

THE PERFORMANCE OF BRANGUS CATTLE IN SANTA CRUZ, BOLIVIA

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In the period 1964 to 1980, a herd of Brangus was maintained at pasture, with almost no access to supplements except for common salt. In this period, 316 calving intervals showed a mean of 402 ± 96.4 days, which corresponds to a theoretical 90.85 fertility. Mortality from birth to weaning was 14% of calves born. Birthweights were 29.7 ± 5.32 kg and 28.1 ± 5.38 kg, and 205 day corrected weights were 145.3 ± 32.99 kg and 138.3 ± 26.88 kg for males and females respectively. These figures suggest a sex correction factor of 1.06 for birthweights and 1.05 for 205 day weights. The 205 day weights were low in the period 1970-1976 due to over-stocking, and the achievable aim should be 160 kg for bull calves.

In order to assess post weaning performance and productivity of pastures in three consecutive dry seasons, Brangus bull and heifer weaners of 8 - 10 months were grazed on Green Panic and Green Panic - Glycine pastures, and in two dry seasons, similar animals were also grazed on Yaragua. The animals were set-stocked at 3 beasts/ha, equivalent to 1.3 Animal Units (AU)/ha at the start of each dry season. During the subsequent rains they were formed into two herds, one of males and the other of females to graze in the general farm rotation. Both males and females grew slower on Green Panic than on the other pastures. Within the males this difference in liveweight was maintained throughout the subsequent rains, while the females showed a compensatory growth effect which nullified the effect of the dry season grazing. Yaragua supported 1.2 AU/ha compared with 1.3 and 1.5 AU/ha from the Green Panic and Green Panic plus Glycine. Productivity from the three pastures respectively was about 0.6, 0.4 and 1.0 kg/ha/day. With good pastures, males should reach a "laughter weight" of 400-500 kg at 30 months of age while females should reach bulling weight by 24 - 26 months, to calve at 3 years. If legume based pastures are scarce they should be reserved for growing males.

Key words: cattle, Brangus, calving interval, birthweights, 205 day weights, post weaning liveweight gain, grasses, grass/legume mixtures

Brangus animals were imported into Bolivia from the USA on a number of occasions from 1955 onwards. The Saavedra herd was formed from original female importations, their descendants, and three young bulls imported in 1965 from the USA specifically for the purpose (Barba and Lora 1965).

The herd remained at Saavedra until the beginning of 1980. This paper describes an analysis of the data available for the period 1964 - 1979.

Materials and Methods

The Estacion Experimental Agricola de Saavedra is situated 65 km north of the city of Santa Cruz de la Sierra, Bolivia, at latitude $17^{\circ}14'S$ longitude $63^{\circ}10'W$, and altitude 320 m above sea level. There is a cool, dry season between May and August and 73% of the annual rainfall occurs between October and March. The long term annual average (29 years) is 1195 mm, but in the three years of weaner growth the annual totals were 946, 1782 and 1526 mm.

Animals. The breeding herd which was established at Saavedra in 1964 consisted of 26 mature cows, 7 of which were part of the original 1955 importation from USA. The herd also included 6 heifers, 1 old herd bull and 3 young, newly imported bulls.

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From this base it expanded, with no further importations, to about 70 cows with their followers in the latter years of the project. Artificial insemination was practised, using semen from USA to prevent inbreeding. A breeding season was immediately established in 1965 with the removal of the bull in March. In subsequent years, mating took place for 3 - 4 months in the period from September to January, in order to calve down in June to September and to wean at about 8 months of age in the following March to May.

In the Saavedra herd, the ratio of bulls to cows was generally between 5 - 8%.

In order to assess post weaning performance, measurements were made during 3 consecutive years from mid 1977. Bull and heifer calves born in June - August were weaned in the following March to April at 8 - 10 months of age. They were routinely vaccinated against endemic diseases and sprayed to control ectoparasites (ticks) when it was noted that they were heavily infested (about every 2 months). They had permanent free access to rock salt but no other supplement was given. Males and females were randomly assigned to graze either Yaragua, Green Panic alone or Green Panic plus Glycine, and liveweights were measured at 14 day intervals after overnight fasting.

