THE EVALUATION OF BREEDING STRATEGIES WITH THE OBJECTIVE OF ENHANCING SUSTAINABLE BEEF PRODUCTION IN NAMIBIA

J.M. Lepen
AGRA (Co-operative) Limited, P/Bag 12011, Windhoek, Namibia

INTRODUCTION

Livestock production is the most important agricultural activity in largely all Southern African countries. Appropriate breeding strategies are therefore extremely important in maintaining sustainable livestock production. The breeding strategy to be followed in Southern Africa in general, and in Namibia in particular, depends primarily on the environment and level of management. As far as the environment is concerned, beef production in Namibia is often practiced under unstable and hazardous production conditions. In addition, sustainable bee production is considerably threatened by either bush encroachment or desertification. With regard to management, it is a reality that a substantial number of subsistence producers from the more undeveloped areas in Namibia recently entered the beef production arena. In these areas a low level of management is usually practiced and the level of nutrition is such that it cannot provide high demands. On the other hand, production is relatively high in the commercial sector and comparable with developed countries. However, commercial farmers experienced enormous increases in production costs against a slower increase in beef prizes. Therefore, in order to meet these challenges, it has become essential for producers to organize themselves in good time to ensure sustained productivity.

Due to the continuous deterioration in beef production environments it was extremely critical to review and re-evaluate different breeding strategies in order to satisfy the following objectives:

- Develop a long-term breeding strategy suited to both communal and commercial production environments,
- Improve sustained productivity
- Produce a product as close to the optimum marketing stage (age and condition) as economically and environmentally feasible and
- Produce a high productive yield per unit area.

MATERIAL AND METHODS

In consultation with animal scientists in the Republic of South Africa, it was decided to evaluate the following breeding strategies as illustrated in diagram 1. The project commenced in January 1992 and the comparisons have been based on the biomass principle developed by Van Schalkwyk (1974). The research is conducted at the Omatjenne Research Station (20?24'S latitude, 16? 29'E longitude) situated in a sweet bushveld savanna in the central parts of Namibia. The average annual rainfall is 395mm.

SYSTEM A :

- SMALL FRAME
- Sanga (indigenous)

PURE

- MEDIUM FRAME
- Bonsmara(synthetic)

BREEDING

- LARGE FRAME
- Simmentaler (dual purpose)

SYSTEM B : (ALL PROGENY ARE SLAUGHTERED)

- SMALL FRAME (PURE BRED)

DAM LINES

Indigenous Sanga cows

TERMINAL CROSS BREEDING

- MEDIUM FRAME (PURE BRED)

Indigenous Afrikaner Cows

SIRE LINES

- PURE BRED BULLS

-Simmentaler -Charolais
-Santa Gertrudis -Hereford

SYSTEM C :

TWO BREED RATIONAL CROSS BREEDING

BRAHMAN
X
SIMMENTALER

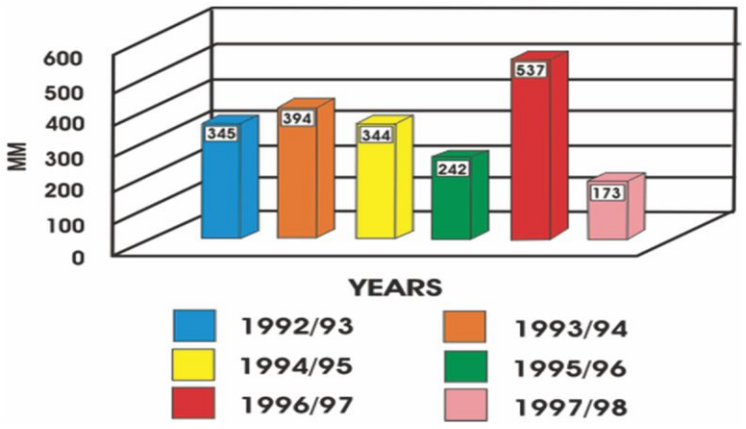

Fig. 1 Average rainfall from 1993/93 to 1997/98

Table 1: Number of breeding cows & total biomass mated (1992-99)

