The reproductive performance and milk yield of Zimbabwean indigenous and crossbred cows offered a commercial concentrate as a supplement

C. Mutisi[1], E. Garwe[1], P. Ball[2] and H. Hamudikuwanda[1]
[1]*Department of Animal Science, University of Zimbabwe, MP 167 Mt Pleasant, Harare, Zimbabwe*
[2]*Scottish Agricultural College, Auchincruive, Ayr KA6 5HW, UK*

Introduction During the mid-1980's, the government of Zimbabwe introduced farming schemes to promote smallholder milk production. The objectives of the schemes were to reduce the disparity in the supply of dairy products between the rural and urban populations and at the same time use dairying as a tool for accelerating rural development (Dairy Development Programme, 1992). However, the success of the schemes have been disappointing mainly due to the lack of adequate nutrition and the poor reproductive performance and milk yield of the indigenous and various crossbred cows found in the schemes. The majority of smallholder dairy farmers in Zimbabwe use indigenous cows and beef breeds for milk production due to the shortage of suitable dairy breeds (Francis *et al*, 1996 and Jingura, 2000). In addition, the feeds available to the animals are mainly poor quality forages (Topps and Oliver, 1993) and farmers rarely offer their cows supplementary feeding (Chigaru, 1997). The current study was therefore carried out to evaluate the reproductive performance and milk yield of crossbreds bred for milk production in Zimbabwe and to investigate their response to supplementary feeding.

Materials and methods The study was carried out at Matopos Research Station in Zimbabwe. The station is located at 20°S and 28°E in an agro ecological zone where the natural vegetation is mainly tree and bush savannah with *Hyparrhenia* and *Accacia* as the predominant grass and tree species, respectively. The mean annual rainfall at the station was 570mm with mean annual minimum and maximum daily temperatures ranging from 20°C to 30°, respectively. Forty indigenous (20 Tuli and 20 Nkone) and 40 crossbred (20 Tuli x Jersey and 20 Nkone x Jersey) cows bred at the station were used in the study. The ages of the indigenous cows ranged from 4 to 6 years. Four of the indigenous cows were in their first parity, 26 were in their second parity and 10 were in their third parity. The ages of the crossbred cows ranged from 2 to 7 years. Twelve were in their first parity, 6 were in their second parity, 8 were in their third parity and 14 were in their fourth parity. The mean body weight and body condition score of the indigenous cows was 337 ± 32 kg and 3.0 ± 0.4, respectively and the mean body weight and body condition score of the crossbred cows was 296 ± 50 kg and 1.76 ± 0.3, respectively. All the cows were under the same management unit in which they were grazed together at a stocking rate of 1LU: 15ha. They all calved during the same period prior to the experiment. The indigenous and crossbred cows were stratified according to parity and randomly allocated to two dietary regimes. The two diets were either grazing natural pastures or grazing natural pastures in addition to access to a daily supplement consisting of 2 kg of maize/soyabean based commercial dairy meal (Urelac ® 14% CP, National Foods, Zimbabwe). The cows were offered the supplement individually once a day just before milking. T he supplement was fed from calving up to a maximum of 60 days postpartum. Milking was done by hand in the morning and it commenced 5 days after calving and continued until the cows had dried off (most of the cows had dried off by 200 days) The calves were separated from the cows during the night and were only allowed to suckle during the day after the morning milking. Milk samples were collected from each cow beginning at 10 days after parturition until the cow dried off or was confirmed pregnant. The samples were collected on every Monday, Wednesday and Friday of each week. Bodyweights and body condition scores were recorded every fortnight from calving until the end of lactation. Observations for oestrus were made 3 times per day during the lactation period. At the first observed eostrus occurring on or after 60 days postpartum, the cows were presented to a bull. Survival analysis models (Everitt, 1994) for assessing the effect of breed and diet on the interval from calving to first ovulation were fitted using the Statistical Package for Social Scientists (SPSS, 1988) and the comparison between treatment groups was performed using the log- rank test. The association between pregnancy status and dietary and breed treatment combinations was determined by the Chi-square test.

