HOLSTEIN CATTLE IN TROPICAL AREAS OF VENEZUELA

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Productive and reproductive parameters of Holstein cattle in the tropics are usually inferior to those in temperate climates. The expression of its genetic potential is related to the production system used. Results obtained in Venezuela with zero grazed animals fed cut forage and concentrates indicated that forage quality and concentrate quantity can be limiting factors. The high level of concentrate needed in tropical areas and the consequent dependence on imported cereal renders infeasible this sort of production. Pasture based intensive systems require lower levels of concentrate supplementation but are affected by climatic factors especially in the wet season. In more intensive systems with low levels of concentrate feeding, production is notably poorer.

The use of specialised milk breeds in crosses with animals adapted to the tropics is a practice widely used in Latin America. However, the low proportion of European blood in this population of crossbred animals is a result of ecological and socioeconomic factors.

The increase in the proportion of these genes will depend on the environmental conditions, feed resources and socioeconomic aspects of each region.

Key words: revision, dairy cattle, tropical environnment, milk production

The introduction of European milk breeds in an attempt to improve milk production and solve the problem of milk supply in our country , has been practised in many areas of tropical Asia, Africa and America. Literature on the performance of these cattle under tropical conditions is abundant (Kiwuwa 1972; Vaccaro 1973) and shows the efforts that have been made introducing European breeds to the tropics. A summary of some productive and reproductive characteristics of Holstein cattle in Venezuela is given in Table 1. The values shown are similar to those from other tropical areas. From the published information two aspects are very clear: (a) the poor performance in comparison with that obtained in their native country and (b) the large variation in response found in the tropics. The low values rarely show the potential of the animals because of limitations with regard to skilled labour and balanced nutrition (Vaccaro 1973). Attempts at improving milk production have concentrated largely on genotype and neglected other aspects of biological and socioeconomic nature. The present work was initiated in an attempt to identify some of the limiting factors.

Table 1:
The performance of Holstein cattle in the tropical areas of Venezuela

	No. of studies reviewed	Mean	Range	Reference
Milk production (kg/lactation)	5	3835	2708-4206	Verde (1979)
Calving interval (days)	3	474	438-517	Chicco et al (1977)
Services per conception	6	2.5	1.7-3.1	Chicco et al (1977)

The variation in responses seen in the literature reflect the variety of conditions under which the animals have been managed. The production system used has a big effect on production, fertility and mortality in exotic cattle in the tropics. A study by Wilkins et al (1979) in commercial ranches in the tropical llanos of Bolivia demonstrated a good correlation between the system intensity and these parameters (Table 2). The systems studied vary from animals kept in shaded pens fed concentrates and cut forages to systems based on unimproved pasture without concentrate supplementation.

Table 2:

Production, fertility and mortality in a range of production systems in the tropical plains of Bolivia (Wilkins et al 1979)

System	Breed	Milk production (kg/cow/year)	Calving interval,d	Calf mortality (%)
1. Zero grazing, forage and concentrates, 2X	Holstein	3,041	417	5.3
2. Grazing + concentrates 2X	Holstein	2,043	470	23.1
	Brown Swiss	2,348	403	16.1
3. Grazing + concentrates, 1X	Brown Swiss	1,470	408	14.8
4. Grazing only, 2X	Brown Swiss	1,950	369	26.5
5. Grazing only, 1X	Holstein	543	514	41.7

1X: Once a day milking with restricted suckling

2X: Twice daily milking with weaning in the first week.

The results demonstrated clearly that reduction in the system intensity reduced appreciably the productivity and fertility of the cattle. Similar results have been obtained in Venezuela where cattle imported from New York State, USA and their offspring were kept at three different sites with different management regimes (Table 3). One herd was kept at Maracay, Venezuela, in pens and fed cut elephant grass and

Table 3:

Milk production from Holstein cows of the same origin in three regions of Venezuela

Locality	Number of lactations	Milk production[1] (kg)	Length of lactation[1] (days)	Temperature (°C)	Rainfall (min)	Feeding and management
El Joque[2]	150	4672 ± 126	341 ± 53	15.4	1240	Grazing at night 6 - 8 kg conc./animal/d
Maracay	692	4290 ± 68	324 ± 68	24.8	953	Zero grazing 6 - 8 kg conc/animal/d
San Nicolás[3]	27	1582 ± 73	212 ± 8	25.5	1472	Night grazing 3 kg. conc./animal/d

[1] Mean ± $SE_{\bar{x}}$

[2] Martínez et al (1977a,b)

[3] Peña et al (1978)

concentrate, and one group was kept at the Experimental Station at San Nicolas in the western llanos of Venezuela where temperatures are similar to Maracay but rainfall is higher, drainage is poor and health management practises inferior. The latter conditions and low level of supplementation produced a significant drop in milk production. The third herd was at El Joque in the Venezuelan Andes where temperatures were lower,and management was based on intensive grazing in Kikuyu pastures. The better response obtained at this altitude when compared with Maracay can be attributed to the better climatic conditions and higher quality pastures and forages.

The mean values of productive and reproductive parameters of imported animals kept at Maracay is shown in Table 4. Milk production was lower than the mean of the USA for similar cattle (6317+ 499 kg). Feeding trials in mid lactation have shown that the consumption of elephant grass dropped sharply with concentrate supplementation although the levels used were normal for the herd (Table 5).