BREEDING GROUP	N	BIOMASS MATED (KG)								
		1992	1993	1994	1995	1996	1997	1998	1999	Total
SIMM	31	14 895	15 231	14 991	15 567	15 358	12 995	15 456	118 753	118 753
BONSMARA	36	15 021	15 434	16 805	15 814	16 080	15 492	17 022	126 992	126 992
SANGA	45	14 941	15 590	15 808	15 082	15 202	14 328	15 321	120 912	120 912
AFRIKANER TERMINAL	35	14 987	14 612	14 912	14 704	14 217	12 996	14 533	114 982	114 982
SANGA TERMINAL	45	14 990	15 670	16 584	15 129	15 120	14 086	15 530	122 646	122 646
SIM X BRAHMAN	36	15 437	15 745	16 572	16 114	15 751	14 145	17 001	125 933	125 933

RESULTS AND DISCUSSIONS

BREEDING GROUP	1992	1993	199 4	199 5	199 6	1997	199 8	199 9	AV (%)
SIMM	96.0	90.0	90.9	93.5	84.4	87.5	87.9	50.0	85.0
BONSMARA	97.0	89.0	92.1	97.2	91.9	87.2	92.1	63.1	88.7
SANGA	91.0	100. 0	95.9	91.1	89.6	97.9	95.9	78.8	92.5
AFRIKANER TERMINAL	97.0	77.0	82.0	80.0	74.2	81.2	73.0	68.9	79.2
SANGA TERMINAL	97.0	96.0	91.8	86.6	89.6	100. 0	94.9	86.5	92.8
SIM X BRAHMAN	94.0	89.0	89.7	91.0	86.5	94.3	78.4	64.9	88.9

Data is given as means over a period of eight years (1992-99). The number of breeding cows in each breeding group and cow biomass mated since 1992, are presented in Table 1. Over the period under review the biomass of both the pure Simmentaler and Afrikaner terminal breeding groups varies somewhat more in drier years, while the other groups slightly increased in biomass during years of high rainfall.

(Table 1.) This tendency could be ascribed to the fact that these two groups were perhaps under more stress due to their higher demands.

REPRODUCTIVE EFFICIENCY

The average calving percentage of the different breeding groups is reported in Table 2. Table 2 shows that all the breeding groups attained an excellent average calving rate of above 85%, except in the case of the Afrikaner terminal group averaging 79.2%. This exceptionally high calving rates can be attributed to the fact that all the breeding groups were continuously subjected to optimal levels of management and nutrition. It must be emphasized that Omatjenne Research Station is situated in a sweet bushveld savanna area with exceptionally high quality grazing throughout the year.

However, the exceptionally high fertility of both the pure Sanga en Sanga terminal groups is apparent from Table 2 and in agreement with other reports (Hetzel, 1998; Lepen, 1988; Scholtz, 1988; Schoeman, 1989; Moyo, 1990; Lepen, 1992). It is interesting to note that there was no actual difference between the calving rates of Sanga cows that suckled pure Sanga or Sanga crossbred calves and thus, concurs with results obtained by Scholtz, Lombard & Roux (1993).

The Afrikaner terminal group suckled pure Afrikaner calves during the first mating season (1992) during which they were exposed to larger frame bulls and obtained a calving percentage of 97,2% (Table 2). The calving percentage however, dropped to 77,1% in 1993 and to 81,0% in 1994, when they suckled crossbred calves (Table 2). Therefore, it appears as if the Afrikaner cows have experienced an additional drain, probably due to the suckling of heavier crossbred calves resulting in longer lactation anoestrus periods.

PRE-WEANING PERFORMANCE AND FETAL DYSTOCIA

The average birth mass and birth mass ratio of the different breeding groups are shown in Table 3. A greater percentage of fetal dystocia was experienced within the larger frame breeding groups (Simmentaler &Simmentaler and Brahman crossbeds) probably due to relatively higher birth masses, 42kg and 37 kg respectively. This is despite of favourable

Birth mass ratios for the Simmentaler (8,2%) and the Simmentaler and Brahman crossbred cows (8.1%). Contrary to that, the Afrikaner terminal group experienced limited and the Sanga terminal group no calving difficulties, despite extremely unfavourable birth mass ratios of 8,9 and 9,8% respectively. These results are in support of results confirmed by Scholtz et al., (1993). Pure Sanga calves had an average birth mass of 29kg and the Sanga crossbred calves an average of 34 kg, 17.2% heavier than the purebreds.

The Sanga cows therefore restricted the birth mass of the crossbred calves well below 15.5%, the mid parent value of 35,5 kg in the case of pure Simmentaler calves. This, together with the results of Greogory et al., (1978) and Scholtz et al. (1993) is an indication that maternal restriction of offspring birth sizes may be evident if the difference between sire and dam lines are large enough. The Bonsmara and pure Sanga breeding groups showed no incidence of fetal dystocia.

