A critical look at the use of exotic bulls in traditional beef farming in Botswana

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Data of indigenous and exotic bull breeds used between 1987 and 1995 were available from Rarnatlabama Bull Stud and Artificial Insemination Laboratory. The bull breeds include indigenous breeds: Tswana, Tuli, Bonsmara and Africander and exotic breeds: Brahman, Simmental, Hereford, South Devon, Santa Gertrudis, Friesian, Charolais, Pinzgauer, Sussex, Gilbviech and Jersey. These bulls were used in natural service (n = 6352 ± 3047 bulls per year) and artificial insemination (n = 5261 ± 1410 semen straws per year). Analyses of the data revealed that throughout the study period significantly ($p < 0.05$) more exotic bull breeds were used in natural service (94.9 ± 2.2% vs 5.1 ± 2.2% per year) and as semen (94.1 ± 3.2% vs 5.9 ± 3.2% per year) than indigenous bull breeds. Brahman bulls (56.5 ± 5.4% per year in natural service, 54.4 ± 6.6% per year in artificial insemination) were the highest in demand compared to other exotic (38.4 ± 6.6% per year in natural service; 39.7 ± 8.6% per year in artificial insemination) and indigenous bull breeds (5.9 ± 2.2% per year in natural service; 5.1 ± 2.2% per year in artificial insemination). The demands for Brahrnan and other exotic bull breeds were significantly ($p < 0.05$) higher than those of indigenous bull breeds in both natural service and semen collection. Such results are consistent with the promotion of the use of exotic bulls over this period through the government bull subsidy scheme and artificial insemination. This promotion was carried out after research showed that crossbred progeny sired by exotic bull breeds had higher productivity than progeny sired by indigenous bull breeds. Crossbreeding should not be practised under the traditional farming system. Under this system paddocks are not fenced hence breeding is not controlled, management expertise is mediocre in most cases, farmers can not afford to supplementary feed animals and farmers can not also afford high veterinary care for their crossbred animals. Comparatively, farming the pure Tswana under the traditional system is advantageous since this breed is acclimatised to the harsh climatic conditions of Botswana and thrives under conditions where crossbreds would produce far below their genetic potential.

Keywords: beef farming, crossbreeding, bulls and traditional farming

Introduction

Crossbreeding has been practised for a number of years with very little control in Botswana. Senyatso & Masilo (1996) estimated that the pure Tswana herd now makes up only 50% of the national herd, which means 50% of the national herd is crossbred. Crossbreeding in Botswana has been encouraged both by the distribution of bulls through a subsidy scheme and by the operation of an artificial insemination scheme (Livestock and Range Research in Botswana Annual Report, 1979). From a long-term genetic point of view it is not clear why crossbreeding has been encouraged at all especially under the communal area/traditional farming system.

Traditional farming is practised on communal or tribal areas where fencing is not allowed, hence there is no controlled breeding. Comparatively, commercial or freehold land is fenced, hence there is controlled breeding. Under the traditional production system, most of the effort should have been

directed to purebred Tswana selection, given that genetic progress from within breed selection is permanent and cumulative (Simm, 1987). More importantly, the purebred Tswana has advantages over crossbreds because it is adapted to the hot harsh climate of Botswana, it can withstand the poor quality and quantity nutritional stress for most of the year with poor management and low veterinary care. Hence its more suitable for communal production than crossbreds.

Information on the relative use of exotic to indigenous bull breeds is scarce in Botswana. Therefore, the purposes of this study were to:

(i) find out what breeds of indigenous and exotic bulls (i.e. European and those not from Sub-Saharan Africa) have been used in Botswana over the period 1980–1995;

(ii) whether the number and composition of indigenous and exotic bulls has changed over this period.

Materials and methods

Data were sourced from the Ramatlabama Bull Stud and Artificial Insemination Laboratory. The data comprised bulls used in natural service and artificial insemination (A.I.) over the period 1987 to 1995. Means were judged to be significantly different ($p<0.05$) based on the t-test.

Results and Discussion

The numbers of bulls used in natural service and artificial insemination are shown in Tables 1 and 2 respectively. These bull breeds include indigenous breeds: Tswana, Tuli, Bonsmara and Africander and exotic breeds: Brahman, Simmental, Hereford, South Devon, Santa Gertrudis, Friesian, Charolais, Pinzgauer, Sussex, Gilbviech and Jersey.

The use of exotic bull breeds in Botswana has been significantly ($p < 0.05$) higher than that of indigenous bull breeds in natural service (94.9 ± 2.2% vs 5.1 ± 2.2% per year) and as semen (94.1 ± 3.2% vs 5.9 ± 3.2% per year) (Tables 1 and 2). This is because local or indigenous bull breeds have not been promoted for crossbreeding by the Government through the Department of Animal Health and Production, Gobuamang (1996). This is because Lethola *et al.* (1983) found that local breeds were genetically similar therefore no heterosis effects of significance could be expected. Comparatively, exotic breeds were genetically dissimilar to Tswana hence positive heterosis effects could be expected from crossbreeding. Therefore, the Department of Animal Health and Production promoted the use of exotic breeds to cross with Tswana cows.

