RELATIONSHIPS BETWEEN MILK PRODUCTION AND CALF GROWTH IN A DUAL PURPOSE HERD[1]

Angela Fernandez, N A MacLeod[2] and T R Preston[3]

Centro Dominicano de Investigación Pecuaria con Caña de Azúcar
CEAGANA, S D

29 cows and their calves from a dual purpose herd producing milk and weaned calves by restricted suckling were used to study relationships between milk and calf production. Total saleable milk in the lactation was positively related with total lactation production (including the milk consumed by the calf) (r=.98)hut not with the milk consumed by the calf from birth to weaning (r =.02), the live weight gain of the calf to weaning (r = -.01), calf live weight at weaning (r = -.01). the age of weaning (r =.004). There was also no relationship between rate of gain of the calf to weaning and-the total production of milk in the lactation (r =.19). The total intake of milk by the calf from birth to weaning was positively related to the age at weaning (r =.88), the weight at weaning (r =.71), but negatively with daily live weight gain to weaning (r = -.47). The age at weaning was also negatively related with rate of live weight gain to weaning (r = -.80) and also with weight for age at weaning (r=-.88). There was no relationship between live weight gain to weaning and birth weight (r =.15). The results indicate that in dual purpose herds employing systems of restricted suckling for calf rearing: (1) lactation yields based on saleable milk can be used in progeny testing of sires for milk production; (2) selection of future herd sires on the basis of growth rate to weaning probably will not affect the overall genetic merit for milk production in that herd.

Key words: Cattle, dual purpose, correlations between traits, restricted suckling

The management of cattle according to dual purpose systems (Preston 1977), for combined milk and weaned calf production creates certain problems with respect to procedures for genetic improvement for either milk I or beef. | Progeny testing for milk yield is based on between sire within herd | daughter comparisons of total milk yield. In specialized milk herds, the calves are invariably weaned at birth, thus saleable milk equates exactly with total milk production. However, when calves are reared by restricted suckling, a variable quantity is consumed by the calf, Techniques for measuring this are time consuming and are not economically feasible in herds managed on strict commercial lines. The question then is: what is the relationship in dual purpose herds between saleable milk which is measured easily and total milk production, which obviously is a more precise assessment of the true milk yield potential ?

The other problem relates to genetic improvement for beef characteristics (growth rate)

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[2] On secondment from Rowett Research Institute, Aberdeen, Scotland

[3] Scientific Adviser to CEAGANA

which in dual purpose herds could be effected by selection of future herd sires on the basis of their growth rate to, or weight for age at, weaning. The heritability of growth to weaning and of weaning weight in beef herds is about 0.30 (Preston and Willis 1974); and it should be higher for restricted suckling systems, for which maternal effects can be expected to be less pronounced than in single suckling beef herds. Thus heritability for growth in this period may approximate more closely to that for growth on performance test (h2 about 0.50; Preston and Willis 1974).

If this were proved to be the case, then fairly rapid improvement in genetic potential for growth could be expected simply by selection on the basis of weight for age at weaning, or growth rate to weaning. The second question is then: what effect would such a selection procedure have on the overall genetic merit of the herd for milk production

In this paper we report the relationships between the various traits for milk production and calf growth in the dual purpose herd at this centre.

Materials and Methods

Data were used from 29 completed lactations, from cows which calved between April 1975 and February 1976. Cows which calved before April 1975 had arrived at the centre already calved; those which calved subsequent to February 1976 had uncompleted lactations. The animals, feeding system and general management procedure have been described in detail in the previous paper (Fernandez et al 1977).

Linear regression equations and phenotypic correlations within and between milk production and calf growth traits were calculated using the method of least squares.

Results

The various relationships are illustrated in figures 1 to 5. Phenotypic correlations are summarised in table 1.

Total saleable milk in the complete lactation was highly related (r =.98) with total milk production (figure 1); the regression coefficient of unity indicates that for 1 kg increase in saleable milk there is an exactly equivalent increase in total milk yield. The Y intercept for the equation (445.2) is an estimate of milk consumed by the calf, and can be compared with the value reported by Fernandez et al (1977) which was measured directly (445 kg).

There was no relationship (figure 2; table 1) between lactation yield of saleable milk and: total milk consumed by the calf (r = -.02) to weaning; calf growth rate to weaning (r = -.01); weaning weight (r = -.01); or age at weaning (r=.004). Daily yield of saleable milk was also not related to daily milk consumption by the calf (r =.01).

