ISSN 0120-2383
CIAT Series No. 02ETP1-79
August 1980

1979
Tropical Pastures Program
Annual Report

Centro Internacional de Agricultura Tropical
Apartado Aéreo 67-13
Cali, Colombia

Table 63. Distribution of calvings and calving rate in the ICA/CIAT Test Herds for the period October 1978-September 1979 at Carimagua.

Herds	Cows	October - December	January -March	April -June	July- September	Calving rate
1, 2 and 3	152	12	47	20	3	53.9
4 and 5	97	4	40	21	5	72.2

Calf mortality this year (5.9%) was practically similar to last year's (5.4%). Of the nine calves lost, two died from snake bite, one due to poliarthritis and another one after a bone fracture; cause of death could not be established for the remaining five calves.

The test herds provided 228 steers, 50 heifers, 9 cows and 9 bulls for other research projects at Carimagua. All these animals were transferred to different sections for other research work.

CATTLE PRODUCTION SYSTEMS (CERRADO)

Animal Management

Previous work at the CPAC, Brazil, has shown that a 3-month mating season is as good as the traditional continuous mating practice in terms of reproductive performance. Since seasonal mating facilitates animal and pasture management, continuous mating has been eliminated from experiments designed to test new management practices based on the strategic use of native and improved pastures at the CPAC.

In November, 1978, three breeding herds were put together from the existing females within the CPAC (Table 64). The females were assigned to herds according to weight, age, and reproductive status such that at the beginning of the mating season each herd

Table 64. Treatments used at the CPAC, Brazil, to study the effects of improved pasture, mating season and weaning age on reproduction in Zebu cows.

Herd	No. of cows	Pasture		Mating season (days)	Weaning age (days)
		Type	Grazing period (months)		
A	50	native	9	90 (Nov/Jan)	90
		improved	3		150
B	50	native	9	45 (Nov/Dec)	90
		improved	3	45 (Apr/May)	150
C	50	native	12	45 (Nov/Dec)	90
				45 (Apr/May)	150

included 15 lactating cows, 21 dry cows and 14 heifers. Mature cows averaged more than 300 kg at the start of the experiment while the 2-year old and 3-year old heifers weighed 243 kg and 289 kg, respectively. The stocking rate to be followed during the experiment will be 5 ha/cow in native pasture and 2 cows/ha in improved pastures. A previously established pasture of *Brachiaria ruziziensis* plus a mixture of legumes (*Glycine wightii, Stylosanthes guianensis* cv. Endeavour and *Macroptilium* sp.) will be used during the mating season. Results presented here are based on the first-year observations.

The average daily gain (Table 65) during the first breeding season (at the befinning of the rainy season) demonstrates that nursing cows gained less than dry cows or heifers suggesting that the lack of quality and/or quality of forage in the native pasture does not provide enough nutrients for the nursing cow to regain sufficient condition to rebreed during the mating season (Herd C). The weights shown for the second breeding season, (at the end of the rainy season) include only those cows in Herds B and C which did not conceive during the first breeding season. Most of these cows were nursing during the first mating season but were subsequently weaned and regained body condition by the time the second mating season began. The weight changes from the beginning of the breeding season to the beginning of the calving season are shown in Figure 65.

The conception rates in Table 66 are closely related to the weight changes observed in Table 65 with the greatest treatment difference occurring among lactating cows. The 90-day mating period for the lactating cows gave better results than the 45-day period due to a longer exposure to the bull and the effect of weaning which occurred approximately 50 days after the breeding season began allowing two additional estrous cycles post-weaning in Herd A. This is further substantiated by the conception rates of the dry cows, 95% of which apparently conceived during the first 45 days. At the begining of the second breeding season all the previously lactating cows had been weaned for at least one month. The effect of improved pasture is noticeable between Herds B and C during the second breeding season.

