simulate normal “Baggara” practice in the region. Cows were allowed to graze 7:00 am to 6:00 p.m. without their calves. Supplementary feeding was not practiced; it was only allowed under desperate situations such as when the cow was **sick** or very weak. All cows had access to common salts, *ad libitum*, weekly during the rainy season and usually after every 3-4 weeks during the summer season. Water was available daily for all cows and calves. Milking was twice a day: early in the morning and in the evening when the cows were back to the camp from grazing. During milking, calves were tied to their dams' legs to stimulate milk letdown. Only two teats were milked: one from the front quarter and the other from the rear quarter diagonally; the other two teats were left for the calf.

Breeding was not controlled. In fact, breeding bulls and female breeding cows were kept together all the year round. Generally, the peak breeding activity was in September and October. This had a positive impact in forcing peak calving to occur between June and **July**, coinciding with the availability of pasture and lush in the area. Because of this favorable coincidence of calving in better season, calf mortality is expected to be low at this time of the year.

Data collection:

The data for this study were collected from 131 calves born during 1988 to 1989 in the migratory herd (in-herd measurements); they were born to 11 bulls in the herd. Collection of the information was started in June 1988 and ended in June 1989. Birth weights were taken within 12 hours after birth using a spring scale. Weaning and yearling weights were measured, before watering, at ages of 180 and 365 days, respectively using a portable scale. Weaning weight was adjusted to 205 days by linear interpolation between birth and **weaning weights**.

Pre-weaning and post-weaning average daily gains for the calves were calculated for weights taken before and after six months of age. There are three distinct seasons in the year, based on rainfall **and** temperature: winter (November to February), dry summer (March **to June**) and wet summer (rainy) (July to October).

Data analysis:

The mixed model procedure in SAS (1988) statistical package was used to analyse the data. For comparisons of the means, Scheffes' method was used but when the numbers of observations were highly disproportionate, Fisher's Least Significant Difference (LSD) was used for comparisons of the means as a confirming statistical test (Chew, 1977). The model for the analysis used was

$$Y_{ijklm} = u + Year_i + Season_j + Sex_k + Sire_l + E_{ijklm}$$

Where

Y_{ijklm} = the observed birth, weaning and yearling weights And pre-and post-weaning ADG of the m^{th} calf;

u = the population mean;

Year; = the fixed effect of **the i^{th} year** of birth ($i = 1-2$);

Season] = the fixed effect of the j^{th} season of calving ($j = 1-3$); Sex $_k$ = the fixed effect of the k^{th} sex ($k = 1-2$);

Sire' = the random effect of the l^{th} sire ($n = 11$); and

E_{ijklm} = the random residual effect associated with each $ijklm^{th}$ observation.

Correction of data for effects of age of the dam at calving was ignored because records on dam's age were not available. However, according to the structure and culling policy in the herd, all calves were born from cows above four years and less than seven years old.

RESULTS

Means and standard deviations of body weight of calves **at birth, weaning** and yearling ages and the pre-and post-weaning average daily gains are presented in Table 1. The average birth weight of calves was 19.0 ± 0.3 kg. The observed growth rate was 0.26 ± 0.05 kg per day **to reached** 87.3 ± 0.9 kg during a year period.

Table 1. Means, standard deviations and coefficient of variation

of body weight at birth, weaning and yearling ages and the average daily gains for “Baggara” calves in South Kordofan.

Trait	No.	Mean	Standard deviation	Coefficient of variation %
Birth weight (kg)	131	19.0	2.9	15.3
Weaning weight				
(205-d) (kg)	125	73.6	16.1	21.9
Yearling weight (kg)	115	93.9	21.6	23.0
Pre-weaning ADG (kg)	125	0.26	0.08	30.8
Post-weaning ADG (kg)	115	0.21	0.06	28.6

Birth weight:

The birth weight of calves adjusted for fixed effects was 17.8 ± 0.3 kg. Among factors investigated, the effects of season of birth ($P < 0.05$), sex ($P < 0.05$), and sire ($P < 0.01$) were significant on birth weight. Male calves were born heavier than females (18.4 vs. 17.2 kg) and were also heavier when born during the rainy season compared to other seasons (Table 2). The seasonal fluctuations in birth weights were probably due to fluctuations in rainfall and hence the range conditions.

Weaning and yearling weights:

Weaning weight was adjusted to 205 days of age. Factors that significantly influenced weaning weight were year of birth ($P < 0.01$), season of birth ($P < 0.05$), and sex ($P < 0.05$). Male calves were heavier (70.5 kg) at weaning than females (64.4 kg).

Yearling weight was influenced by year of birth ($P < 0.01$) and sex ($P < 0.01$) but season had no effect ($P > 0.05$). Male calves were also heavier at yearling (90.6 kg) than females (84.0 kg). Across years, the differences in weaning and yearling weights (Table 2) were mainly due to the variation in quantity and quality of pasture. Calves that

were weaned in summer season had higher weight than those weaned in winter. The reason could be that the calves which were born in summer (for example in June) had reached their weaning

age at a time coinciding with relatively good fodder quality and availability (December = winter). In addition, they passed through the rainy season where pastures were at their maximum potential. On the other hand, calves which were born in winter had reached weaning age at a time of feed scarcity and nutritional stress (June = summer).

