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Reproductive Performance of White Fulani, N'dama and Their Crossbred in a Hot Humid Environment

F.O. Ahamefule, J.A. Ibeawuchi, S.N. Okereke and A.C. Anyanwu
College of Animal Science and Animal Health, Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria

Abstract: The reproduction records of a herd of White Fulani (WF), N'dama (ND) and their crossbreds (WF×ND), raised semi-intensively at Michael Okpara University of Agriculture Teaching and Research Farm, Umudike, Abia State, Nigeria were evaluated within a 9 year period (1997-2005) of study. Parameters considered were age at first calving, calving interval, calving rate, birth weight and weaning weight. Results showed that all parameters investigated differed significantly ($p<0.05$) among genotype groups. Age at first calving (months) was similar ($p>0.05$) for White Fulani (48.88±0.16) and the crossbred WF×ND (48.77±0.21) but differed significantly ($p<0.05$) with the value obtained for N'dama (38.22±0.26). Calving Interval (CI) (days) was comparatively higher ($p<0.05$) for N'dama than for either White Fulani (446.88±0.16) or the crossbred WF×ND (488.77±0.12), however, the difference between the CI values obtained for White Fulani and the WF×ND was not significant ($p>0.05$). Birth and weaning weights (kg) were 19.66, 79.88; 13.93, 63.66 and 17.33, 70.88 for White Fulani, N'dama and WF×ND, respectively. These values differed significantly ($p<0.05$ among treatments. The White Fulani performed comparatively better than either the N'dama or the crossbred (WF×ND). It would appear in this study that the crossbreds performed relatively better than the N'dama in most of the reproductive parameters measured.

Key words: Reproduction performance, white fulani, N'dama, environment, Nigeria

INTRODUCTION

The significance of cattle production in Nigerian agriculture is well recognized (Olaloku, 1982). It accounts for more than 50% of Nigeria's total meat supply (RIM, 1992), provides draught power for cultivation, transport and crop threshing and utilizes resources that otherwise would been wasted such as crop residue and fallow lands. In Nigeria, cattle not only provide meat and milk for consumption or sale; their manure can also be utilized as fertilizer. Cash generated from the sale or export of animal products and by-products make substantial contribution to the foreign exchange earning of the country (Mukasa-Mugerwa, 1989). According to Nuru (1982) the social role of the cattle industry is just as significant as the economic role; for the cattle industry offers employment to million of Nigerians as rearers, traders, transporters, butchers etc.

Some cattle breeds indigenous to Nigeria include the White Fulani, Sokoto Gudali, Muturu and N'dama. These breeds are adapted to tropical conditions and are able to withstand great heat and poor diet. White Fulani is the most numerous and widely distributed in Nigeria. It is a medium breed averaging 130 cm at the withers and weighing about 340 kg per mature cow and 523 kg per mature bull (Oyedipe *et al*., 1982). N'dama is also widely distributed throughout West Africa. It has a compact well-proportioned body with a good beef conformation. It is resistant to trypanosomiasis (Maule, 1990).

Despite the economic and social importance of cattle, the productivity over the years in Nigeria has remained poor. Nutrition, thermal stress, diseases and management are some of the major constraints to production. Other factors include such reproductive limitations as late age at sexual maturity, late age at first calving, higher number of services per conception and long calving interval (Tegene *et al*., 1981; Alberro, 1983; Mukasa-Mugerwa, 1989; Sheferaw *et al*., 2003). Long calving interval reduces the total number of calves in a cow's productive lifetime. It is however influenced by nutrition, season, milk yield, parity and suckling (Buck *et al*., 1975; Das *et al*., 1999; Obese *et al*., 1999).

Another major factor affecting reproductive performance in cattle is the genetic constitution or make up of the dam. This study was carried out to evaluate the reproductive performance of three distinct genotypes of cattle; the white Fulani, the N'dama and their crossbreds, raised semi-intensively in a hot humid environment.

Corresponding Author: F.O. Ahamefule, College of Animal Science and Animal Health, Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria

MATERIALS AND METHODS

Experimental site: The study was carried out at the Teaching and Research Farm, Michael Okpara University of Agriculture, Umudike. The farm is located at about 10 km from Umuahia, the Abia State capital, Umudike bears the coordinate of 520' east and lies at an altitude of 122 m above sea level. The environment of study is situated within the tropical rainforest zone and is characterized by an annual rainfall of about 2177 mm. The relative humidity during the rainy season is well over 72%. Temperature ranges from 220-360°C with March being the warmest month. July to October represented the coolest period with a temperature range of 220-300°C.