Animals spent the dry season (May - October) under a set-stocking regime in their respective paddocks, but in the following rains (November - April) they were formed into two herds, one of males and the other of females, and were rotationally grazed under normal farm management. In each year the stocking rate at the start of the dry season was established at approximately 1.3 AU/ha (IAU = 400 kg liveweight).

Pastures, normal farm grazing. Pasture species used varied with soil type, and originally were mainly *Hyparrhenia rufa* (Nees) Stapf (Yaragua), with small areas of *Pennisetum purpureum* Schumach (Elephant grass) and *Digitaria decumbens* Stent. (Pangola grass) but the last two named species were soon replaced by *Panicum maximum* Jacq. In the period from 1966 the legumes *Glycine wightii* (R. Grah. ex Wight and Arn.) Verde. and *Macroptilium atropurpureum* (DC) Urb became widely distributed on the farm. Pastures were never fertilised. These pastures were used for the breeding herd all the year and for the weaned calves during the wet season.

The following pastures were utilised in each dry season during the 3 year assessment of post-weaning performance. No fertilizers were used on any of them. They were mechanically slashed and rested for 4 weeks prior to the entry of the animals,

Green Panic only : This paddock was sown in 1970 and in the period 1977 - 1980 it was almost pure Green Panic but with 4% of the area dominated by the unpalatable grass *Digitaria insularis* (L) Fedde.

Green Panic Glycine Association: Two areas of this association were used, both having been sown in 1970. They were very similar in botanical composition which remained stable over the trial period. At the start of the grazing period in each year (May) legume content was estimated at 40%, Green Panic at 45% and 15% other species, mainly woody shrubs, but with some patches of *Paspalum notatum* Flugge.

Yaragua: This paddock was sown in 1972 and during the assessment period it was almost pure Yaragua with a few shrubs and broad-leaved weeds, Some natural legumes, mainly *Desmodium* spp. made a limited contribution to available grazing.

Animal nutrition: The Brangus herd was always kept on pasture with almost no access to concentrates or conserved fodder. In general, common salt was the only supplement, although at times a mineral mix of salt, bonemeal and iodine was provided. A supplement of maize, soya and bonemeal, or of cottonseed cake was offered at weaning in most years.

Records: Although records regarding the breeding herd are incomplete, each animal was tattooed and weighed at birth and branded at weaning. The date of calving, the number of the calf and its birthweight were recorded individually for each cow, and weaning dates and weights were also noted. From this information, calving intervals and weaning weights corrected to 205 days were calculated. Where any doubt existed, for example as to the exact birth weight of a specific calf, the doubtful information has been discarded.

Results

Although it is difficult from the available records to determine the number of cows mated in each year, calving intervals may be calculated, and these are presented by year in Table 1 and by distribution in Figure 1.

Table 1:
Production parameters for a Brangus herd in Santa Cruz, Bolivia

Parameters	Mean \pm s.d.	Number of observations	Period of observations
Calving interval (days)	402 \pm 96	316	1966-1970 and 1973-1979
Implied fertility (%)	90.8	316	
Birthweight (kg)			
Males	29.7 \pm 5.32	309	1965-1970 and 1972-1979
Females	28.1 \pm 5.38	248	
Corrected 205 day weaning weight (kg)			
Males	145.3 \pm 32.99	225	1965-1970 and 1972-1979
Females	138.3 \pm 26.88	174	

The variations in the numbers of observations in Table 1 are due to incomplete data, but in 1965-70 and 1975-79, of a total of 421 fully recorded births, 59 calves (14.0%) did not survive to weaning, and this figure, in conjunction with the implied fertility shown in Table 1 would suggest that 100 cows put to the bull should wean 78 calves under the best conditions found at Saavedra.