Generally, weaning and yearling weights were low indicating poor management or poor maternal and/or environmental influences such as internal and external parasites; they were prevalent in the area. The results in this study were in general agreement with other reports (Ageeb, 1991).

Pre-and post-weaning average daily gains (ADG):

The ADG of calves (adjusted for fixed effects) during the pre-and post-weaning periods were 0.24 ± 0.05 and 0.19 ± 0.04 kg, respectively. Among sexes the difference in pre-weaning ADG significant ($P < 0.05$) while for post-weaning ADG the difference was negligible ($P > 0.05$) (Table 2).

Table 2. Least-squares means of birth, weaning, and yearling weights and pre-and post-weaning average daily gains of “Baggara” calves ($\pm$ standard error).

Factor	No.	Birth weight (kg)	weight (kg)	Weaning weight (kg)	Yearling weight (kg)	Pre-ADG	Post-ADG (kg)
Sex:							
Male	52	$18.4 \pm 0.5_a$	$70.5 \pm 1.2_a$	$90.6 \pm 1.2_a$	$0.25 \pm 0.08_a$		0.19 ± 0.06
Female	79	$17.2 \pm 0.5_b$	$64.4 \pm 0.8_b$	$84.0 \pm 1.1_b$	$0.23 \pm 0.05_b$		0.18 ± 0.05
Year:							
1988	60	18.6 ± 0.5	$74.5 \pm 1.0_a$	$93.9 \pm 1.2_a$			$0.27 \pm 0.06_a$ $0.21 \pm 0.06_a$
1989	71	18.2 ± 0.4	$64.2 \pm 0.9_b$	$85.4 \pm 1.1_b$			$0.22 \pm 0.06_b$ $0.18 \pm 0.05_b$
Season:							
Rainy	50	$19.3 \pm 0.5_a$	$70.4 \pm 1.2_a$	88.7 ± 1.3			$0.25 \pm 0.08_{ab}$ 0.19 ± 0.06
Winter	37	$18.6 \pm 0.5_b$	$65.1 \pm 1.2_b$	94.3 ± 1.6			$0.23 \pm 0.08_b$ 0.21 ± 0.08
Summer	31	$17.8 \pm 0.6_b$	$72.9 \pm 1.4_a$	90.1 ± 1.6			$0.27 \pm 0.09_a$ 0.19 ± 0.08

a, b Means within a factor having a subscript in common are not significantly different ($P > 0.05$).

DISCUSSION

The performance of this herd can, at large, represents the performance of the transhumant herds at the Nuba Mountains area. The observed birth weight were lower than those reported by Ageeb (1991) and Osman and Rizgalla (1968) for “Baggara” cattle but differences in locality, management (sedentary vs. migratory) and feeding practices should be taken into account. The performance of this migratory herd was also lower in birth weight compared to Butana (26.4 kg) and Kenana (25.2 kg) breeds of the Sudan but higher in weaning weight (205-d) compared to Western breed at Ghazala Research Station (58.5 kg) (Ageeb, 1991). Butana and Kenana are local Sudanese breeds of the Northern cattle group-type. In comparison with other zebu breeds, weight attained for age was somewhat similar if differences in management, feeding, and location were considered (ILCA, 1977). In this study, birth weight was found to correlate positively with both weaning ($r = 0.28$, $P < 0.01$) and yearling weights ($r = 0.21$, $P < 0.05$).

Ageeb (1991) reported 0.23 kg as pre-weaning ADG for both male and female Butana calves and 0.20 kg for male and female calves of Western “Baggara” breed. Marples (1963) reported 0.43 and 0.39 kg as pre-weaning ADG for male and female calves, respectively, for Uganda zebu breeds under range conditions.

The environmental factors that appear to influence body weight of calves are season and year of birth, sex, age of the dam, sire, herd, and herd x year interaction were the main sources of variation for birth and weaning weights and pre-weaning ADG (Bersotti *et al.*, 1979; Dillard *et al.*, 1980; Ageeb, 1991). Growth rates in this study were likely low, especially after weaning. The severe dry summer nutritional stress (in March, April, May and June) without supplementation that the calves experienced and the low amounts of milk allowed for calves before weaning could be the main reasons among many others (Figure 1). The influence of external and internal parasites on growth of calves should also be considered a significant factor. A study of the differences in performance of calves after weaning under feedlot and under the open range conditions may be beneficial. Also, studies on the economic evaluation of the options could be worthwhile.

The level of variation in these data was high. Large part of this variation is attributed to environmental factors, that can be controlled; but also the genetic portion should not be overlooked. More data on performance of these cattle could be generated so that selection of

breeding bulls can be facilitated and organization of fair-shows can be developed for the dissemination of better genetic materials among the herders through an exchange of bulls.

CONCLUSIONS

The pre-weaning ADG of calves in this herd was comparable to the ADG of other zebu cattle raised under traditional beef production systems in the tropical and subtropical areas. This is one herd evaluation with paucity of data, which makes conclusions and recommendation difficult. In general, there is potential for improvement of the environmental factors affecting growth rate of these cattle. Also, genetic improvement (selective breeding) of these local cattle under their habitat conditions could be considered in research programs thereafter.

ACKNOWLEDGEMENTS

The financial support of Western Sudan Agricultural Research Project (WSARP) and the technical support of staff at Kadugli Research Station were appreciated. The valuable comments of colleagues during the initial stage of the manuscript were acknowledged.

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