Results The estimated cumulative probability of ovulation occurring by 200 days postpartum was 0.9 for crossbred cows and 0.6 for indigenous cows (Log rank statistic 12.83, $P<0.001$). The estimated probability of ovulation occurring by 200 days for the unsupplemented cows (0.75) was similar to that for the supplemented group (0.70). The mean interval from calving to first ovulation for crossbred cows was 76 ± 41 days (see Table 1) compared to the mean interval of 106 ± 38 days observed in indigenous cows ($P<0.05$). There was an interaction ($P<0.05$) between breed and diet on oestrus detection rates. Giving supplementary feeding to indigenous cows increased oestrus detection rate ($P<0.05$). The assumed pregnancy rate, the actual pregnancy rate and the calving rates were similar between the breeds ($P>0.001$). However, crossbred cows appeared to produce more milk than indigenous cows ($P<0.05$) but supplementary feeding did not have an effect on milk yield in both breeds.

Table 1 Oestrus detection rates, assumed pregnancy rate, pregnancy loss, mean milk yield, bodyweight and condition score for indigenous and crossbred cows

	Indigenous		Crossbreds	
Number of cows	20	20	20	20
Number of cows ovulating by 200 days postpartum	12	10	17	17
Mean interval from calving to first ovulation (days)	$109^{a} \pm 39$	$103^{a} \pm 40$	$80^{b} \pm 44$	$73^{b} \pm 39$
Oestrus detection rates (%)	45.5^{a}	65^{b}	44.4^{a}	45.5^{a}
Assumed pregnancy rate (%)	38.5^{a}	$4I.2^{a}$	68.2^{b}	62.5^{b}
Actual pregnancy rate (%)	34.6^{a}	35.3^{a}	59.1^{b}	56.3^{b}
Assumed pregnancy loss (%)	10^{a}	14^{a}	13.3^{a}	10^{a}
Calving rate (%)	34.6^{a}	35.3^{a}	59.1^{b}	56.3^{b}
Mean milk yield (kg/d ± SD)	$0.55^{a} \pm 0.2$	$0.61^{a} \pm 0.3$	$1.69^{b} \pm 1.02$	$1.88^{b} \pm 1.02$
Bodyweight (kg)	375^{a}	382^{a}	319^{b}	340^{c}
Body condition score	2.5^{a}	2.6^{a}	2.0^{b}	2.1^{b}

[a, b] Within a row, means lacking a common superscript letter differ ($P<0.05$).

Conclusions The study established that crossbred cows ovulated earlier, had higher pregnancy rates and produced more milk than indigenous cows. Supplementary feeding with a commercial concentrate improved oestrus detection rate in indigenous cows and bodyweight in crossbred cows.

References

Chigaru, P. 1997. Womens role in dairy industry undermined. *Financial Gazette.* Thursday 25 July 1997, pp25.

Dairy Development Programme. 1992. Agricultural and Rural Development Authority, Annual Report. Zimbabwe.

Everrit, B. S. 1994. *Statistical Methods for Medical Investigations.* Second Edition, Edward Arnold, London.

Francis, J., Sibanda, S., Østergaard, V. and Sithole, B. N. 1996. Characterization of smallholder dairy systems in Zimbabwe. In: *Proceedings of a workshop on the improvement of ruminant production.* Eds: Gomez, M. and Sibanda, S. Harare, Zimbabwe. pp 67-84.

Jingura, R. 2000. Fodder production and use of farm grown feeds in the smallholder dairy sector. PhD Thesis, University of Zimbabwe.

Topps, J. H. and Oliver, J. 1993. Animal feeds of Central Africa. *Zimbabwe Agricultural Journal Technical Handbook, No 2.* Revised Edition.