The total consumption of milk by the calf was positively related with the age at weaning (r =.88) and the weight at weaning (r =.71). There was no relationship between birth weight and rate of live weight gain to weaning (r =.14; figure 3) or weaning weight (r =.13). Daily milk intake was highly related to rate of live weight gain to weaning (r =.97) but not to weaning weight (r =.05).

Table 1:
Phenotypic correlations between traits for milk production and calf growth in a dual purpose herd (n = 29)

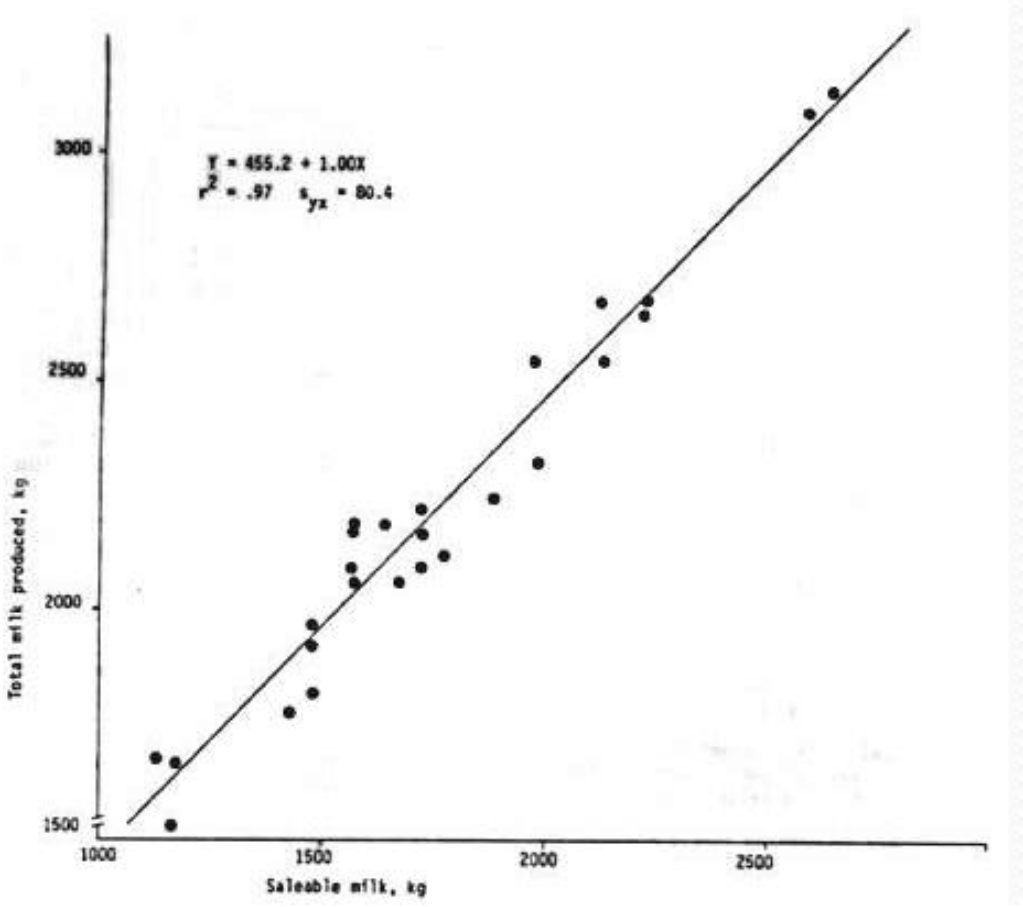
Saleable milk in the lactation (kg) and:	
Rate of gain to weaning (g/d)	-.11
Age at weaning (days)	.004
Live weight at weaning (kg)	-.07
Calf milk consumption (kg)	-.02
Total milk production in the lactation	.97
Saleable milk (kg/d) and:	
Calf milk consumption (kg/d)	.10
Rate of gain to weaning (g/d)	.10
Total milk production in the lactation (kg) and:	
Birth weight (kg)	.02
Rate of gain to weaning (g/d)	.06
Weight for age at weaning (kg/d)	.09
Total milk production (kg/d) and:	
Birth weight (kg)	.02
Rate of gain to weaning (g/d)	.06
Weight for age at weaning (kg/d)	.09
Calf milk consumption to weaning (kg) and:	
Age at weaning (days)	.88
Weaning weight	.71
Birth weight (kg) and:	
Rate of gain to weaning (g/d)	.14
Weaning weight (kg)	.13
Calf milk consumption (kg/d)	.14
Calf milk consumption (kg/d) and:	
Rate of gain to weaning (g/d)	.97
Weaning weight (kg)	.05
Age at weaning (days) and:	
Rate of gain to weaning (g/d)	-.80
Weight for age at weaning (kg/d)	-.88

Discussion

The relatively small size of the population under study, means that caution must be exercised in interpretation of the results. Nevertheless, the size of the correlations indicates that the relationships are probably meaningful.