Experimental animals and management: The University herd consists of 55 heads of cattle made up of 30 White Fulani, 5 N'dama and 20 White Fulani×N'dama crossbreds. The herd is managed semi-intensively; they graze natural pasture within the university and its environs between 8 am-12 noon and 2-4 pm daily. Supplementary feed was also provided daily after grazing and this consisted of 12% CP concentrate formulation (derived from maize offal, palm kernel cake, brewers dried grain, soya cake and bone meal) and maize silage. One kilogram of the supplement was offered daily to each mature cow (>3 years) in the dry season and 0.5 kg in the rainy season. White Fulani bulls were given 1 and 1.5 kg of the supplements per day in the rainy and dry seasons, respectively. These same bulls were subsequently allowed to run with the cows naturally (both White Fulani and N'dama). Reciprocal crosses with N'dama bulls were not possible because the latter were disadvantaged in size and this made 'mounting' inconvenient.

Data collection: The data on age at first calving, calving interval, calving rate, birth weight and weaning weights for White Fulani, N'dama and the crossbreds (WF×ND) were collected from the production records of the herd kept between 1997-2005 at the University livestock farm. Records of the total number of cows (= 3 years) in the herd each year as well as the total number of calving per year were also collected.

Analysis of data: The data collected above were subjected to Analysis of Variance (ANOVA) procedures (Steel and Torrie, 1980). Significant means were separated using Duncan's Multiple Range test.

RESULTS AND DISCUSSION

Table 1 shows the total number of cows in the herd within the period of study. There was a general increase in the total number of cows (= 3 years) from 8 in 1997 to 35 in 2005, indicating that an average of 3 cows came into sexual maturity yearly. Within genotype groups, the White Fulani and WF×ND breeder cows rose each from 3-15, while N'dama increased marginally from 2-5, within the corresponding period.

Table 1: Total number of cows in the herd

Year	Total no.	WF	ND	WF×ND
1997	8	3	2	3
1998	10	4	2	4
1999	12	5	3	4
2000	16	6	3	7
2001	20	8	3	9
2002	25	11	4	12
2003	28	11	4	13
2004	30	13	4	13
2005	35	15	5	15

Table 2: Total number of calving in the herd

Year	Total no.	WF	WF×ND	N
1997	4	2	1	1
1998	4	2	1	1
1999	6	4	1	1
2000	8	4	2	2
2001	8	5	2	1
2002	9	6	2	1
2003	9	6	2	1
2004	11	7	3	1
2005	12	8	3	1
Total	71	44	17	10

Table 3: Reproductive performance of White Fulani, N'dama and their crossbreds

Parameter	WF	ND	WFXND	SEM
Age at first calving (month)	48.88a	38.22b	48.77a	1.63
Calving interval (days)	446.88b	653.77a	488.77a	43.88
Calving rate (%)	61.21a	22.22b	49.21a	6.88
Birth weight (kg)	19.66a	13.93c	17.33b	1.38
Weaning weight (kg)	79.88a	63.66c	70.88b	2.19.

[abc]Means on the same row with different superscripts differ significantly ($p < 0.05$) WF = White Fulani; ND = N'dama; WF×ND = White Fulani×N'dama Cross

Table 2 shows the total number of calving within the experimental period. There were 71 calving made up of 44 White Fulani, 10 N' dama and 17 White Fulani×N'dama calves. This signified that 8 calves were averagely added to the herd each year. The White Fulani calves were more than twice the number of crossbreds (WF×ND) and also more than thrice the number of N'dama calves, born to the herd during the study period.

Table 3 shows the reproductive performance of White Fulani, N'dama and their crossbreds. Age at first calving differed significantly ($p<0$ .05) among the treatment groups. Values reported for White Fulani and the crossbreds (WF×ND) were similar ($p>0.05$)) but differed ($p<0.05$) from what was obtained for N'dama. Age at first calving has an influence on a cow's productive life (Mukasa-Mugerwa, 1989; Maule, 1990). Generally, early first calving increases lifetime productivity of cows (Meaker *et al*., 1980). Age at first calving is also closely related to generation interval. Under controlled breeding, heifers are usually mated, not at any visible sign of