Table 3: Birth mass and birth mass ratio

BREEDING GROUP	BIRTH MASS (KG)	COW MASS (KG)	RATIO (%)
SIMM	42	515	8.2
BONSMARA	35	468	7.4
SANGA	29	357	8.1
AFRIKANER TERMINAL	39	437	8.9
SANGA TERMINAL	34	348	9.8
SIM X BRAHMAN	37	459	8.1

Table 4: Mortality and weaning percentage

BREEDING GROUP	CALVING (%)	MORTALITY (%)	WEANING (%)
SIMM	90.4	5.9	85.1
BONSMARA	92.4	4.1	88.3
SANGA	94.2	1.7	92.5
AFRIKANER TERMINAL	81.9	3.6	78.3
SANGA TERMINAL	93.5	2	91.5
SIM X BRAHMAN	90.7	4.7	86.4

WEANING PERFORMANCE

The weaning masses of the different groups are indicated in Table 4. From Table 4 it is clear that the pure Sanga and Sanga terminal groups produced calves with the lowest weaning masses (244 and 249kg). The crossbred calves weaned by the Sanga terminal group were 13.6% heavier than the pure Sanga calves. However, taking into account the total weaning mass produced over the period of eight years (1992-00), summarized in Table 4, it is evident that the Sanga terminal (56 624 kg), pure Sanga (52 314.4 kg) and the Simmentaler and Brahman crossbreds (51 839.4 kg) produced the highest total weaning mass, followed by the Bonsmara (48 855.6 kg), Simmentalers (44 470.4 kg) and the Afrikaner terminal group (42 886.2 kg).

The lower total weaning mass produced by the Afrikaner terminal group can be attributed to a relatively lower calving rate.

The performance of the terminal sires mated to the Sanga and Afrikaner terminal groups is presented in Tables 5 and 6, respectively. In respect of the Sanga terminal group, the Simmmentaler and the Charolais bulls produced more calves, 67 and 63 respectively, over the eight year period, than the Hereford (61) and the Santa Gertrudis (58). However, the Santa Gertrudis produced the heaviest weaners (214 kg), followed by the Hereford (211 kg), Simmentaler (208 kg) and the Charolais (207 kg). In the case of the Afrikaner terminal group, the Simmentaler bulls again, produced the largest number of calves (49), followed by the Charolais (47), Hereford (31) and the Santa Gertrudis (31). Moreover, the Simmentaler weaned the heaviest calves (241 kg) followed by the Charolais (239 kg), Santa Gertrudis (238 kg) and the Hereford (237 kg). Thus, in respect of both terminal groups, Simmentaler bulls produced the largest number of calves, whereas the Santa Gertrudis produced the heaviest calves.

Table 5 Average weaning mass and cow productivity

				PRODUCTIVITY	
BREEDING GROUP	WEANING MASS (KG)	TOTAL WEANING MASS (KG)	COW MASS AT WEANING (KG)	WEANING MASS/COW MASS (%)	PER 100 KG COW MASS MATED
SIMM	244	44 470.4	511	47.7	33.6
BONSMARA	232	48 855.6	504	46.0	34.3
SANGA	177	52 314.4	408	43.4	38.8
AFRIKANER TERMINAL	222	42 886.2	461	482.0	33.2
SANGA TERMINAL	201	56 624.0	393	511.0	40.9
SIM X BRAHMAN	249	51 839.4	496	502.0	36.6

COW PERFORMANCE

Cow productivity calculated in terms of weaning mass produced per 100 kg cow mass exposed, is illustrated in Table 7. With regard to weaning mass produced per 100 kg cow mass exposed, the Sanga terminal (40.9 %), pure Sangas (38,8 %) and the Simmentaler and Brahman crossbreds (36,6 %) were the most productive groups, followed by the Bonsmaras (34.3 %), Simmentalers (33.6 %) and the Afrikaner terminal group (33.2 %). Therefore, terminal crossbreeding with small indigenous cows may succeed in improving the output of beef cattle farming as demonstrated by Scholtz et al. (1993).

POST-WEANING VELD PERFORMANCE

Oxen were slaughtered on an age constant basis (21,27 & 33 months). The live and carcass weight, dressing percentage and grading are summarized in Tables 8,9 and 10. At 21 months, as given in Table 8, the Simmentaler and Brahman crossbreds (197 kg) produced the heaviest carcasses, the Bonsmara (184 kg), Simmentaler (179 kg) and Afrikaner terminal (178 kg) intermediate and the Sanga terminal (169 kg) and pure Sanga (147 kg) the lowest carcass weights. All the carcasses, with the exception of the Bonsmara and to a lesser extent the pure Sanga, were too lean at a slaughter age of 21 months. The Simmentaler car asses were exceptionally lean.