Figure 1: Calving intervals: distribution and culmulative %

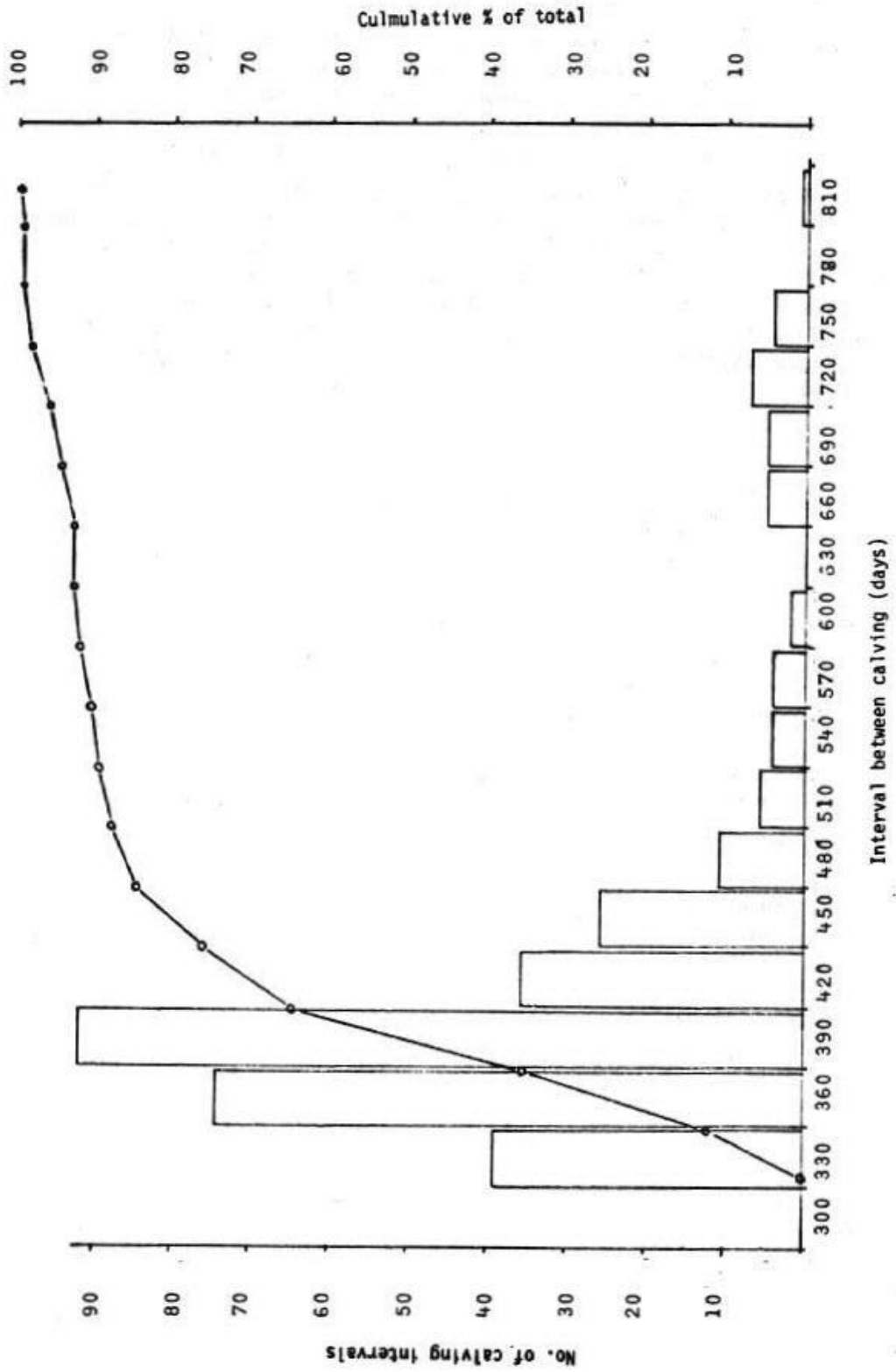


Table 2:
Performance of *Btanguus* weaners on different dry season pastures

Parameter	1977/78			1978/79			1979/80		
	Green Panic cine	GP/Gly cine	SE (±)	Green Panic cine	GP/Gly cine	SE (±)	Green Panic cine	GP/Gly cine	SE (±)
Start of dry season									
Initial weight (kg) 8-10 months									
Female	166 ²	146		167	169	7.7	162	165	162
Male	186	189	11.29	177	179	7.7	175	170	172
Initial grazing pressure (AU/ha) ¹	1.33	1.31		1.38	1.48	1.37	1.31	1.32	1.32
Dry season grazing period									
(days)	180	180		155	155		88	88	88
Dry season LMG (kg/day)									
Female	0.19 ²	0.29		0.09	0.20	0.044	0.02	0.16	0.20
Male	0.16	0.40	0.31	0.12	0.24	0.044	0.19	0.24	0.22
Wet season grazing period									
(days)	186	186		195	195		98	98	98
Wet season LMG (kg/day)									
Female	0.62 ²	0.41		0.47	0.39	0.029			
Male	0.40	0.45	0.022	0.55	0.53	0.029	0.60	0.60	0.58
Total grazing period (days)									
	366	366		350	350		186	186	186
Average LMG (kg/day)									
Female	0.41 ²	0.35		0.30	0.30	0.027	0.09 ³	0.20 ³	0.14 ³
Male	0.28	0.43	0.041	0.36	0.40	0.027	0.40	0.43	0.41
Final weight (kg) 20-22 months									
Female	315 ²	275		274	275	14.1			
Male	290	346	12.9	314	331	14.1			