The most important finding is the close correlation between saleable and total milk production, which shows that the amount of milk consumed by the calf is quite independent of the milk yield potential of the dam. It can therefore be concluded that records of saleable milk production in dual purpose herds can be confidently used as indices of total milk production for purposes of within herd progeny testing systems.

Figure 1:
Relationship between saleable milk and total milk



The lack of relationship between growth rate to weaning and birth weight contrasts markedly with the situation in single suckling beef herds where comparable correlations are of the order of r =.32 (Preston and Willis 1974).

These findings suggest that maternal effects are not so important in dual purpose systems with calf rearing by restricted suckling, and that heritabilities for gain to weaning may well be higher than would be predicted from data obtained from traditional beef herds.

The lack of relationship between calf growth rate to weaning and any trait concerning milk production in the dam, indicates that selecting future herd sires on the basis of their growth rate to weaning is unlikely to affect, positively or negatively, the overall level of genetic merit for milk production in the herd. In any event, the milk yield potential that is envisaged as an acceptable target (about 2000 kg per lactation), is easily maintained by occasional introduction of sires from breeds such as Holstein, Brown Swiss or Simmental, such a procedure will also help to sustain a higher level of heterosis in the herd as well as contributing to beef production characteristics.

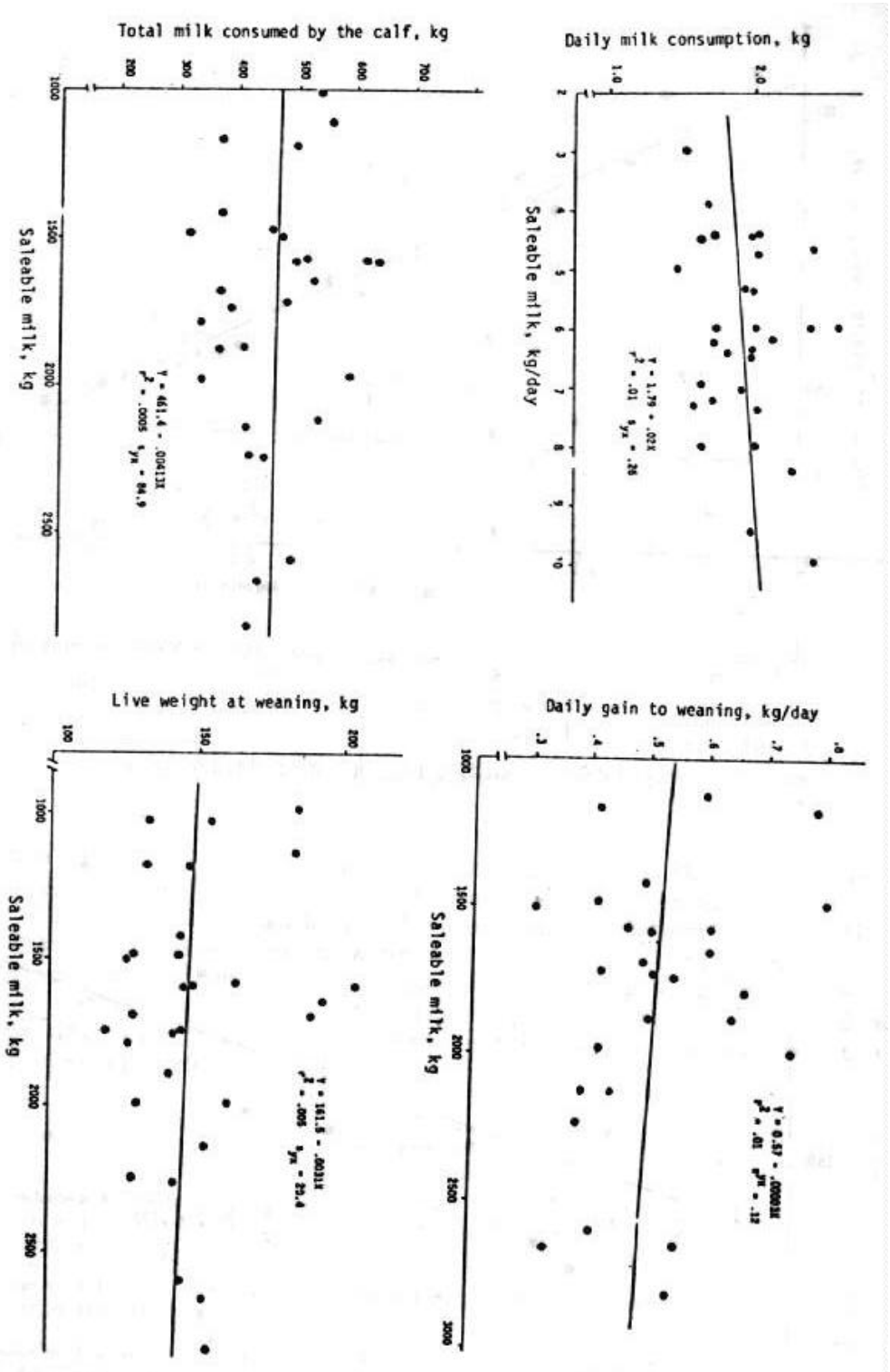


Figure 2: Relationship between saleable milk and various parameters of calf performance