At 27 months the carcass weights of the Simmentaler and Brahman crossbreds, Afrikaner terminal group, Simmentaler, Bonsmara and Sanga terminal varied between 246 and 219 kg, while those of the pure Sanga were 177 kg. The dressing percentages for all the oxen varied between 50.7 % and 53.5 %. The Simmentaler and Brahman crossbred oxen were the heaviest (246 kg) and had the highest dressing percentage of 53.5 %. The Simmentaler carcasses were still too lean, while those of the other groups grade fairly well.

In the case of the 33 months slaughter point the carcasses of the Simmentaler and Brahman crossbreds, Afrikaner terminal and the Bonsmara were the heaviest, 289 kg, 274 kg and 271 kg respectively. The Simmentaler (268 kg) and Sanga terminal (258 kg) groups intermediate, while those of the Sangas were the lightest (209 kg). The Sanga crossbreds (52.5 %); Simmentaler and Brahman crossbreds (52,3%) and the Afrikaner crossbreds (51,6 %) attained the highest dressing percentage, followed by the Bonsmara (51.3 %); Pure Sangas (51,2%) and the Simmentalers (50.1%). The carcasses of the Bonsmaras were too fat, while all the other groups, except the Simmentalers, graded exceptionally well.

Table 7: Carcass traits of oxen slaughtered at 21 months

BREEDING GROUP	N	AV. MASS (KG)	CARCASS MASS (KG)	DR ES. (%)	AV. GRADE	NS/ KG	AV RETURN (NS)	TOTAL RETURN (NS)
SIMM	19	381	179	471	A0.00	6.91	1 238	23 517
BONSMARA	27	381	184	484	A1.75	7.65	1 407	37 985
SANGA	37	306	147	482	A1.60	7.45	1 095	40 497
AFRIKANER TERMINAL	24	366	178	485	A1.10	7.55	1 344	32 266
SANGA TERMINAL	33	348	169	49	A1.00	7.24	1 223	40 345
SIM X BRAHMAN	30	396	197	497	A1.00	7.42	1 461	43 830

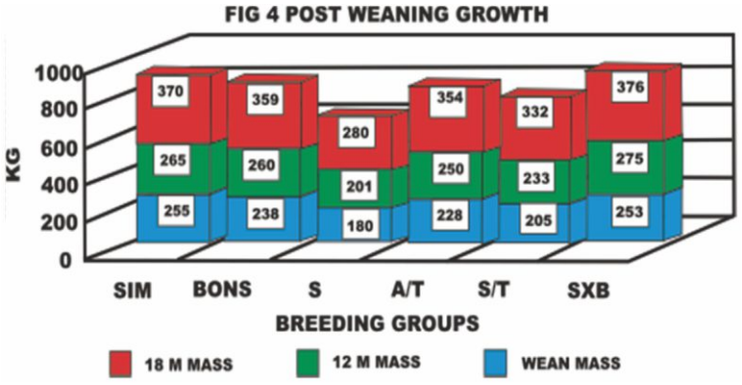

Table 8: Carcass traits of oxen slaughtered at 27 months

BREE DIN G GROUP	N	AV. MAS S (KG)	CA RC ASS MA SS (KG)	DR ES. (%)	AV. GR ADE	NS / K G	AV RETUR N (NS)	TOTAL RETUR N (NS)
SIMM	23	452	229	50.7	B0.6	7	1 610	37 026
BONSMARA	31	441	229	51.9	B2.8	7.9	1 817	56 317
SANGA	41	343	177	51.5	B2.4	7.7	1 356	55 577
AFRIKANER TERMINAL	27	447	235	52.6	B2.0	7.9	1 855	50 076
SANGA TERMINAL	34	419	219	52.3	B2.0	7.7	1 684	52 270
SIM X BRAHMAN	30	460	246	53.5	B1.5	7.7	1 883	56 476

Table 9: Carcass traits of oxen slaughtered at 33 months

BREEDING GROUP	N	AV. MASS (KG)	CARCASS MASS (KG)	DR ES. (%)	AV. GRADE	NS/ KG	AV RETURN (NS)	TOTAL RETURN (NS)
SIMM	18	534	268	501	B1.1	6.8	1 817	32 709
BONSMARA	20	529	271	513	B3.7	7.3	1 987	39 733
SANGA	26	409	209	51.2	B3.2	7.3	1 523	39 587
AFRIKANER TERMINAL	14	531	274	51.6	B2.6	7.5	2 057	28 796
SANGA TERMINAL	28	491	258	52.5	B2.5	7.4	1 918	53 692
SIM X BRAHMAN	23	553	289	523	B2.4	7.5	2 160	49 685

