Reproduction and production potential of communal cattle on sourveld in the Eastern Cape Province, South Africa

C.B. Nowers[1#], L.M. Nobumba[1] & J. Welgemoed[1]
[1]Döhne Agricultural Development Institute, Department of Rural Development and Agrarian Reform, Private Bag X15, Stutterheim, 4930, South Africa

Abstract

The effect of improved management on the reproduction and production rates of cattle in communal areas has not been quantified and compared to commercial farming. The objective of this study was to determine the reproduction and production rates of communal cattle in the sourveld areas when managed with commercial practices. Cattle from the communal sourveld farming areas of the Wartburg community were randomly divided into one of two treatment groups. One group (Communal treatment) remained in the community to be managed under communal farming practices. The other group was transferred to Döhne A.D.I. where sound commercial beef farming practices were followed (Commercial treatment). Reproduction and production parameters were recorded for the treatments from 2003 until 2010. The average calving percentage of the Commercial treatment cows and their progeny (82.6%) was significantly higher than that of the Communal treatment (35.7%). Calves reared in the communal treatment weighed only 60.9% of the live weight of calves reared in the commercial treatment. Pre-wean growth rate in the Commercial treatment was 0.721 kg/day with average cow efficiency rates of 48% compared to 0.343 kg/day and 29.5% respectively for the communal treatment. The reproduction and production data of communal cows and their progeny that were managed under commercial conditions compared favourably to that of commercial beef breeds kept under similar conditions at Döhne A.D.I. It was concluded that cattle production in communal areas can be significantly improved by implementation of commercial management practices.

Keywords: Cattle, livestock management, communal cattle, reproduction potential
[#]Corresponding author: christo.nowers@drdar.gov.za

Introduction

Even though 84% of the communal land in southern Africa has a potential for grazing, livestock production from these areas contributes little to the cash economy in terms of sales for slaughter to the market (Bembridge, 1987). The efficiency of meat, wool and milk production from communal livestock is estimated to be only a quarter of that in commercial farming due to low levels of nutrition and management in communal grazing areas (Bembridge & Tapson, 1993). The combination of climatic, topographic and geological features in the Eastern Cape province limit crop production such that about 90% of the province is rangeland used by humans for communal grazing, commercial livestock production, nature conservation and game ranching (de Wet & van Averbeke, 1995 and CSIR, 2004). The Eastern Cape is, where animal numbers are concerned, the most important province in the Republic of South Africa. The distribution of more than 8.1 million sheep with 36% in the developing areas, 2.9 million cattle and 3.1 million goats, of which 66% and 60% respectively are found in the developing areas (mostly communal farming areas), emphasize the fact that animal production and promoting animal production should be a high priority in the Eastern Cape (National Department of Agriculture, 2004).

It is generally accepted that the resource base in the communal farming areas is rapidly degrading and that communal ownership of rangelands is responsible for the deterioration of range condition, low productivity and regional poverty (Boonzaier *et al.*, 1990). In comparison with commercial beef production, communal livestock farming reflects a high level of mortality of up to 30.7%, low reproduction rates (± 48%) (Scholtz & Bester, 2010), low weaning rates (± 45%) (Bembridge & Tapson, 1993) and a low turnover. All this contribute to a very low off-take (± 3%) (Scholtz & Bester, 2010) and poor economic returns from this sector. Research reports from Ainslie *et al.* (2002), Montshwe (2006), Scholtz *et al*. (2008) and Scholtz & Bester (2010) indicate that the communal and emerging sectors have still a long way to go before reaching its full potential as compared to that realized by the commercial sector.

It is well known that environmental effects on animal production are much greater than genetic effects (Luitingh, 1978). Genetic improvement can improve production only up to the limits imposed by management and nutrition. Management is the only factor responsible for the difference in level of production between commercial and communal farmers. Very little management practices routinely done by commercial farmers, are applied in communal areas. Practices such as vaccination and tick control show high rates of adoption while carried out as a government service, but deworming and other practices are poorly adopted. The animals in these developing areas have mainly been subjected to natural selection where only the fittest survive. The effect of improved management on the reproduction and production rates of cattle in the communal areas has not been quantified and compared to commercial farming. This study was undertaken to determine and evaluate the reproduction and production potential of communal cattle in sourveld areas when they are managed under favourable commercial conditions.

Material and Methods

This study was conducted from 2003 to 2010 at the Wartburg communal land (27E 24' E, 32E 26' S) and the Döhne Agricultural Development Institute (Döhne A.D.I.) (27E 29' E, 32E 29' S). Both localities are situated in the Döhne Sourveld of South Africa (Acocks, 1988) with mean annual rainfall of 688 mm.

