

# **BEEF CATTLE BREEDING IN BOTSWANA WITH PARTICULAR REFERENCE TO THE ESTABLISHMENT OF THE MINISTRY OF AGRICULTURE'S RESEARCH PROGRAMME IN 1970**

**L'élevage de bétail à viande en Botswana, en faisant une référence particulière à l'établissement du Programme d'Investigation du Ministère de l'Agriculture en 1970**

**La cría de vacuno de carne en Botswana, con especial referencia al establecimiento del Programa de Investigación del Ministerio de Agricultura en 1970**

J. C. M. TRAIL \*

## **BACKGROUND TO BEEF PRODUCTION IN BOTSWANA**

The Republic of Botswana covers some 570,000 Km<sup>2</sup> at a mean altitude of 1000 m, with about 84 % of the land surface being Kalahari sand. The climate is continental, arid to semi-arid, with mean maximum temperatures rising to 31 °C in December and January, when diurnal variation is about 13 °C . The mean rainfall is 400 mm per year, but the distribution is erratic. Over 90 % of the total rainfall falls between October and March.

The rangeland of Botswana basically consists of a number of bush and tree savannah types with the grasses generally being of low productivity. Certain grass species remain palatable in the dry season and these together with some bush species enable cattle to maintain weight through the dry season if sufficient food is available. The estimated carrying capacity varies from 6 to 20 hectares per livestock unit. The national beef cattle herd totals around 2 million animals.

The Botswana Meat Commission (B.M.C.) has a monopoly on the slaughter of all cattle destined for export. It's one abattoir can handle over 1000 head per killing day. From 1966 to 1973 the B.M.C. slaughtered an average of 135,000 head per year, reaching 209,500 in 1973, in which year 75 % was exported as boneless beef.

## **BACKGROUND TO CATTLE AND BREEDING POLICIES PRIOR TO 1970**

The three basic cattle types are Tswana, Africander and Tuli, all members of the stabilised Sanga grouping. About 75 % are indigenous Tswana type and 20 % Africander, many imported in the past from the Republic of South Africa by

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(\* ) UNDP Office, P. O. Box 54, Gaborone, Botswana.

European farmers. A small proportion of Tulus are found, this breed having developed in the south west of Rhodesia from 1946 onwards, the foundation animals having been rather similar to some Tswana types.

Prior to 1970, the Botswana Government had for a number of years encouraged the use of Africander, Tuli, Brahman and Simmental bulls on Tswana cows, both by the sale of bulls through a subsidy scheme and through the operation of an artificial insemination scheme. However, no information was available on the performances of the crossbred progeny and the bulls themselves were selected solely on visual examination.

In May 1970 an integrated research programme commenced, covering animal management, nutrition, breeding and range management. As far as beef cattle breeding research was concerned, the general approach was similar to that of most logical programmes in developing countries, with initial work planned in three main areas:

- a) Performance testing of major types to determine their qualities.
- b) Performance testing of best types for continued improvement.
- c) Exploitation of heterosis effects through crossbreeding.

In view of the past involvement of Government assistance in artificial insemination, bull subsidy, and loans for cattle purchase, there were a number of immediate requirements.

1) As far pure breeds were concerned, the indigenous Tswana, the Africander introduced in large numbers from South Africa, and the more recent and much less numerous Tuli had to be evaluated.

2) Objective performance testing systems had to be organised so that animals sold back to the industry through the various Government schemes would be genuinely superior stock.

3) Breed types being used for crossbreeding with the indigenous Tswana had to be evaluated.

The general management conditions under which this breeding work was to be organised were defined as requiring firstly a degree of fencing so that breeding herds could be controlled, young stock separated and standing hay retained for dry season feeding; secondly attention to disease control and mineral supplementation and thirdly adequate water supplies within reasonable distance.

Sixteen ranches which prior to 1970 had been operated by different sections of the Ministry of Agriculture were brought together to form a network of Government beef cattle ranches stretching throughout Botswana. The husbandry and management methods employed on all stations were standardised and each station carried at least two breeds or crosses. The total area involved is 40,000 ha, the 13 stations carrying breeding herds range in size from 1500 to 6000 ha. There are 5,000 head of cattle including more than 1500 breeding cows. A field unit is continually engaged in tying in results achieved by unimproved farms with the results achieved on this network of stations.