Table 10: Productivity of terminal sires

SIMMENTALER	HEREFORD	SANTA GERTRUDIS	CHAROLAIS
67.0	61.0	58.0	63.0
25.1	22.8	21.7	23.6
33.2	33.6	33.4	33.8
208	211	214	207
227	227	231	224
337	333	335	327

Table 11: Carcass traits of oxen slaughtered at 21 months

TERMINAL SIRE	LIVE MASS (KG)	CARCASS MASS (KG)	GRADING	DRESSING %	NS/HEAD
SIMMENTALER	360	173	A0.3	48.0	1 242.36
HEREFORD	361	176	A1.0	118.7	1 277.26
SANTA GERTRUDIS	360	174	A1.2	48.3	1 310.94
CHAROLAIS	349	174	A0.7	49.8	1 219.70

Table 12: Carcass traits of oxen slaughtered at 27 months.

TERMINAL SIRE	LIVE MASS (KG)	CARCASS MASS (KG)	GRADING	DRESSING %	NS/HEAD
SIMMENTALER	425	221	B1.3	52.0	1 651.94
HEREFORD	411	218	B2.2	53.0	1 732.07
SANTA GERTRUDIS	427	223	B2.0	52.2	1 798.91
CHAROLAIS	416	217	B1.2	52.2	1 687.46

Table 13: Traits of oxen slaughtered of 33 months

TERMINAL SIRE	LIVE MASS (KG)	CARCASS MASS (KG)	GRADING	DRESSING %	NS/HEAD
SIMMENTALER	513	267	B2.0	52.0	1 963.66
HEREFORD	496	257	B2.5	51.8	1 930.08
SANTA GERTRUDIS	484	254	B2.3	52.5	1 988.70
CHAROLAIS	472	254	B2.3	53.8	1 853.70

CONCLUSION

Preliminary results presented, show that although purebreds such as the Bonsmara and Sanga performed exceptionally well, crossbred cattle may be more productive on condition that appropriate breeding strategies be practiced under certain circumstances.

33 Months old pure SAnga oxen with carcass weights of approximately 210 kg.

As purebred, Simmentalers will thus be best suited for weaner production which is in support of other authors such as Els (1988), Van Zyl (1990) and Lepen (1992). In addition to that, it is clear that the Simmentaler may play a prominent role in crossbreeding systems and specially as sire line in terminal crossbreeding.

Futhermore, the results support the view of other reports (maule, 1973; Trail et al., 1977; Hetzel, 1988; Scholtz, 1988 and Maree & Casey 1993) that indigenous breeds should form the cornerstone of sustainable livestock production in harsh and undeveloped or communal areas.

At a higher lever of management input consideration could be given to the Bonsmara as it combines adaptiveness and relatively high productivity. Els (1988) and Van Zyl (1990) also find the Bonsmara as a productive pure bred and even recommended Bonsmara –type cows for crossbreeding.

Different straight- and crossbreeding results analysed by Venter, Van Zyl and Coertze (1987) proved that Brahman and Simmentaler crosses perform Excellently under extensive conditions which is also concluded in this report. It is however true that the potentially higher fertility of large crossbred cows, can only be utilized at a higher level of nutrition and management (Scholtz, 1988). Furthermore, Scholtz (1988) is of opinion that the continuous production of crossbred cows requires large managerial inputs.

Various authors (Venter et al., 1987; Hetzel, 1988; Scholtz, 1988) stated that the role of indigenous African types eg.

The Sanga or Nguni in different breeding systems demands futher investigation. So far, several studies in Africa, as reviewed by Hetzel (1988) and confirmed by Scholtz et al., (1993), proved that the Sanga, due to their adaptation, exceptionally high fertility and disease resistance, is ideally suited to be utilized as dam lines in terminal crossbreeding in more developed areas with a more complicated level of management. This research also found the Sanga group, mated to large frame bulls, as the most productive breeding group and is thus in agreement with previous reports by Hetzel (1988) and Scholtz et al., (1993). Calving difficulties are absent and due to the high fertility and lower maintenance requirements of the smaller dam, which produces large offspring, a higher productivity is realized.