¹ One Animal Unit (AU) is considered to be 400 kg live weight

² Means of 2 animals. All other groups contained 4 animals

³ Total grazing period for females was 121 days

Post weaning performance:

Males: Results for males grazing Green Panic alone or in association with Glycine in the 1977 dry season and in the following rains have been presented by Paterson et al (1979). These data, together with results from subsequent groups on those pastures, and also on Yaragua in 1978 and 1979 are shown in Table 2. In each case the figures are the means over 4 animals. Despite active vaccination, foot and mouth disease was observed in August 1979 and so results are not presented for the period while the disease influenced animal growth. The work was concluded in January 1980.

Females: In 1977, Brangus heifers were included in the Green Panic and the Glycine/Green Panic grazing groups as non-tester animals to equalise stocking rates between the paddocks. Although the performance of the females was not specifically considered by Paterson et al (1979), their growth rates are included in the calculations of liveweight gains per hectare. In 1978 and 1979 the tester animals in each grazing group consisted of 4 heifers and 4 bulls. The same problem of foot and mouth disease as was noted in the males cast doubts upon the performance of the females in the period August to September, and these results are not presented. The heifers were sold in December 1979 and so wet season data for the 1979/80 period are minimal, Female liveweight gains are also presented in Table 2. Liveweight gains per hectare in each of the three dry season periods are shown in Table 3. The data for 1979/80 refer to only the first half of the dry season because of the foot and mouth outbreak.

On the Yaragua pastures, in August 1978, and again in June 1979, the stocking rate had to be lowered to prevent grazing to below a height of 8 - 10 cm.

Table 3:

Dry season grazing days and Liveweight gains per hectare (kg)

Year	Period	Grazing days/ha	Green Panic		Green Panic/Glycine		Yaraguá	
			LWG/ha /day	Grazing days/ha	LWG/ha /day	Grazing days/ha	LWG/ha /day	
1977	May-July	89 days	280	0.45	273	0.71		
	Aug-Oct	91 days	255	0.54	273	1.29		
	Total	180 days	535	0.50	546	1.00		
1978	Jun-July	57 days	177	0.15	185	0.57	186	0.28
	Aug-Oct	98 days	305	0.44	276	0.77	233	0.79
	Total	155 days	482	0.34	461	0.70	419	0.06
1979	May-July	88 days	274	0.35	285	0.62	251	0.71
	Aug-Oct	71 days	188		203		169	
	Total	151	462		488		420	

No LWG data are presented in the period August to October 1979 due to animal health problems

Discussion

No calf records were available for either 1971 or 1972. It is possible that in this period there were some exceptionally long intervals that would have increased the overall average. Similarly, there may have been some semi-sterile cows maintained in the breeding herd which figure only once in the calving records, and so do not provide calving intervals. It is clear from the records that most cows calved regularly every