Table 4:

Production and reproduction parameters of the Holstein herd of the Instituto de Producción Animal, Facultad de Agronomía, Venezuela

	Imported cows [1]	Cows born in the country [1]
Production parameters (1968-1976)		
Number of lactations	181	412
Milk production (kg)		
Total	4731 ± 96	4213 ± 120**
305 days	4564 ± 73	4041 ± 91**
Length of lactation (days)	323 ± 5	326 ± 7NS
Liveweight (kg)	606 ± 6	517 ± 6**
Reproduction parameters (1970 - 1977)		
Number of lactations	72	473
First heat after calving (days)	69 ± 5	63 ± 3NS
Interval calving to conception (days)	151 ± 10	157 ± 6NS
Services/conception	2.3 ± .3	3.1 ± .2**

** $P < 0.01$

[1] Mean ± $SE_{\bar{x}}$

Digestibility and consumption of tropical forages is inferior to those of temperate areas (Minson and McLoed 1970), which dictates the use of high levels of concentrates feeding to specialized dairy cows. Systems based on concentrate use are of limited value in tropical countries because of the dependence on imported cereal crops (Dale 1979),and it is not likely in the near future that increase in cereal production will allow an increase use in rations for cattle of high genetic potential. Alternative energy sources such as cassava have not been adequately explored in this country.

Table 5:

Effect of concentrate supplementation on the feed intake and productivity of Holstein cows in mid-lactation

	Level of supplementation (kg/d)			
	3	6	9	$SE_{\bar{x}}$
Milk production (kg/cow/d)	10.1	12.4	13.8	0.32**
Liveweight change (kg/cow/d)	-0.07	0.17	0.23	0.105*
Intake of fresh forage (kg DM/cow/d)	5.51	4.85	3.65	0.18**

* P< 0.10

** P< 0.01

One alternative to reduce the needs for supplementation could be the use of intensive pasture based systems. Some work in the Caribbean has produced good results (Perez Infante 1977; Caro-Costas and Vincente-Chandler 1974, 1976). However under adverse climatic conditions the response is very different. Trials in Maracay have shown that in this system the animals milk yield dropped appreciably during the wet season (Table 6). Similar results have been seen in Guatemala at the

Table 6:

Effect of season on productivity of grazing Holstein cows

Origin[1]	n	No. of calvings	Season	Milk production (kg/d)		Change in liveweight (kg/d)
				Pre-experimental[2]	Experimental	
Holland	12		Rainy	12.2	9.2	-0.11
North American	12		Rainy	18.0	10.8	-0.21
Holland	12		Dry	11.6	9.1	+0.58
North American	12		Dry	17.8	13.2	+0.10

[1] The four groups were allocated to the four treatments and pasture availability to all groups was similar.

[2] Production during the last week of zero grazing

farm level where reductions of 2.5 to 3 kg/ d of milk were reported in the wet season when compared to the dry season (Cabezas et al 1980); a drop in the liveweight gain of beef animals at the start of the rainy season have also been seen in Africa (Norman 1967; Walker 1969). The causes of the reduced production at this time of year are not well understood. It could be a direct climate effect on the animal due to the combined effects of time and. high relative humidity (Johnson 1965). Indirect climatic effects causing sickness and variation in pasture quality could also cause effects. When high levels of concentrate are fed in the wet season the animal is less dependent on pasture and the drop in production is less (Combellas and Martinez 1979). This

however is contrary to the plan to reduce the dependency on concentrates, The wet season also has a negative effect on reproductive efficiency. Results from Maracay (Fenton et al 1976) with Holstein cows in pens, show that there is a negative effect of the number of services per conception and the interval between calving and conception in the wet season which can be explained by nutritional and climatic effects (Table 7).

Table 7:

Effect of the season on some reproductive parameters of the Holstein breed (Fenton et al 1976)

	Month of parturition			
	Jan - March	April-June	July - Sep	Oct-Dec
Number of lactations	83	84	83	105
Number of services per conception	3.8	2.8	2.8	2.9
Interval between calving and conception (ICC) (days)	196	148	148	155
Calving interval (ICC + 280 days)	476	428	428	435

The present situatation with regard to milk production: The present situation with regard to milk production in the tropics is not a happy one. The productivity per cow in countries such as Colombia and Venezuela (Mendez 1977; Luz 1977) varies between 2.5 and 4 kg/d. The production the in our country is 1.25 kg/d (Luz 1977). The plan to improve this situation by introducing such breeds as Holstein and Brown Swiss cattle without consideration of other facto,s responsible for the low productivity of the system has been calamitous. The dairy producers in Venezuela using European cattle that contributed only a few years ago 16% of total annual production (MAC 1968, 1969), today contribute virtually nothing.

The limitations to the use of pure bred European breeds in the Tropics which have already been mentioned do not prevent their use as a mean of genetic improvement to existing breeds. There is a lot information showing the benefit of crossbred animals (Verde 1979; Prada 1979; Wilkins 1979; Katpatal 1977). Milk production of these crossbreds is equal or superior to that of specialized dairy breeds although of course this is dependent on management and feeding conditions Crossbred cattle are not a new phenomenon for the majority of farmers in our countries. The original cattle imported from Spain have practically disappeared in some Latin American countries and been replaced by a mixed type of animal ("mosaicos") in the milking herd. In Venezuela milk production is based on the Mosaico Perijanero, which is a cross of Criollo, Zebu, Holstein and Brown Swiss, with the last two only present in small amounts. This genotype generated by the farmers themselves is well adapted to the climate but of low production and is used in low productivity systems.

The low productivity of the milk production systems based on grazing in Venezuela is a result of ecological, technological and socioeconmic limitations (Capriles et al 1980). Between these it is important to mention the work routine at the level of the production system. The farm is often run by an absert land-lord, a foreman and many unskilled employees of whom about 70% milk the cattle. The two last groups have a very poor knowledge and no training. This work organization is not appropriate to manage a pasture based system where good management is required and limits the increase in the proportion of genes from specialised breeds in the population.

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