A steering committee, consisting of the responsible scientist and technician for the project, the departmental extension officer for the ward and nominated representatives of the Wartburg community, was established before the commencement of the project. The primary role of this committee was to take responsibility for the management of the project according to the prescribed protocol and to ensure that participating members are at all times informed and updated with regard to the progress of the project. Cattle owners from this community who wanted to participate in this project presented their cattle for screening during February 2003.

During the screening process experimental animals were selected after pregnancy diagnosis was done and all the cows with obvious functional defects and old age (estimated to be older than eight years) were excluded. Fifty eight communal cows from nine different owners were eventually selected and randomly divided into two treatment groups: a group of cows (n=29) continued to be managed under the communal farming practices at Wartburg (Communal treatment) and a group of cows (n=29) that was transferred to the Döhne A.D.I. where they were managed under commercial beef farming practices (Commercial treatment). In the Communal treatment an open breeding season was followed, no specific grazing system was applied, no specific weaning was applied and females mated with communal bulls. One Nguni and one Bonsmara bull were issued in 2003 to the Wartburg community as part of the Eastern Cape Department of Agriculture's Livestock Improvement Scheme in order to ensure that communal cows could be mated to superior genetic bulls if so desired by their owners. The Commercial group at Döhne was managed under the recommended livestock and grazing practices which included a fixed mating season (November – January) with a medium frame beef breed bull (Bonsmara), herd management practices (e.g. dipping, vaccination, supplementary feeding, replacement and stocking rate) were standardised with other beef breeds on the same locality. Animals in the Commercial treatment were only dipped when the number of engorged blue ticks (*Rhipicephalus (Boopphilus) spp.)* exceeded 50 per animal. Dipping of communal cattle is invariably carried out at communal dipping tanks as a service as part of government animal health programs.

Calves in the Commercial treatment were weaned when they reached on average 205 days of age. The same culling and replacement strategies were used as recommended and applied by commercial beef breeders. Pregnancy diagnosis was performed by means of rectal palpitation by the same experienced stockman. Cows that were not pregnant or had aborted or that did not wean a calf were culled from the Commercial group. Cows and their progeny at the two localities were continued to be managed as separate entities for the next seven years until June 2010 (potential of seven production cycles) with replacement heifers bred from the respective treatment groups.

Live weights for both localities were recorded at monthly intervals. Weaning weight was corrected to a 205-day weight in the Commercial treatment. As no physical removal of calves from their dams were practised in the Communal treatment, their weaning weight was calculated when calves reached on average 205 days of age. Birth weight of calves in the Commercial treatment was recorded within 48-hours. Birth weight of calves born in the Communal treatment was determined during weekly visits. Dipping frequencies, mortality rates and reproduction and production data were recorded for both treatment groups.

Calving percentage (CP), Corrected 205 Day weight (Corr. 205 D), average daily gain (ADG) and cow efficiency (CE) were calculated, using the following equations:

$$\text{Calving percentage (CP)} = \frac{Number\ of\ cows\ calved}{Number\ of\ cows\ mated} \text{ x } 100$$

$$\text{Cow efficiency (CE)} = \frac{Weaning\ weight\ of\ calf}{Cow\ weight\ at\ weaning} \text{ x } 100$$

$$\text{Average daily gain (ADG)} = \frac{Weight\ gained}{Number\ of\ days}$$

$$\text{Corrected 205 Day weight (Corr. 205 D)} = \frac{Weaning\ weight\ of\ calf}{Age\ of\ calf\ at\ weaning} \text{ x } 205$$

Standard analyses of variance were performed on reproduction and production data and Tukey-Kramer multiple comparison test and Student's t-LSD were calculated at the 5% significance level to compare treatment means (NCSS, 2007).

Results and Discussion

Cattle owners in the communal farming areas can have their cattle dipped fortnightly during the summer period and monthly during the drier winter periods. This dipping frequency show high adoption rates as this service is rendered and subsidized by the Eastern Cape government animal health programs. Therefore, cows and their calves in the Communal treatment were more frequently dipped than those in the Commercial treatment, as shown in Table 1. The dipping frequency of the cows and young animals (< 12 month of age) managed under communal conditions were similar and showed that communal cattle owners dipped their cattle irrespective of the tick burdens. The Communal group were dipped on average 14 times a year (varied from 8 – 18 times an annum) whereas the cows in the Commercial group were not dipped more than three times a year (Table 1). This frequent dipping of communal cattle can result in the development of acaricide resistance (Nolan, 1990 & Rajput *et al.*, 2006) and loss of their natural immunity against tick-borne diseases, especially redwater and gallsickness. This was found not to be the case in this study as only one cow mortality in the Commercial treatment was confirmed during 2004 to be due to the transmission of tick-borne diseases (redwater) (Table 2).