Fluctuations of bull breed demand both as natural or semen evidently might be due to several reasons. Firstly, personal preference, as farmers' interests and priorities depend on their breeding aims (Kapele, pers. comm.). The choice of bull breeds by farmers is mainly determined by farmers with the technical assistance from Animal Health and Production staff. Secondly, drought was experienced in some of the years; in 1987 to 1988 and 1991 to 1992 (Kapele, pers. comm.). During drought periods farmers brought less numbers of cattle for insemination at artificial insemination centres. Lastly, there was lack of proper record keeping from 1973 to the 1980s at the Ramatlabama Bull Stud and Artificial Insemination Laboratory (Kapele, pers. comm.). Therefore, there is a missing or incomplete trend of bulls used during this period.

Although the use of Brahman bulls (56.5 ± 5.4% per year in natural service; 54.4 ± 6.6% per year in artificial insemination) and other exotic bull breeds (38.4 ± 6.6% per year in natural service; 39.7 ± 8.6% per year in artificial insemination) did not differ significantly ($p > 0.05$), the former bull breed was in more demand than the latter bull group. Comparatively, the use of these two bull groups was significantly ($p < 0.05$) higher than that of indigenous bull breeds (5.9 ± 2.2% per year in natural service; 5.1 ± 2.2% per year in artificial insemination) (see Tables 1 and 2). This is

Table 1 Total numbers of indigenous and exotic bull breeds used throughout the country from 1987–1995. The figures in parentheses show the percentage contribution of each bull breed towards the total number of bulls each year

	Year								
Bull breeds	1987	1988	1989	1990	1991	1992	1993	1994	1995
Bonsmara*	40	243	260	686	267	229	60	76	104
	(1.1)	(3.1)	(2.8)	(5.1)	(4.9)	(4.9)	(1.6)	(1.5)	(2.4)
Brahman	**2086**	**4603**	**5333**	**7483**	**3191**	**2839**	**2363**	**2144**	**2265**
	(59.0)	**(59.1)**	**(57.8)**	**(56.0)**	**(58.6)**	**(60.9)**	**(61.9)**	**(43.1)**	**(52.1)**
Charolais	874	1318	1446	1113	648	738	157	467	784
	(24.7)	(16.9)	(15.7)	(8.3)	(11.9)	(15.8)	(4.1)	(9.4)	(18.0)
Pinzgauer	–	–	–	–	–	–	56	95	73
							(1.5)	(1.9)	(1.7)
Simmental	367	824	1390	3057	862	236	541	1161	531
	(10.4)	(10.6)	(15.1)	(22.9)	(15.8)	(5.1)	(14.2)	(23.3)	(12.2)
Santa Gertrudis	24	652	513	747	337	185	88	273	107
	(0.7)	(8.4)	(5.6)	(5.6)	(6.2)	(4.0)	(2.3)	(5.5)	(2.5)
Sussex	–	–	–	–	–	–	–	311	45
								(6.3)	(1.0)
Tswana*	–	–	25	194	30	135	22	26	12
			(0.3)	(1.5)	(0.6)	(2.9)	(0.6)	(0.5)	(0.3)
Tuli*	22	36	162	91	108	50	121	42	41
	(0.6)	(0.5)	(1.8)	(0.7)	(2.0)	(1.1)	(3.2)	(0.8)	(0.9)
Friesian	100	–	–	–	–	245	410	340	372
	(2.8)					(5.3)	(10.7)	(6.8)	(8.6)
Hereford	–	–	103	–	–	–	–	24	–
			(1.1)					(0.5)	
South Devon	24	106	–	–	–	–	–	–	–
	(0.7)	(1.4)							
Africander*	–	–	–	–	–	4	–	17	12
						(0.1)	–	(0.3)	(0.3)
Total	3537	7782	9232	13371	5443	4661	3818	4976	4346
Exotic (%)**	98.2	96.4	95.2	92.7	92.6	91.0	94.7	96.8	96.1

* — Indigenous bull breeds, the rest are exotic. The Brahman figures are bolded to show the high demand. Dashes (–) indicate numbers which were not available. ** = (total number of exotic bulls/ total number of bulls) × 100

because the Brahman-Tswana and other crossbred progeny (e.g. Simmental-Tswana) outperformed the pure Tswana progeny by 6–11% in terms of weaning and 18-month weights under the same level of management. Furthermore, cows' crossbred progeny had a higher calving percentage (83-85% vs 80%) with lower mortality (5.3-6.9% vs 8.2%), resulting in these cows having a higher production index (113–123% vs 100%) than pure Tswana cows (APRU, 1980). This led to the rec-