Figure 3:
Relationship between birth weight and daily gain to weaning

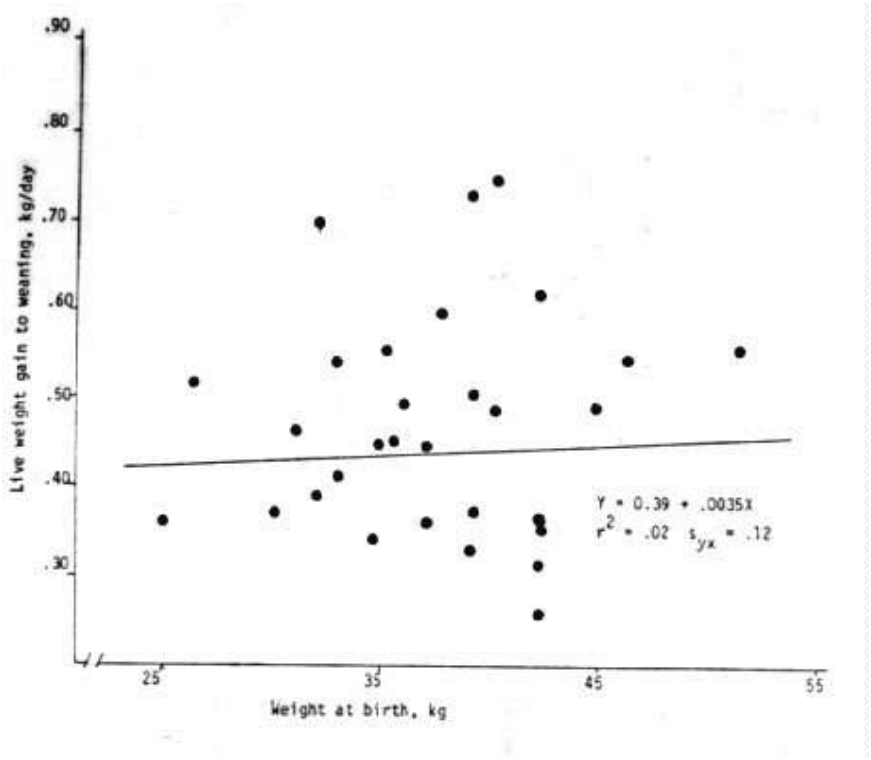


Figure 4:
Relationship between weaning weight and milk consumed

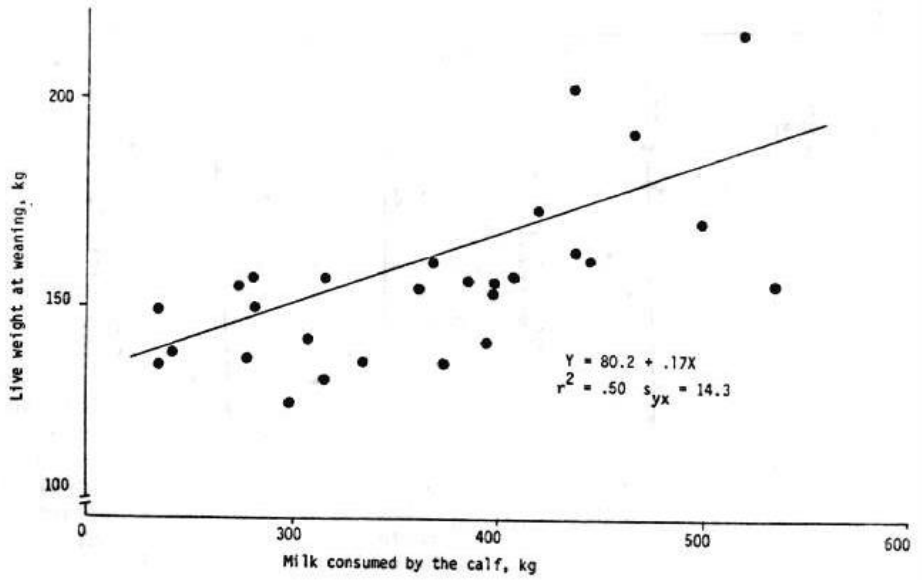
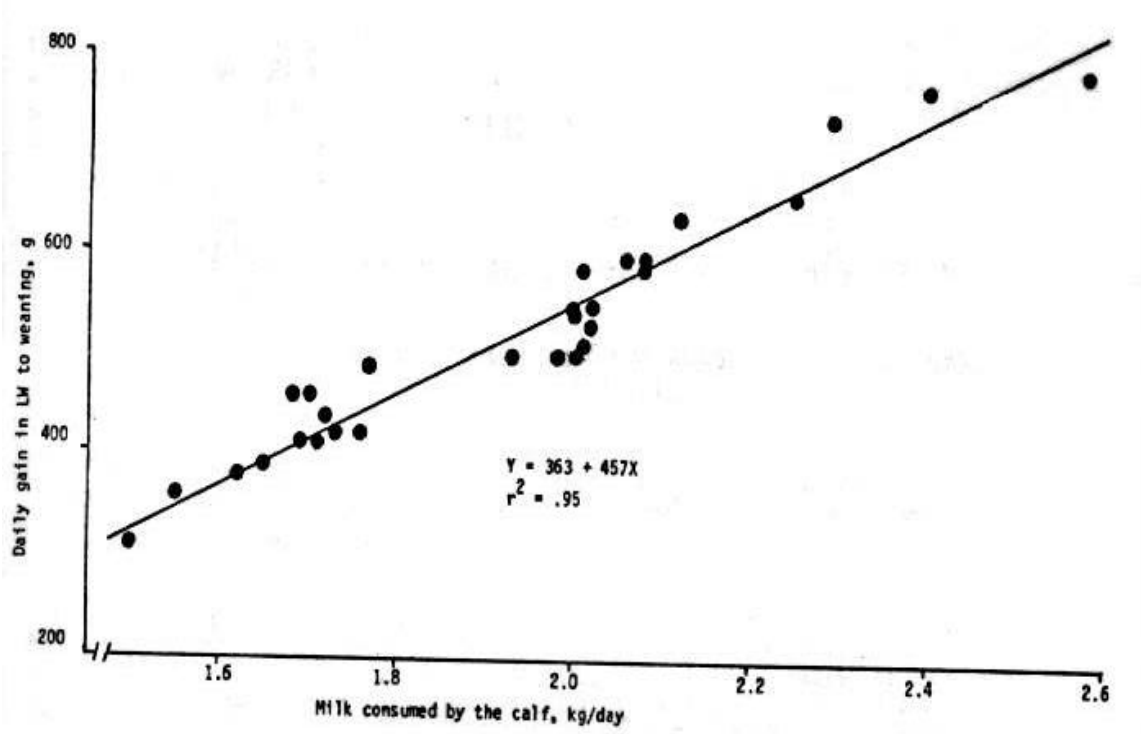


Figure 5:
Relation between daily milk consumption and rate of live weight gain to weaning



Conclusions

The experimental findings provide grounds for believing that in dual purpose herds employing restricted suckling systems of calf rearing : (1) lactation yields based on saleable milk can be used in progeny testing of sires for milk production; (2) selection of future herd sires on the basis of performance to weaning will lead to a reasonable rate of improvement in this trait, and that such a procedure will be unlikely to have any effect on the overall genetic merit of the herd for milk production.

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