A great deal of effort was put into evolving a data handling and analysis system that permits the simplest possible recording at ranch level, the minimum of opportunity for human error thereafter, the accurate adjustment of data for environmental effects and the rapid production of the information on which management decisions are based. In summary this involves the despatch of

information from each ranch at very frequent intervals to a central data handling unit where after checking and preliminary adjustment on a microcomputer the information is transferred on to punch cards. The data are then added to the main files on magnetic tape in an ICL 1902 computer which automatically updates and manipulates all herd information from birth to final disposal. Young stock listings are produced at birth, weaning and 18 months for all stations and at these three stages all animal weights are automatically adjusted by least squares for environmental effects within stations and animals are ranked within stations and breeds. Breeding cow lists are similarly updated automatically with calving results and calf weaning performances. Thus rapid and accurate decisions on culling, replacement and sale of surplus stock can be made.

#### PRELIMINARY RESULTS OF BREEDING RESEARCH PROGRAMME

##### a) *Evaluation of Tswana, Africander and Tuli breeds*

Three stations in the network maintain herds of Africander and Tuli cattle, while three others maintain herds of Africander and Tswana. All animals of similar age groups are run together except for breeding cows during the 90 day service period. The three important traits being evaluated at the present time are calving percentage, growth and mortality.

*Calving percentage.*—Table 1 lays out the calving percentages for the three years 1971-73, corrected for station, year, cow age and previous parous state effects.

TABLE 1  
CALVING PERCENTAGES OF TSWANA, AFRICANDER AND TULI BREEDS

Breed	No. of cows presented	Calving percentage
Tswana ... ..	261	71 a
Africander ... ..	1124	66 a
Tuli ... ..	271	88 b

The Tuli had a significantly higher calving percentage ( $P < 0.01$ ) than both Africander and Tswana.

*Growth.*—Table 2 lays out birth and weaning weight for the 3 years 1971-73 and 18 month weights for 1972-73, all after adjustment for environmental effects.

TABLE 2  
WEIGHTS OF TSWANA, AFRICANDER AND TULI BREEDS (Kg)

Breed	Pre-weaning			Post-weaning	
	No.	Birth wt.	Weaning wt.	No.	18 m. wt.
Tswana ... ..	178	31.3	172	97	270 ab
Africander ... ..	866	30.4	165	577	263 a
Tuli ... ..	225	29.8	166	128	277 b

The only significant difference was that the Tuli was heavier than the Africander at 18 months of age ( $P < 0.05$ ).

*Mortality.*—Mortality rates to one year of age were 5.9 % for Tuli, 6.0 % for Tswana and 9.9 % for Africander. The Africander mortality rate was significantly higher ( $P < 0.05$ ) than both Tuli and Tswana.

*Productivity.*—A comparison of the three breeds on the basis of «weight of weaner calf produced per cow per year», combining the effects of calving percentage, early growth and mortality, showed that over the three years 1971-73 the Tulis produced 138 Kg, the Tswanas 115 Kg and the Africanders 99 Kg of weaner calf per cow per year.

*Quality of Africanders in Botswana and Republic of South Africa.*—In 1971 a progeny test was organised to compare the growth of progeny of 3 Africander bulls that had been widely used in Botswana, with the progeny of the 2 Africander bulls offered from 1970-1973 by a major Artificial Insemination Centre in the Republic of South Africa. The progeny group comparisons, after adjustment for all environmental effects, are shown in Table 3.

TABLE 3  
COMPARISON OF BOTSWANA AND SOUTH AFRICAN AFRICANDER BULLS ON BASIS OF PROGENY 18 MONTH WEIGHTS

Sire	No. of progeny	18 month wt. (Kg)
Botswana 134 ... ..	20	260 a
Botswana 132 ... ..	27	240 b
R. S. A. 145 ... ..	18	237 b
Botswana 129 ... ..	20	237 b
R. S. A. 148 ... ..	34	236 b

On the basis of progeny 18 month weight, 2 Botswana bulls and the 2 South African bulls were identical in breeding value while the third Botswana bull was superior to the 4 other sires ( $P < 0.01$ ).

Thus at this stage, the first objective information on performance of the 3 main breeds in Botswana suggests that the indigenous Tswana and the more recently developed Tuli are superior to the Africander under the «reasonably acceptable level of management» practised on the network of Government ranches in Botswana. There is no evidence to suggest that further importation of Africander stock from the Republic of South Africa will lead to improved cattle performance, thus farmers in Botswana should certainly not be encouraged to replace their Tswana stock with Africanders.

b) *Performance testing for continued improvement within breeds*

All animals on the network of stations (1000 + per year) are automatically ranked on weight-for-age at 18 months. The very best males are used as replacement sires for Government herds and for semen collection for the A.I. scheme. The remainder of the 50 % that proved average or above are sold back to the industry through a subsidy scheme.

c) *Evaluation of Tuli, Bonsmara, Brahman and Simmental breeds for crossbreeding*

The Tuli obviously had to be evaluated for crossing on to the indigenous Tswana, while information available from adjoining countries suggested the Brahman as the best representative of the Zebu breeds, the Simmental as representative of the large European breeds and the Bonsmara as the representative of the recently developed breeds. Five stantions maintain a herd of pure Tswanas and a herd where one or more of the above 4 sire breeds are crossed on to Tswana females. The preliminary growth results available in 1973 are shown in Table 4.