Table 1 Dipping frequency of cows and their progeny for the Communal and Commercial treatments

Year	Communal (Wartburg community)		Commercial (Döhne A.D.I.)	
	Cows	Calves < 12 months	Cows	Calves < 12 months
2003	11	11	1	-
2004	12	12	3	2
2005	12	12	3	3
2006	12	12	3	1
2007	18	18	2	2
2008	15	15	2	3
2009	19	19	2	1
2010*	8	8	2	2
Average	14	14	2.25	1.75

* Trial was terminated during June 2010

The annual mortality rates of cows and calves in the respective treatments from 2003 until June 2010 are presented in Table 2. The average cow mortalities in the Communal treatment were just over 13% and 0.9% in the Commercial treatment. The cow mortality rate of Communal treatment cows (13.1%) is similar to the herd mortality rate of 13.0% in two communal areas found by Bembridge & Tapson (1993) and

slightly lower that the herd mortality of 16.7% reported by Bembridge in 1987 in the Transkei. The average mortality rate of 26.7% of young calves over seven years in the Communal treatment is similar to the calf mortality rate (26.8%) reported by Bembridge (1987) but lower than the 30.7% reported by Scholtz & Bester (2010) and the pre-weaning mortality of 50% that is sometimes quoted for the communal sector (Clark *et al*., 2005). Such high mortalities represent a significant effect on the profitability of cattle farming and the mortality rate in a herd is a direct reflection of management efficiency. The maintenance of adequate records by communal farmers in this study was poor as they ascribe most of the mortalities to tick-borne disease. This was despite the fact that tick control via dipping of communal cattle is offered as a free government service. The pre-weaning mortality of 1.6% for the Commercial treatment is lower than the accepted levels of 4% in the commercial sector in South Africa.

Table 2 Annual percentage mortalities of cows and their progeny in the Communal and Commercial treatments

Year	Communal (Wartburg community)		Commercial (Döhne A.D.I.)	
	Cows	Calves < 12 months	Cows	Calves < 12 months
2003	15.4	11.6	0	-
2004	8.0	33.0	3.3	3.1
2005	8.7	28.6	3.1	0
2006	11.3	25.0	0	0
2007	20.8	28.6	0	0
2008	15.2	29.0	0	3.6
2009	12.2	31.3	0	3.5
2010*	9.2	12.1	0	0
Average	13.1	26.7	0.9	1.6

* Trial was terminated during June 2010

The reproductive performance of beef cattle under communal farming conditions is low, taking calving percentage as a measure of production (Bembridge, 1987; Bembridge & Tapson, 1993; Nthakheni, 1993; Mokantla *et al*., 2004; Scholtz & Bester, 2010). Table 3 shows the calving percentages of the communal cows under the two different management systems over a seven year period. The average calving percentage of 35.7% in the Communal treatment is similar to the findings of Clark *et al.* (2005) who reported calving percentages in the communal sector in the region of 40% but lower than the calving percentages of between 43% and 64% reported by Madzivhandila *et al*. (2007). The calving percentages reported in this study for communal beef farming are also in agreement (34.9%) with findings from a survey used to estimate the calving percentage in different sectors (Scholtz & Bester, 2010).

Table 3 Calving percentage for cows in the Communal and Commercial treatments

Year	Communal management (Wartburg)		Commercial management (Döhne A.D.I.)	
	Calving %	Re-conception %	Calving %	Re-conception %
2003	38.5^{a}		42.3^{a}	
2004	52.0^{a}	36.4^{a}	88.0^{b}	90.9^{b}
2005	48.0^{a}	38.5^{a}	84.0^{b}	86.4^{b}
2006	29.6^{a}	8.3^{a}	69.0^{b}	72.9^{b}
2007	37.0^{a}	25.0^{a}	80.0^{b}	83.9^{b}
2008	27.2^{a}	24.5^{a}	93.8^{b}	90.9^{b}
2009	21.4^{a}	19.5^{a}	68.8^{b}	71.4^{b}
2010*	34.4^{a}	26.2^{a}	93.6^{b}	85.5^{b}
Average	35.7^{a}	25.2^{a}	82.6^{b}	83.9^{b}

^{a,b} Means within rows with different superscripts differed significantly (P <0.01)

* Trial was terminated during June 2010 but pregnancy status confirmed by rectal palpitation

The calving percentage (35.7%) in the Communal treatment was lower (P <0.01) than the calving percentage (82.6%) of cows managed in the Commercial treatment. This emphasizes the tremendous potential that exists in communal areas for improving their reproduction rates by applying optimal management practices. During 2003 similar reproduction rates were found (P >0.05) but this is due to the start of the study in 2003. The re-conception rates (number of cows that conceived for two consecutive years) did also significantly differ between the two management systems (Table 3). The average calving percentage (82.6%) of the cows in the Commercial treatment was considerably higher than the 60.8% reported by Scholtz & Bester (2010) for the commercial sector and higher than the accepted norm of between 55% and 65% in national commercial herds.

