EVALUATION OF ANIMAL PRODUCTIVITY IN A SUSTAINABLE GRAZING SYSTEM BASED ON THE USE OF TREES IN ASSOCIATION WITH PASTURES.

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ABSTRACT
Young bulls of different breeds (Zebu, Holstein and F-1 strain Holstein Zebu) were grazing together on a meadow composed of Guinea grass (*Panicum maximum*), Brachiaria (*Brachiaria decumbens*) and a mixture of natural pastures, all in association with Leucaena (*Leucaena leucocephala*) sown at a density of 555 plants per ha in order to evaluate the potential of that system for beef production. A completely randomized design was used. The meadow was rotationally grazed at stocking rate of 3.6 animal per ha. During the 18 months of fattening the best results were obtained with the Zebu type. The final weight of those bulls occurred to be significantly (P< 0.05) superior (413.7 vs 357.4 and 376.3 kg) when compared with Holstein or F-1 cross. The gains obtained by the Holstein and F-1 bulls could be considered satisfactory.

KEYWORDS
Beef production, *Leucaena*, Association.

INTRODUCTION
In Cuba many attempts have been made to improve beef production from grazing, and in the last years by the way of introducing legume species such as *Leucaena* in association with grasses or as a Protein bank.(Hernandez, Alfonso and Duquesne, 1986,1987; Simon, Iglesias, Hernandez, Hernandez and Duquesne, 1980.).

All these works have been done using Zebu type animals, however, most of the animals used for beef production in the country come from calves born in the dairy herds which are considered not suitable for beef, because of the low gains they make during the fattening period. Thus, the purpose of this study was to determine whether the dairy calves could be raised on grazing systems which use *Leucaena* in association with pastures to improve the growth of cattle.

METHODS
Pasture Resources: The predominant pastures were guinea grass (cv. Likoni), brachiaria (cv. Basilisk) paspalum (*Paspalum notatum*) and *Dichantium* sp. The grazing area comprised 10 ha fenced into five paddocks each 2 ha. *Leucaena* had been sown in every paddock in 1985 at a density of 555 plants/ha. The area received no fertilizer treatment during the course of the experiment.

Animal Resources: Thirty six yearling calves with a mean liveweight of 118 kg were allocated into three groups on the basis of the breed or strain to which they belonged. These animals grazed together through the whole fattening period at a stocking rate of 3.6 bulls/ha. The breeds used were Zebu, Holstein and the F-1 strain within them.

Grazing management: The area was grazed rotationally during 18 months which included two springs and one winter season.

In the drought, from February to April the plants of *Leucaena* were pruned at a height of 50-70 cm to permit the animals to get forage that was above 2 m of height without possibility for browsing. The cattle were weighed every 28 days.

Presentation yields: The availability of pastures was determined monthly by a visual estimation technique (Haydock and Shaw, 1975). Dry matter yield of *Leucaena* was estimated on the 3 % of the plants by hand, selecting the leaves and stems less than 3-5 mm diameter which were under 2 m of height. When pruning, all the edible material was taken.

The botanical composition of the sward was measured at the beginning, in the middle and at the end of each season by the "steps method" described by Anon (1980).

Chemical analyses: Analysis for nitrogen, phosphorus, calcium and crude fibre were carried out by the methods of AOAC (1965).

Statistical Analyses: Analyses of variance was used to compare the liveweight performances of the animals, using a Duncan test (1965) for means comparison

RESULTS AND DISCUSSION
There was a significant difference (P< 0,05) in grasses yield among the seasons. However, the yields reached in the dry season (3,600 kg DM/ha) could not be consider so bad, cause they permitted animals to have an offer of around 7 kg of DM per 100 kg of liveweight, which is considered a sufficient amount of pasture to reach medium levels of liveweight gains (García-Trujillo, 1980).

The integration of *Leucaena* in a grazing system increased the offer of a high quality food, principally in the drought, when availability of that legume by means of pruning was almost 500 g/animal/day. These results are better than those obtained by Iglesias, Simón, Docazal, Aguilar and Duquesne (1994), with a similar system but raising growing heifers for replacement.

In the rainy period of 1994 the availability of *Leucaena* was lower (around 200 g/head/day), because the height the plants had at that time (2-2.5 m) did not permit the animals to browse all the forage of the plants.

The regrowth of the trees after pruning helped animals to get almost 250 g of DM of fodder from browsing in the spring of 1995, suggesting the benefits of this practice for the the general management of the system.

The nutritional potential of *Leucaena* to grow and fatten cattle is evident when the liveweight responses of the animals are analysed (Table1). There were no significant differences in liveweight gains among the breeds in the drought and also in the last period of fattening where the gains were over 700 g/day for the three types of animals. The achieved results are of less relevance when compared with those obtained by Carrete, Eguiarte and Sanchez (1986) in a system which included star grass and Leucaena. However, the gains made by all types of cattle in our research were greater than the 210 g overall gain made by Hereford cattle grazing *Leucaena* and speargrass (*Heteropogon contortus*) in south-east Queenland (Foster and Blight, 1983).

The potential of the system with *Leucaena* to fatten cattle was due mainly to its high feed quality.

The high levels of protein (more than 26%) are similar to those observed by Vargas and Elvira (1994) and better than those obtained by Caceres and Santana (1990) when they evaluated the nutritive value of *Leucaena* in different moments of the year. The phosphorus

contents of the trees were also high, above the range of 0.05 to 0.08 % found in pastures (Milford and Haydock, 1965) and similar to those cited by Shelton and Brewbaker, 1994).

From the commercial point of view all three types of animals were suitable for fattening, although the beef price for Holstein and F-1 strain was lower (1.50 pesos/kg of liveweight) (Table 2) due to lower weight, below 400 kg.

After this study it could be concluded that in tropical conditions the persistence and high nutritive value of *Leucaena* could be of profitable use in a grazing system as a supplement to fatten cattle of different breeds.

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Table 1
Seasonal average daily gain (kg/hd) of cattle.

Breeds	Initial liveweight (kg)	Final liveweight (kg)	Daily gain (kg)	Age Months
		Spring 1994		
Zebu	111.5	273.4a	0.705[a]	
F-1	120.0	235.1[b]	0.476[b]	12
Holstein	117.1	233.0[b]	0.506[b]	
		Drought 1994-95		
Zebu	273.0	315.5[a]	0.229[a]	
F-1	235.1	283.5[b]	0.261[a]	18
Holstein	233.0	264.8[b]	0.172[b]	
		Spring 1995		
Zebu	315.5	413.7[a]	0.785	
F-1	283.5	376.3[b]	0.742	24
Holstein	264.8	357.1[b]	0.738	

a, b Means in rows with different superscripts differ significantly ($P<0.05$)

Table 2
Economic valuation of the fattening system

Type of animals	Number	Average liveweight (kg)	Price of 1 kg of beef (pesos)	Sales (pesos)	Costs of farmer labour (pesos)	Investment on animals (pesos)	Revenues (pesos)
Zebu	13	414	1.65 *	8880.3	405	1811.8	6663.5
F-1	14	376.3	1.50	7902.3	405	2205	5887.18
Holstein	11	357.1	1.50	5892.15	405	1610.12	3877.03
			Total	22674.75	1215.0	5626.92	15832.83

* 1.65 the price for First Class animal (above 400 kg of L.W)