year, and that in comparison with the calculated average of 45% weaning for Santa Cruz Department (CORDECRUZ 1981) the Saavedra Brangus herd has a very high reproductive efficiency. Birthweights are very similar to the figure of 29.0 kg given by Reynolds (1973) for Brangus in Louisiana. The 205 day weaning weights are lower than the 188.2 noted in Louisiana (Reynolds 1973). This is attributed to over stocking on the research station from 1965 onwards. By 1976 the over-grazing was severe, and a strict selection and culling process was initiated to reduce the overall farm stocking rate. Considering 205 day weaning weights for each year: alongside the annual reports on pasture availability it is suggested that with good management, 205 day weights of 160 kg for males are achievable. Although poor management factors may have contributed to the high calf mortality rates observed the Brangus animals were more susceptible to tick-borne diseases (mainly anaplasmosis) than Zebu or Criollo animals. Despite routine vaccinations, several outbreaks of foot-and-mouth disease were noted. Umbilical infections in new-born calves were common, and when not carefully treated, resulted in mortality. While they showed good reproductive capacity and mothering ability, the Brangus animals required careful attention to health care to prevent excessive mortality of the calves. Considering post weaning performances, entire males, depending upon the quality of the grazing offered during their first dry season after weaning are capable of reaching liveweights of 300- 350 kg at 20 - 22 months of age. The growth rate of over 0.6 kg/day measured by Paterson et al (1979) when bulls were given good pastures in their second dry season, would permit a slaughter weight of over 450 kg at 28 - 30 months of age, and this is considered to be an achievable goal on a commercial scale,

Animals born between June and August should then be turned off between December and February, thus decreasing the grazing pressure well before the start of the dry season. Males on Green Panic alone would take 3 - 4 months longer to reach a suitable slaughter weight than contemporaries on Yaragua or Green Panic with Glycine, and would be sold between April and June. Stocking rate would then still be high at the start of the dry season. The farmer with only Green Panic pastures would have to choose between selling animals below their optimum weight or entering the dry season fully stocked.

Males showed no compensatory growth effects during the 3 years of the trial. Although Brangus heifers grew slower in the dry season when given access to Green Panic only, there appeared to be a compensatory growth effect in the following wet season which counteracted the beneficial effect of the better pastures during the dry winter. It should be noted that in 1977 only 2 heifers were included in the Green Panic group. Both had calculated 205 day weights 23 kg greater than the average for the 4 heifers in the Green Panic - Glycine group, and so a comparison between groups in that year must be treated with caution.

The heifers of all grazing treatments in 1977-78 and 1978-79 reached a weight of some 280 kg at 20-22 months, rising to about 330 kg at 24-26 months of age. An adequate weight for mating is considered to be about 300 kg, and under commercial management it is feasible to expect the heifers to calve at 34 - 36 months. If grass-legume pastures are in short supply, they could profitably be reserved for growing males rather than be offered to weaner females.

Temperature fluctuations were not sufficiently great to influence pasture production although rainfall distribution had a considerable effect. Good rains in August 1977 resulted in increased growth rates of both pastures and animals in the subsequent weeks, as did the showers in September 1978. The heavy rains during the 1978/79 wet season led to some problems of waterlogging, with consequent slow recovery of the Green Panic and the Glycine in the first part of the 1979 dry season. The Yaragua took advantage of the unusually moist soil conditions in May and June to produce fresh growth, and although the quantity of new forage was limited the high quality stimulated animal production. It is suggested that while animal performance from the Yaragua in this period was better than average, the well documented susceptibility of Green Panic and tropical pasture legumes in general to water logging (Bogdan 1977) resulted in below average performance from animals grazing these pastures.

The carrying capacity in terms of grazing days per hectare was 10-15% higher from the Green Panic than from the Yaragua. Appropriate stocking rates during the dry season were 1.3 AU/ha in May - June rising by natural growth to 1.4 AU/ha by October in the Green Panic, and about 1.2 AU/ha throughout the period from Yaragua. The Green Panic - Glycine pasture supported 1.3 AU/ha at the start of the dry season, rising to 1.6-1.7 AU/ha in October, for a dry season average of 1.5 AU/ha.

The productivity of the Yaragua, expressed as LWG/ha/day was better than the Green Panic alone, but inferior to the grass-legume pasture.

The Yaragua used in the present work was considerably better than the majority of commercial sowings, since it had not been subjected to the severe overgrazing, often accompanied by frequent burning which is characteristic of many Santa Cruz ranching enterprises. Although areas of Yaragua with legumes were not available for direct comparison in the present work, Paterson et al (1980) showed in San Javier that commercial Yaragua pastures produced about 0.5 kg/ha/day of LWG with crossbred steers, and that the sowing of 25% of the area with legumes increased LWG to 0.8 kg/ha/day. If a similar increase in productivity were to be seen in Saavedra, Yaragua associated with Glycine would be superior to Green Panic with Glycine, although the carrying capacity may be lower.

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