The very low adaption rates of cattle management practices such as winter supplementary feeding, effective control of internal and external parasites, culling and selection were all contributing factors towards the large difference in reproduction rates between the two treatments. No selection of best genetic material was done by communal farmers in the Communal treatment and all heifers born were retained as replacements. Cows with poor fertility were not culled and management of nutrition was absent with no supplementary feeding provided and malnutrition was subsequently deemed to be the most important cause of the low reproduction rates. Cows calved down throughout the year which is the result of females exposed to bulls throughout the year. The kraaling of cattle at night by livestock owners of the Communal treatment contributed negatively towards production as animals regularly stay confined until mid-morning whereby prime early-morning grazing time was reduced.

Data in Table 4 show that, except for birth weights, all other production parameters differed between treatments (P <0.01). The higher than expected birth weight of calves born in the Communal treatment can be ascribed to new born calves weighed during weekly visits. The majority of the communal cows originally used in both treatments were of the medium-frame type and cows calving in the Communal treatment were generally in good condition due to their long intercalving periods.

Table 4 Production data (± SE) of cows and progeny for the Communal and Commercial treatments

Parameter	Communal management (Wartburg)	Commercial management (Döhne A.D.I.)
Birth mass (kg)	$32.3^{a} \pm 1.91$*	$29.4^{a} \pm 1.41$
Corrected 205 day weight (kg)	$107.6^{a} \pm 3.67$	$176.4^{b} \pm 4.64$
Pre-weaning ADG (kg/day)	$0.343^{a} \pm 0.079$	$0.721^{b} \pm 0.022$
Cow efficiency (%)	$29.5^{a} \pm 1.15$	$48.9^{b} \pm 1.91$

[a,b] Means within rows with different superscripts differed significantly (P <0.01)
* Birth mass recorded on weekly basis

The average Corr. 205 D weight of calves in the Communal treatment (107.6 kg) at Wartburg community was 68.8 kg less than that of the calves born under commercial management (176.4 kg) at Döhne A.D.I. (P <0.01). This constitutes only 60.9% of the Corr. 205 D of the weight of calves in the Commercial treatment. The pre-weaning ADG was subsequently also significantly lower for the calves reared in the Communal treatment (Table 4). The CE of cows in the Communal treatment (29.5%) was extremely low and this can largely be attributed to the very low weights and poor condition of calves at weaning. The reason for this could be ascribed to the communal milk production system where farmers mostly utilize beef cows for milk production with less milk available for suckling calves. This impacted negatively on the growth rate of calves.

The reproduction and production rates of the cattle in the Commercial treatment compares favourably with that of pure beef breeds (Nguni and Bonsmara) managed under similar conditions and management practices at Döhne A.D.I. The calving percentage of 82.6% of cows in the Commercial treatment (Table 3) were comparable to that achieved by pure-bred Nguni cows over the same period (85.7%) and even higher than those of the Bonsmaras (74.4%) on Dohne Sourveld. The production potential of communal cows managed under commercial practices seems to be higher than that of a small-frame breed (Nguni) but lower than a medium-frame breed under sourveld conditions. This observation correlates with the frame sizes of

the non-descript communal cows. The Corr. 205 D mass of 176.4 kg of the Commercial treatment was higher than the 153.4 kg of Döhne Nguni calves but lower than that of Döhne Bonsmara calves (192.7 kg). The CE of the cows in the Commercial treatment (48.9%) was higher than both the Nguni (43.6%) and Bonsmara (41.6%) breeds managed commercially at Döhne A.D.I. This is ascribed to the relative high weaning weights of calves and smaller body frame of cows in the Commercial treatment.

Conclusion

Findings from this study emphasises the importance of the adoption of optimal management practices by communal cattle farmers to increase production from their livestock. The adoption of sound management practices, as practised under commercial conditions, can result in an improvement of approximate 40% in both the reproduction and production performance of communal cattle in a very short period. Several communities, such as the one involved in this study, has in the past benefitted from Livestock Improvement Schemes by receiving bulls of superior genetic quality. However, it is well known that genetic improvement can improve production only up to limits imposed by management and nutrition. This does not mean that genetic improvement should be neglected but rather that aspects such as animal health and management practices in the communal sector be urgently addressed to improve production from this sector.

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