When conception rates are observed according to physiological status of the cows (Table 67) it is apparent that dry cows and heifers were not the problem breeders. It can also be observed that an unexpectedly high number of 2-year old heifers conceived at weights below that normally considered adequate for heifers. This would indicate that 2-year old heifers with average development are fertile; however, if they are mated before they reach a target weight of approximately 300 kg, their subsequent reproductive performance can be expected to be retarded because of the weight loss during the first lactation and the extended period required to recuperate body condition. Experiments are underway to develop a management program based on various combinations of native and improved pastures which will produce 300 kg heifers at 24-27 months of age. The above experiment will be continued for three more years.

During the same period, a more detailed experiment was initiated to provide more basic information (Table

Table 65. Weights of Zebu females by treatments and physiological status at mating time in the Cerrado, CPAC, Brazil.

	Mean weights (kg)					
	First breeding season			Second breeding season		
Herd	Nursing cows	Dry cows	Heifers	Weaned cows	Dry cows	Heifers
A	303 (.325)[1]	329 (.529)	269 (.617)	-	-	-
B	310 (.289)	325 (.578)	266 (.622)	348	380	324
C	311 (.133)	328 (.544)	267 (.422)	335	373	315

1 Figures in parenthesis are mean daily weight gains during the breeding season.

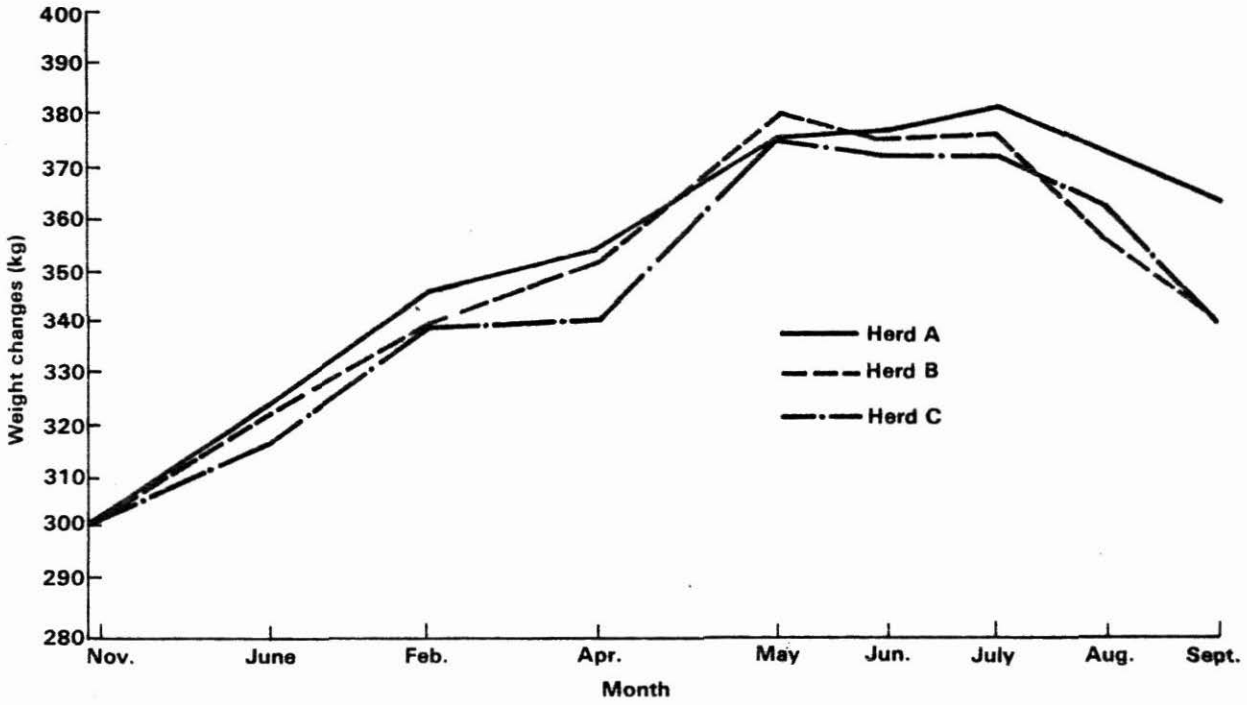

Figure 65. Weight change of Zebu cows during the breeding and lactation periods in the Cerrado, CPAC, Brazil.