TABLE 4  
BIRTH, WEANING AND 18 MONTH WEIGHTS OF CROSSBREDS (KG)

Crossbred	No.	Birth wt.	Weaning wt.	No.	18 month wt.
Simmental × Tswana ... ..	137	34.4 a	191 a	33	319 a
Brahman × Tswana ... ..	92	34.1 a	189 a	10	292 b
Bonsmara × Tswana ... ..	116	32.2 b	172 b	55	278 bc
Tuli × Tswana ... ..	42	31.6 b	169 b	13	278 bc
Tswana × Tswana ... ..	229	31.3 b	172 b	65	270 c

In 1973, the preliminary crossbreeding results, together with more subjective assessment of the few Brahman herds in Botswana, have led to the general encouragement of the use of Brahmans for crossing on to Tswana females by the extension services of the Ministry of Agriculture.

#### SUMMARY

The establishment in 1970 of a beef cattle breeding research programme under the semi arid and extensive grazing conditions of Botswana is described. The aims were to evaluate, through performance testing, the 3 main cattle types, Tswana, Africander and Tuli; to set up performance testing facilities so that stock sold to farmers from Government stations would be of superior quality; and to investigate the exploitation of heterosis through crossbreeding.

Preliminary results suggest that the Tswana and Tuli are superior to the Africander and importation of Africanders from the Republic of South Africa to replace Tswana stock should not be encouraged. Successful performance testing systems within breeds have been established on the Government network of ranches and only bulls proven above average on weight at 18 months are sold or used for A.I. Initial growth results from crossbreeding Tswana cows with Simmental, Brahman, Bonsmara and Tuli are presented.

#### RESUME

On décrit l'établissement d'un programme d'investigation sur l'élevage de bétail à viande, réalisé en Botswana en conditions semi arides et de pâturage extensif, au cours de l'année 1970. Les objectifs furent: évaluer par l'étude de la conduite, les trois types principaux de bétail: Tswana, Africander et Tuli; établir une série

de facilités dans l'étude de la conduite, de façon que les animaux vendus aux fermiers qui procédaient de stations du Gouvernement, fussent de qualité supérieure; et faire de recherches sur l'exploitation de l'hétérose par le moyen de croisements inter-races.

Les résultats préliminaires suggèrent que les types Tswana et Tuli sont supérieures à l'Africander, et qu'on ne devrait pas appuyer l'importation de ce dernier de la République de l'Afrique du Sud pour remplacer le stock qui existe en Tswana. Dans les réseaux de ranchs du Gouvernement, on a établi avec succès, de systèmes d'étude des conduites chez les différentes races, et on n'a vendu ou utilisé pour A. I. que ces taureaux qui surpassaient clairement la moyenne de poids après 18 mois. On présente les résultats initiaux de croissance provenant du croisement de vaches Tswana avec Simmental, Brahman, Bonsmara et Tuli.

### RESUMEN

Se describe el establecimiento de un programa de investigación sobre la cría de ganado de carne realizado bajo condiciones semiáridas y de pasto extensivo en Botswana a lo largo de 1970. Los objetivos fueron evaluar mediante el estudio del comportamiento los tres tipos principales de ganado: Tswana, Africander y Tuli; establecer una serie de facilidades en el estudio del comportamiento de tal forma que los animales vendidos a los granjeros procedentes de estaciones gubernamentales fuesen de calidad superior, e investigar la explotación de la heterosis por medio de cruzamientos inter-razas.

Los resultados preliminares sugieren que los tipos Tswana y Tuli son superiores al Africander, y que no se debería apoyar la importación de este último de la República de Africa del Sur para reemplazar al stock existente de Tswana. Dentro de las redes de ranchos del Gobierno se han establecido con éxito sistemas de estudio de los comportamientos dentro de las distintas razas, y sólo se han vendido o usado para A. I. aquellos toros que rebasaban claramente el promedio de peso a los 18 meses. Se presentan los resultados iniciales de crecimiento provenientes del cruzamiento de vacas Tswana con Simmental, Brahman, Bonsmara y Tuli.