

The effect of feed supplementation on reproductive performance and milk yield of cows in a smallholder farming area of Zimbabwe

H. Hamudikuwanda¹, E. Garwe¹, P. Ball² and C. Mutisi¹

¹*Department of Animal Science, University of Zimbabwe, MP 167 Mount Pleasant, Zimbabwe*

²*Scottish Agricultural College, Auchincruive, Ayr KA6 5HW, UK.*

Introduction Reproductive performance and milk yield of cows in the smallholder farming sector of Zimbabwe are low. Calving intervals of up to two years and annual calving rates of between 30 % and 52 % have been reported (GFA, 1987; Mutsvangwa *et al.*, 1989). The poor reproductive performance has been primarily attributed to inadequate feeding (Sibanda, 1993). Few studies have assessed the effect of supplementary feeding on reproductive performance and milk yield of cows in the smallholder farming areas. While there is abundant evidence of the beneficial effects of high feeding levels on milk yield and reproductive performance in cows, the effects of low levels of supplementary feeding, as practised in the smallholder dairy sector are not clear. In addition, there is little information on the reproductive performance and the influence of supplementary feeding in cows of local breeds (Nkone and Tuli) and their crosses in the semi-arid areas. The current study was, therefore, carried out to assess the effect of low levels of feed supplementation on the reproductive performance and milk yield of cows in a semi-arid smallholder farming area of Zimbabwe.

Material and methods The study was conducted from October 1998 to July 2000 in Irisvale, Umzingwane, Zimbabwe. Irisvale is 20° S and 29° E and is at an altitude of 1300m. The annual rainfall in the area ranges from 400 to 600 mm. The mean annual minimum and maximum daily temperatures at the site are 20°C and 30°C, respectively. One hundred and twenty cows were selected for the study. They consisted of 40 Tuli, 20 Nkone, 20 Brahman, 10 Friesland x Tuli, 10 Friesland x Nkone, and 20 non-descript breeds. Twenty five farmers supplied the cows for the study. Only farms with at least two lactating cows were included to ensure that the two dietary treatments were allocated to each farm. In total, 60 cows received supplementary feeding in addition to grazing of natural pastures and 60 cows were not supplemented but accessed grazing. The estimated stocking rate on the grazing area was 1LU:20 ha. Individually supplemented cows received 2 kg/day (93 % dry matter (DM), 14 % crude protein (CP), 10.8 MJ metabolizable energy (ME)/kg) of a maize/soyabean-based commercial dairy meal once a day at milking for 180 days post-partum. All cows had access to water *ad libitum*. Pregnancy diagnosis was by rectal palpation. Calves were allowed to run with their dams after milking, but only during the day. All farmers milked their cows by hand, once a day at sunrise. Milk samples for progesterone analysis were collected from each cow every Monday, Wednesday and Friday, starting at about 10 days post-partum until 180 days post-partum. The body weight and body condition score of each cow were determined once every fortnight. Oestrus detection was conducted by farmers daily during milking and when the cows were driven to and from the paddocks. The cows on heat had access to bulls during the grazing period and in the kraals at night. The data was discarded from eight Friesland x Nkone cows that died, and six cows that lost their calves within three weeks of calving causing lactation to cease. Survival analysis models (Everitt, 1994) for assessing the effect of supplementary feeding on the probability of first ovulation in the cows were fitted. The effect of supplementary feeding on body weight, body condition score, average daily milk yield, total lactation milk yield and lactation length were analysed using repeated measures analysis of variance and the general linear model procedure. The models accounted for breed, season, herd and the random effect of the cow. The association between pregnancy status and diet, and calving status and diet were determined using the Chi-square test.

Results The probability of ovulation in the supplemented cows was higher (Log rank statistic = 3.74, $P < 0.05$) compared to that in the non-supplemented cows. The reproductive performance and milk yield data are shown in Table 1. The mean body weight, body condition score, daily milk yield, lactation yield, lactation length, and oestrus detection, conception and calving rates were higher ($P < 0.05$) in the supplemented cows compared to those in the non-supplemented cows. Supplemented cows produced approximately three times more milk than control cows. The gross margin based on milk output only was 80 % higher and calving rate per year at least 70 % higher in the supplemented than in the non-supplemented group.

Table 1 Mean body weights, body condition scores, milk yield, lactation length and reproductive performance of cows supplemented and not supplemented with concentrate

	Non-supplemented	Supplemented
No. of cows	52	60
No. of cows that had ovulated by 300 days post-partum	32	47
Mean interval from calving to ovulation (d)	132 ^a ± 63	108 ^b ± 56
Oestrus detection rate (%)	10 ^a	38 ^b
Conception rate (%) for 1999/00	35 ^a	47 ^b
Calving rate (%) for 1999/00	18 ^a	33 ^b
Conception rate (%) for 2000/01	50 ^a	80 ^b
Calving rate (%) for 2000/01	38 ^a	65 ^b
Mean body condition score	2.8 ^a ± 0.21	3.1 ^b ± 0.2
Mean body weight (kg)	391 ^a ± 64	423 ^b ± 56
Mean daily milk yield (kg)	1.26 ^a ± 0.5	3.1 ^b ± 1.1
Total lactation milk yield (kg)	252 ^a ± 1.0	698 ^b ± 1.5
Lactation length (days)	200 ^a ± 25	225 ^b ± 45

^{a,b} Within a row, means lacking a common superscript letter differ ($P < 0.05$).

Conclusion This study demonstrated that a low level of feed supplementation increased milk output and calving rate in a semi-arid smallholder farming area of Zimbabwe. The results indicate a potential avenue for the improvement of incomes and welfare of low-income farmers in semi-arid smallholder farming areas of Zimbabwe where livestock is the mainstay of agriculture.

References

- Everitt, B. S. 1994. *Statistical Methods for Medical Investigations*. 2nd Edition, Edward Arnold, London.
- GFA 1987. Study on the Economic and Social Determinants of Livestock Production in the Communal Areas- Zimbabwe. Final Report. GFA, Hamburg.
- Mutsvangwa, T., Hamudikuwanda, H. and Makoni, N.A.F. 1989. The influence of supplementary feeding of dried poultry litter on milk production and reproduction of Mashona cows in a smallholder farming system in Zimbabwe. *Zimbabwe Journal of Agricultural Research* 27: 35-43.
- Sibanda, S. 1993. Cattle feed resources and their use in the communal areas. *Zimbabwe Society of Animal Production* 37: 30-33.