68) on the reproductive response of commercial Gir cattle to (a) post-partum energy levels, and (b) different ages at weaning. The cows were confined and trough fed a mixture of grass hay, ground corn and cotton seed meal to provide high (1.3 times NRC requirements) and low (0.7 NRC) energy levels while maintaining the protein level (10%) constant for both herds. The cows were assigned to the two energy levels at calving time according to post-partum weights; weaning age was assigned at random within herds. The cows were removed from the experiment and returned to native pasture as they were found pregnant.

As expected, the low energy herd lost more weight (21%) during the first 150 days after parturition than the high energy cows (Figure 66). However, both herds began to gain weight 150 days after calving which corresponds to weaning at five months and time at which only five lactating cows were left in each herd.

Table 66. Conception rates of Zebu cows by treatments and physiological status at breeding time in the Cerrado, CPAC, Brazil.

	First mating season[1]				Second mating season[2]			
Herd	Lactating cows	Dry cows	Heifers	Subtotal	Weaned cows	Dry cows	Heifers	Total
A	67	95	80	82	-	-	-	82.0
B	20	90	64	62	91	50	60	92.0
C	13	100	57	62	62	0	50	84.0

1 Beginning of rainy season.
2 End of rainy season.

Table 67. Reproductive response of Zebu cows at various physiological stages during the breeding season in the Cerrado, CPAC, Brazil.

Reproductive stage	No. exposed to bull	Weight at initial breeding season (kg)	Conception rate (%)
Nursing during first half of breeding season	45	308	75.6
Dry at onset of breeding season	62	327	96.8
27 month old heifers	28	243	71.4
35 month old heifers	15	289	100.0

The effect of weaning age had a stronger effect on post-partum cow weight change than energy level (Figure 67). When the lactation stress was removed at 30 days post-partum, the daily weight loss decreased but the cows did not reach a gaining condition until 60 days post-weaning. Separating the calves from their dams at 30 days of age and allowing them to nurse twice daily (30 minutes each) reduced the rate of weight loss in these cows and put them in a gaining state sooner than cows weaned later than one month. Weaning the cows at 90 days post-partum stopped their weight loss at that point; however, they did not begin gaining until 60 days after weaning. There were no great differences in weight changes between cows and weaned at five or six months post-partum suggesting that the major affect of lactation stress had ended by five months post-partum.

Table 68. Treatments to study the effect of energy level and weaning age on reproduction in Zebu cows, CPAC, Brazil.

Treatment No.	No. of cows	Age of calf at weaning (months)	Energy level[1]
1	5	1	High
2	5	1	Low
3	5	3	High
4	5	3	Low
5	5	5	High
6	5	5	Low
7	5	6	High
8	5	6	Low
9	5	Controlled nursing[2]	High
10	5	Controlled nursing	Low