estrous, but when they are mature enough to withstand the stress of parturition and lactation. This influences early conception after parturition. In traditional production systems however, heifers are bred at the first opportunity and this results in longer subsequent calving intervals. Heifers that have not reached their mature weight at first conception need a longer period for recovery and additional growth before they can conceive again (Oyedipe *et al*., 1982). The present result suggests that N'dama comes into sexual maturity earlier than either the White Fulani or White Fulani×N'dama crossbred because of her earlier age at first calving. Sexual maturity in cattle has inclination more to size than with age (Oyedipe *et al*., 1982). A cow's mature weight has a significant bearing on sexual maturity and subsequently age at first calving. Animals with low mature weights often show early signs of sexual maturity and that includes N'dama. N'dama is indeed a small breed, averaging about 250 kg in weight at maturity. The White Fulani is a medium breed weighing between 350-500 kg at maturity. Meanwhile the age at first calving (months) obtained for N'dama (38.2), White Fulani (48.8) and the cross (48.7) in this study is in discordance with results reported in literature. Sada (1968) and Carew *et al.* (1978) reported 39.2 and 46.5 months for N'dama in Nigeria and Sierra Leone, respectively. For White Fulani, 40.4 (Oyedipe *et al*., 1982), 49.4 (Knudsen and Sohael, 1970) and 60 (Pullan, 1979) months have been reported. There is however dearth of information on the age at first calving of F_1 crosses between these two breeds, however the scanty information available conforms to the range of 40-50 months reported (Oyedipe *et al*., 1982) for this genotype group.

Calving interval (day) also differed among treatment groups. The White Fulani and the crossbred WF×ND had lower but similar ($p>0.05$) calving intervals which however differed ($p<0.05$) from that of N'dama. Calving interval estimates the length of time between two successive calving; the longer it is, the smaller the number of calves a cow is capable of having in her life time. The present result suggests that the White Fulani or the crossbreds (WF×ND) cows were more likely to have greater number of calves in their lifetime than the N'dama. This presents an estimate of prolificacy. The calving interval (days) obtained for White Fulani (448.8), N'dama (653.7) and White Fulani×N'dama cross (488.7) in the present study is consistent with what has been reported. CI of 510-750 days has been reported for N'dama (Jeaning *et al*., 1988; Carew *et al*., 1978), 390-810 days for White Fulani (Pullan, 1979; Oyedipe *et al*., 1982) and 390-750 days for White Fulani×N'dama cross (Oyedipe *et al*., 1982; Maule, 1990).

Sada (1968) generally observed that for most Nigerian and West African indigenous cattle, calving interval shorter than 410 days are very good, those of 411-460 days are satisfactory while those greater than 461 days are unsatisfactory. Calving interval obtained for N'dama is this study was quite high and predicts low calf crop for the breed. This may explain the observed low calf crop recorded for the breed within the study period.

Calving rate (%) also differed significantly ($p<0.05$) among treatment groups. There was no significant difference ($p>0.05$) between calving rate values obtained for White Fulani and White Fulani×N'dama cross. The value obtained for N'dama was however lower ($p<0.05$) than those of either White Fulani or N'dama. High calving rate is the propensity for a large number cows bred yearly in a herd not to return on heat but to conceive and calve eventually. This is a measure of prolificacy. The result of the present study shows that the tendency for pregnancy and calve crop to result from breeding exercise is remarkably higher for White Fulani and WF×ND cows than for N'dama, in a mixed herd. Calving rates are generally low in animals raised traditionally. Nuru and Dennis (1976) calculated a calving rate of 67% for White Fulani cattle raised in a government ranch in Nigeria, compared to 34-55% recorded for similar animals raised by local farmers. Also, values obtained for N'dama and the cross (WF×ND) in this study falls within the range of what has been reported (Carew *et al*., 1978; Jeaning *et al*., 1988; Oyedipe *et al*., 1982).

Birth weight and weaning weights were significantly higher ($p<0.05$) for White Fulani calves than for WF×ND or N'dama calves. Birth weight in calves is highly correlated to survivability and accounts for 36- 60% of relative weight gain in calves before weaning and thereafter (Maule, 1990); therefore, the future development of a calf can be fairly estimated from weight at birth (Ibeawuchi, 1989). Good birth and weaning weights also determine good finishing in cattle. Large cattle breeds usually produce calves of relatively heavy birth and weaning weights, unless in situations where external influences such as environmental or disease situations confer negative influence. N'dama had the smallest weight at maturity of the three genotypes understudied. The present result also showed that N'dama calves had the lowest birth and weaning weights. This is so because birth weights and hence weaning weights are positively correlated to mature or finishing weight (Ibeawuchi, 1989).

CONCLUSION

The present result suggests that the White Fulani and the crossbred (WF×ND) performed relatively better than the N'dama, in most of the parameters evaluated. Rearing White Fulani or the cross (WF×ND) is therefore, encouraged in the hot humid zone of Nigeria where the climate favours their production; this will subsequently help to meet the animal protein need of the country.

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