Table 2 Total numbers of semen straws used at artificial insemination camps throughout the country from 1990 until 1995.The figures in parentheses show the percentage contribution of semen straws from each bull breed towards the total number of semen straws each year

	Bull breeds**												
Year	**Br**	Sm	Sg	Bo*	Ts*	Fr	Ch	Pz	Sx	Tu*	Af*	Gb	Js
1990	**4168**	1199	256	506	194	41	603	–	–	91	–	–	–
	(59.1)	(17.0)	(3.6)	(7.2)	(2.7)	(0.6)	(8.5)			(1.3)			
1991	**3191**	965	337	267	30	298	692	–	–	108	14	–	–
	(54.1)	(16.4)	(5.7)	(4.5)	(0.5)	(11.7)			(1.8)	(0.2)			
1992	**2906**	427	185	229	135	375	880	–	–	50	4	–	–
	(56.0)	(8.2)	(3.6)	(4.4)	(2.6)	(7.2)	(17.0)			(1.0)	(0.1)		
1993	**3332**	762	68	60	22	410	355	51	–	123	–	26	7
	(63.9)	(14.6)	(1.3)	(1.2)	(0.4)	(7.9)	(6.8)	(1.0)		(2.4)		(0.5)	(0.1)
1994	**2883**	1295	273	76	26	330	730	80	311	42	17	8	14
	(49.9)	(22.4)	(4.7)	(1.3)	(0.5)	(5.7)	(12.6)	(1.4)	(5.4)	(0.7)	(0.3)	(0.1)	(0.2)
1995	**1055**	327	42	5	12	385	526	–	29	36	–	10	3
	(43.4)	(13.5)	(1.7)	(0.2)	(0.5)	(0.5)	(21.6)		(1.2)	(1.5)		(0.4)	(0.1)

** Br = Brahman, Sm = Simmental, Bo = Bonsmara, Af = Afrikander, Tu = Tuli, Sg = Santa Gertrudis, Fr = Friesian, Ts = Tswana, Ch = Charolais, Pz = Pinzgauer, Sx = Sussex, Gb = Gelbvieh and Js = Jersey. * Indigenous bull breeds, the rest are exotic. The Brahman figures are bolded to show the high demand. Dashes (-) indicate numbers which were not available.

ommendation by APRU that Brahman bulls and other exotic bull breeds are suitable for crossbreeding with indigenous cows. What is not reported in the APRU study is the veterinary care of crossbred animals which is higher than that of indigenous pure breeds. Such information is important for small-scale farmers who can hardly afford any extra expenses on veterinary care. There is also a need to assess the performance of crossbreds under small scale farming conditions, i.e. low veterinary care and no supplementation and not on the conditions of APRU publications where the opposite was true.

The lower performance of the pure Tswana than the crossbreds does not make it an inferior breed. The poor productivity of local breeds has been observed under poor traditional management. Therefore, these breeds have been regarded as unproductive and rejected for farming purposes. However, raised under improved management, local breeds can be quite productive given that they have never been selected for high production. For example, the pure Tswana breed exhibited its superiority over the Brahman in calving percentage (80 vs 72%), mortality percentage in two years (9 vs 19%) and weight of 18-month-old calf per cow per year (213 vs 181 kg) under range conditions (APRU, 1980). More importantly, indigenous cattle are well adapted to the local environment. This environmental adaptation is particularly important in respect of resistance to local endemic diseases and the ability to withstand nutritional stress during the dry season (Buck *et al.*, 1982), hence the need of low veterinary care and little or no supplementation. Therefore, the Tswana cattle breed should be managed better than at present in small-scale farming and for the long term future it should be selected for high productivity because of its outstanding features which are climatic adaptation, high calving percentage and low mortality.

Conclusions

The bulls used during the period of study include: indigenous breeds, Tswana, Tuli, Bonsmara and Africander and exotic breeds; Brahman, Simmental, Hereford, South Devon, Santa Gertrudis, Friesian, Charolais, Pinzgauer, Sussex, Gilbviech and Jersey. Demand for exotic bull breeds has been consistently higher than that for local bull breeds over the period of study.

Trends of the use of exotic bull breeds in natural service and artificial insemination have consistently shown the Brahman bulls to be in highest demand with other combined exotic bull breeds being intermediate and indigenous bull breeds being the least in demand.

Recommendations

Crossbreeding should not be practised under the traditional farming system, since paddocks are not fenced and breeding can not be controlled. Furthermore, under this farming system, there is usually a lack of management expertise, farmers can not afford to supplementary feed animals and farmers also can not afford high veterinary care for their animals. Hence farming pure Tswana is ideal under this system, since this breed thrives under conditions typical of this system because it is acclimatised to the harsh conditions of Botswana.

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