1 High energy = 1.3 NRC recommendation; low energy = 0.7 NRC recommendation.

2 Two nursings/day beginning at 30 days post-partum.

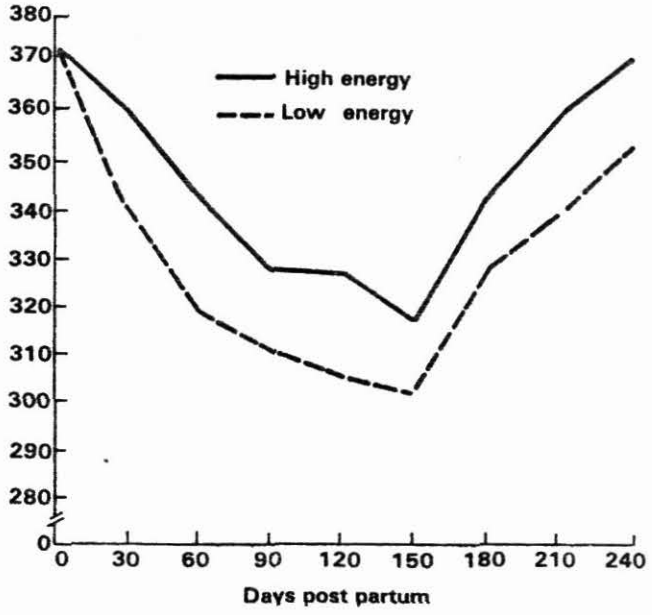

Figure 66. Effect of two energy levels on post-partum weights of cows fed in confinement.

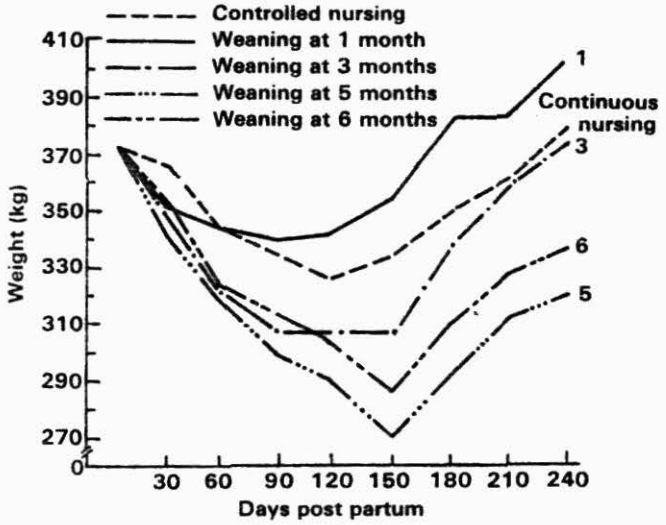

Figure 67. Effect of weaning age on post-partum weights of cows fed in confinement.

The service period (days from parturition to reconception) was estimated from palpation data which appears in Table 69. These data show a positive response to the higher energy level in reducing the service period by 41 days. The trends indicate that better nutrition becomes more important as the weaning time is prolonged. There appears to be little effect of energy level on the service period between weaning at 90 days or controlled nursing. However, in the low energy group, the controlled nursing cows conceived while nursing, while cows weaned at 90 days conceived 16 days post-weaning.

Table 69. Effect of energy and weaning age on the post-partum service period of Zebu cows in the Cerrado, CPAC, Brazil.

Weaning age (months)	Service period[1] (days) Energy level		
	High	Low	Average
1	46	58	52
3	81	106	94
Controlled nursing	85	111	98
5	124	210	167
6	180	236	208
Average	103	144	

1 Days from parturition to reconception.

The difference in service period between weaning at one month and at six months was a reduction fo 156 days. Cows weaned at one month reconceived on an average of 52 days post-partum indicating excellent fertility when physiological and nutritional stress of the calf on the cow is removed early. The above service period would give an annual calf crop greater than 100%. While weaning at one month is not considered practical, the treatment was included to investigate if Gir cattle are physiologically capable of rebreeding as early as other breeds of temperate cattle.

Weaning at 90 days post-partum or controlled nursing during the breeding season are management practices which could be employed under improved ranch conditions. The data indicate that an annual calf crop greater than 90% could be achieved by using either of the two methods recognizing the fact that an improved calf raising program must be included in the management system.

The calves from this experiment were maintained on an average quality *Brachiaria decumbens* pasture without supplementation. At weaning, the 6-month weaned calves were 30 kg heavier than the calves which had been weaned three months earlier; however, at one year of age the difference between the two groups had been reduced by 34%.

The controlled weaned calves were only 9 kg lighter than the 6-month weaned claves at one year. The negative effect of controlled nursing during the breeding season on calf growth is minimal. Although some extra labor and infrastructure are required, controlled nursing offers the possibility of increasing the reconception rate in areas where subnutrition is a problem without delaying the growth of the nursing calf. Experiments were initiated with legume based pasture in search of a high quality pasture suitable for calf rearing which would make early weaning a viable alternative towards increasing reproduction.

