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REPRODUCTIVE PERFORMANCE AND ITS ASSOCIATED FACTORS IN COWS RAISED IN SOKOTO, NIGERIA

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ABSTRACT

This study was designed to assess some reproductive performance indices of cows raised in Sokoto, Nigeria and the factors affecting them. A total of 14 herds within Sokoto metropolis were identified and visited periodically, and information on measures of reproductive performance; such as calving to conception interval, calving interval, age at first service, calf mortality and pregnancy rates were collected using interviewed questionnaire. The calving to conception interval was 75.7 ± 14.7 day, while calving interval was 413.8 ± 221.9 days and age at first service was 23.78 ± 4.0 months. The calf mortality and pregnancy rates were 6.6 ± 7.7 % and 73.9 ± 6.5 %, respectively. These reproductive parameters were affected by management practice, calving season, history of return to estrus, dystocia, abortion, history of retained placenta and uterine prolapse. The study showed that the reproductive performance of cows in cattle herds raised in Sokoto is fair. We therefore recommend, improvement in the management of the herds.

Keywords: Calving; Cows; Reproductive performance; Sokoto

INTRODUCTION

Cattle are the most important livestock specie in Nigeria, accounting for over 18.8 million in the country (NASS, 2010). They are found throughout the country, but are most common in the northern two-thirds of Nigeria. Cattle are rich sources of meat, milk and blood although their horn, bone, hide and skin are also valuable. The blood, bone and horn are used in making animal feed (Bourn, 2010). In agriculture, cattle are used for ploughing, harrowing and ridging. In addition, they are used in lifting water from deep wells and for transportation (Blench, 1999). Sokoto Gudali, Rahaji and Bunaji are the predominant breeds found in the Sokoto state, although other indigenous and exotic breeds are also found in clusters (Blench, 1999). The state was reported as second to Borno state in cattle production (Williams *et al*., 2000). However, the security challenges in Nigeria`s north eastern region may have placed Sokoto state in the first position.

Reproductive performance indices are most important for determining the productivity of livestock. In spite of this, the reproductive performance of cattle raised in Sokoto is not fully known. Common parameters used for estimating reproductive performance of cows are calving to conception interval, inter-calving interval, age at first service, pregnancy rate and service per conception (Dayyani *et al*., 2013). Information on

these parameters is important, as it assist the farmers in reducing cost of production (Wangdi *et al*., 2014). This is particularly important in dairy production systems to reduce operating cost and early identification of unfertile cows for culling. This study was designed therefore, to assess the reproductive performance of cows raised in Sokoto, Nigeria.

MATERIALS AND METHODS

Study Area

The study was conducted in Sokoto metropolis, Nigeria. Sokoto is located in the dry Sudan savannah region of Nigeria and has a hot semi-arid vegetation. It lies between 4° to 6° N and between 11° to 13° E, sharing boundary with Kebbi state to the south, Zamfara state to the east, and Republic of Niger to the north. There are three seasons in Sokoto, namely: harmattan (November-February); hot season (March-May) and wet season (June-October). The temperature ranges from about 14^0C – 45^0C with annual average of 28.3^0C (Ohunakin *et al*. 2014).

Study Herds and Animals

A total of 14 cattle herds comprising of 907 cows of Sokoto Gudali, Bunaji, Friesian and their crosses were identified and used for this study. The characteristics of the herds are presented in Table 1. A total of 907 cows were examined during the study, with an average of 64.8 ± 38.6 cows per herd. The herds were 7.5 ± 3.7 years old with an average bull to cow ratio of 1: 8.5.

Table 1: Characteristics of cattle herds studied in Sokoto, Nigeria

Herd No.	Age of herd (years)	Herd size	Number of cows	Number of bulls	Bull:cow ratio
Herd 1	10	120	100	20	1:5
Herd 2	8	90	80	10	1:8
Herd 3	12	120	100	20	1:5
Herd 4	4	68	60	8	1:7.5
Herd 5	8	160	150	10	1:15
Herd 6	6	75	70	5	1:14
Herd 7	7	53	50	3	1:16
Herd 8	4	22	20	2	1:10
Herd 9	5	70	65	5	1:13
Herd 10	2	19	18	1	1:18
Herd 11	3	40	38	2	1:19
Herd 12	10	115	100	15	1:6.7
Herd 13	14	42	40	2	1:20
Herd 14	12	20	16	4	1:4
Total	105	1014	907	107	
Mean±SD	7.5 ± 3.7	72.4 ± 43.7	64.8 ± 38.6	7.6 ± 6.6	1: 8.5

Study Design

Cattle herds in Sokoto metropolis were identified on visits based on convenience sampling technique. The herders were briefed about the objective of the study, and their consent was sought for interview regarding the management operations of their herd and its reproductive performance. The interview questions were translated into the local language by the authors for clarity and farm records (where available) was also obtained. The data obtained were herd size (cow, bull, calves), management system, breeding purpose and method, parity, calving season, calving to conception interval, calving interval, pregnancy rate, survival rate, age at first breeding, history of return to estrus, history of abortion, dystocia, prolapse and retained placenta.