Pasture Utilization

Two stocking rates were used to evaluate the productivity of an established *Brachiaria ruziziensis*/legume pasture during the dry season. The pasture had been rested for six weeks before the animals entered at the start of the dry season. Pasture samples taken at the beginning of the dry season showed high dry matter availability which was approximately 80% grass and 20% legume *(Stylosanthes guianensis, Macroptilium* sp. and *Glycine wightii)* (Table 70). As

Table 70. Pasture and animal performance during the 1979 dry season under two stocking rates in a Brachiaria ruziziensis and legume[1] pasture in the Cerrados, CPAC, Brazil.

Stocking rate (AU/ha)	Available dry matter (t/ha)				Liveweight gains (g/head/day)
	Beginning of dry season		End of dry season		
	Grass	Legume	Grass	Legume	
1.25	3.76	0.94	2.24	0.0	7.0 (28.0)[2]
0.65	3.83	0.56	2.63	1.01	44.0 (88.0)

1 Glycine wightii, Stylosanthes guianensis cv. Endeavour, and Macroptilium sp.
2 Figures in parenthesis are liveweight gains in g/ha/day).

expected, the reduction of dry matter from the sward was greater at the higher stocking rate (17.6 versus 12.5 kg/ha/day) assuming no correction for regrowth; however, the dry matter reduction per AU was the contrary (14.1 versus 19.2 kg/animal/day) suggesting that the animals in the lower stocking rate had a higher intake.

While animal liveweight gains were small both groups lost no weight during the dry season. The 28-day weight changes are shown in Figure 68. Weight losses during July and August are more closely associated with the disappearance of the legume component from the sward than the reduction in total available dry matter. By the end of the dry season the legume had practically disappeared from the sward. The positive weight change which occurred in late September was due to an unseasonal rain in late August. The experiment will be continued through the rainy season where both animal and pasture performance will be monitored.

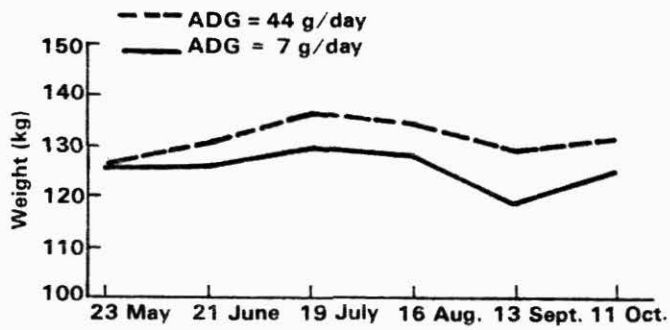

Figure 68. Effect of stocking rate on liveweight change in Zebu calves grazing a *Brachiaria ruziziensis*/legume mixture during the dry season in the Cerrado, CPAC, Brazil.

ANIMAL HEALTH

The objective of the Animal Health section is to develop preventive medicine schemes adjusted to the pasture/animal management systems developed by the Tropical Pastures Program. Work continued at three levels: at the macro-level, an inventory of disease and syndromes conducive to mortality or decreased productivity is being assembled and will be integrated with the target area survey in order to piece together distributions based on ecosystems. Macro-level studies are providing a catalogue of all existing conditions that are influencing productivity in the target area and their relative importance. At the intermediate level, work continued on surveillance in farms of the ETES project and monitoring of the test herds at Carimagua. Intermediate level monitoring provides information from individual animals in specific farms that permits quantification of main disease causes. At the micro-level, studies continued on the profile of gastro-intestinal parasites and hemoparasites at Carimagua, and the development of photosensitization in steers grazing *Brachiaria decumbens*. Micro-level studies provide information on incidence of specific conditions defined as important for the development of a preventive medicine control scheme.