Data Analysis

Data collected were entered into SPSS version 20 and analysed using descriptive statistics. The results were summarized as mean ± standard deviation and frequency.

RESULTS

The measures of reproductive performance are presented in Table 2. The calving to conception interval was 75.7 ± 14.7 days, while the calving interval was 413.8 ± 221.9 days. The age at first service was 23.78 ± 4.0 months. Pregnancy and calf mortality rates were 73.9 ± 6.5 % and 6.6 ± 7.7 %, respectively.

Table 2: Measures of reproductive performance in cattle raised in Sokoto, Nigeria (n = 907)

Parameter	Mean ± SD
Calving to conception interval (days)	75.7 ± 14.7
Calving interval (days)	413.8 ± 221.9
Age at first service (months)	23.78 ± 4.0
Calf mortality rate (%)	6.6 ± 7.7
Pregnancy rate (%)	73.9 ± 6.5

The factors affecting these reproductive parameters of cows raised in Sokoto are presented in Table 3. Eight (57.1 %) herds were managed intensively, while 6 (42.9 %) were under semi-intensive system. Nine (64.3 %) of the herds were dual (dairy and beef) purpose, whereas 5 (35.7 %) were bred for dairy purpose. All the herds practice natural method of breeding and calved during the harmattan season. Nearly all the herds examined, 13 (92.9 %) had history of return to estrus, and dystocia that was resolved solely by manual traction. All the herds reported cases of abortion, which occurred between 3 to 6 months after breeding. Also, all the herds had history of retained placenta and prolapse after birth.

Table 3: Factors affecting reproductive performance of cows raised in Sokoto, Nigeria

Parameter		Frequency	Percentage (%)
Management system	Intensive	8	57.1
	Semi-intensive	6	42.9
	Extensive	0	0.0
Breeding purpose	Dairy	5	35.7
	Dual	9	64.3
Method of breeding	Natural	14	100.0
	Artificial insemination	0	0.0
Parity	NA		
Calving season	Harmattan	14	100.0
	hot season	0	0.0
	wet season	0	0.0
History of return to estrus	Yes	13	92.9
	No	1	7.1
Dystocia	Yes	13	92.9
	No	1	7.1
Management of dystocia	Manual traction	13	100.0
	Surgical	0	0.0
Abortion	Yes	14	100.0
	No	0	0.0
Time of abortion	< 3 months	0	0.0
	3 – 6 months	14	100.0
	> 6 months	0	0.0
History of retained placenta	Yes	14	100.0
	No	0	0.0
History of prolapse	Yes	14	100.0
	No	0	0.0
Period of prolapse	Before calving	0	0.0
	After calving	14	100.0

NA – Not available

DISCUSSION

Reproductive performance indices are important in maximizing herd profitability. The calving to conception interval (CCI) recorded in this study is similar to that reported by Eduvie *et al*. (1993) for a herd studied in Kaduna state, Nigeria, but lower than that reported by Obese *et al*. (1999) for a herd observed in Ghana. This could be due to differences in study location. The authors further observe difference in CCI between two herds in Ghana. In addition, the effect of suckling on the cows may have delayed uterine involution leading to prolonged CCI. The calving interval (CI) of cows raised in Sokoto was similar to the findings of Obese *et al*. (1999) in Ghana. It was however lower than the values earlier reported in Nigeria (Voh and Otchere, 1989) and Ethiopia (Rege *et al*., 1993; Dinka, 2012), but higher than the report of Kouamo *et al*. (2019) in Cameroon. Kouamo et al. (2019) also reported low CI in exotic breed of cows raised in the country. Breed, genetic traits and other non-genetic factors such as calving sequence, month or season of calving and age at calving are believed to have significantly influence on calving interval (Dhillon *et al*., 1970). These may be

responsible for the variation seen in CI. Furthermore, parity and season of calving have also been reported to affect the CI of Bunaji cows (Dawuda *et al*., 1988).

The age at first service in this study was 23.78 months. This is similar to the reports of Rege *et al*. (1993) and Dinka (2012) in Ethiopia but higher than the report of Kouamo *et al*. (2019) in Cameroon. In addition, it is lower than what was earlier reported in Nigeria by Voh and Otchere (1989). This may be due to better nutrition since nourishment is known to play a major role in the onset of puberty and reproductive process (Schillo *et al*., 1992; Soliman *et al*., 2014). The calf mortality rate in our study is lower than that reported by Otchere (1986) in Kaduna, Akpa *et al*. (2011) in Jigawa state, Nigeria and Yalew *et al*. (2011) in Ethiopia. The low calf mortality recorded in this study indicates good production index. Calf mortality is usually caused by poor management practice that encourages proliferation of pathogenic bacteria such as *Escherichia coli*, leading to diarrhea and finally death (Ate *et al*., 2003; Olaogun *et al*., 2016). Results from this study showed a higher pregnancy rate than the conception rate reported by Kubkomawa *et al*. (2017) in Adamawa and Kaduna states of Nigeria. Conception rate is usually less than or equal to pregnancy rate because it measures the ability to conceive, unlike pregnancy rate that measures ability to conceive. Additionally, conception rate does not account for early embryo losses. Results from this study therefore suggests better pregnancy rate for cows in Sokoto than Adamawa and Kaduna state of Nigeria.

This study also revealed that intensive system of management was more common than other systems among the herds studied. This may have contributed to the better reproductive indices for cows in Sokoto. Earlier studies by Oyedipe *et al*. (1982) showed that cattle raised under intensive system attain puberty early thereby having early age at first service and shorter calving interval than those raised under other systems. Most cattle herds in the study area were raised for milk and beef, while others are raised strictly for dairy. However, studies on reproductive performance of cattle tend to concentrate on dairy breeds (Gröhn and Rajala-Schultz, 2000), probably due to their profitability from milk production. In this study, natural service was the only method of breeding utilized by the herders for their cows despite the enormous advantages of artificial insemination (Gunawan *et al*., 2011). Lima *et al*. (2009) reported higher reproductive performance in cows naturally serviced over those artificially inseminated. However, this was attributed this to several periods of coital relationship provided by natural service, which is absent in artificial insemination. In addition, period of estrus, semen handling, and experience of the inseminator are factors affecting the success of artificial insemination (Barth, 1993). Parity has been described as a very important factor affecting reproductive performance of cattle (Voh and Otchere, 1989; Hoving *et al*. 2011). However, information on the parity of cows in this study was contradictory due to poor record keeping, and this parameter was, therefore excluded from the study.

The harmattan period was the most common calving season observed in this study. This is similar to the reports of Dawuda *et al*. (1988) as well as Voh and Otchere (1989) in Kaduna state, Nigeria. It is also similar to the reports of Rege *et al*. (1993) and Obese *et al*. (1999) in Ethiopia and Ghana, respectively. This suggests that most cows in Sokoto begin to conceive from late harmattan to early hot season. This is despite the fact that these periods are characterized by shortage of pasture due to poor quality herbage (Igbokwe *et al*., 2009). The reason for this is not clear, but is assumed to be associated with faster resumption of ovarian activities soon after calving in the dry season when strategic supplementation of their feed is practice (Osei *et al*., 1993). Almost all the herds reported history of return to oestrus. This is not unexpected since the reproductive performance of cows in Sokoto is not perfect,

and return to oestrus depends on a variety of factors such as diseases like trichomoniasis (Adeyeye *et al*., 2012).

Dystocia affects pregnancy outcome leading to decrease in pregnancy and calf survival rates. The present study revealed that dystocia was common in nearly all the herds examined, and the cases were all managed by manual traction, similar to the reports of Adeyeye and Olajide (2009). Effective management of dystocia is important in reducing calving interval and calf mortality. All the herds reported abortion, which occurred within the second trimester. Abortion affects conception and pregnancy, leading to prolonged calving to conception interval and calving interval. The causes of abortion are varied and multi-factorial. However, poor management practices provide conducive environment for the proliferation of infectious agents that may lead to loss of pregnancy (Anderson *et al*. 1990). Retained placenta was reported in all the herds in this study. Its occurrence is believed to be associated with abortion, dystocia, hypocalcaemia and twining (Jesse *et al*., 2016). Retained placenta affects calving interval as well as calving to conception intervals particularly when there is delay in managing the cow, leading to complications by secondary bacterial infections that causes metritis and mastitis (Fesseha, 2020). It was observed that there was history of prolapse in all the herds studied, with uterine prolapse as the only type of prolapse seen. In severe situations, uterine prolapse may lead to rupture of the uterus leading to sterility and render the cow unfit for breeding. This drastically reduces reproductive performance.

CONCLUSION

The study showed that the reproductive performance indices of cows raised in cattle herds in Sokoto; such as calving to conception interval, calving interval, age at first service and calf mortality as well as pregnancy rate are good. However, these parameters were affected by poor management practice, calving season, return to estrus, dystocia, abortion, retained placenta and uterine prolapse. We therefore recommend an improvement in the management and record keeping of the herds.

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