

ANIMAL HUSBANDRY

TROPICAL DAIRYING PROBLEMS ❖

Feeding Problems.—Things which have a seasonal distribution have also a geographic range, and an interesting comparison can be made between the seasonal variation and geographic differences in milk yields. Sanders has investigated the seasonal variation in the yields of cows in two different districts in England, which show that on the average in commercial herds, the yield rises at the time the grass begins to grow in the spring and falls again as the hot weather begins and the grass matures and becomes fibrous. Woodman's work on the composition of grass has shown that in the early stages of growth it is a concentrated food (plus water) and that its high protein content, high digestibility and low fibre content makes it a very suitable food for milk production purposes. As the grass gets older, however, and especially after the flowering shoots appear, lignified fibre is formed, the proportion of protein and the digestibility fall and the bulkiness is increased. Thus even in England where the supply of concentrated feeds is abundant, commercial herds on the average show well-marked seasonal changes due to the type of roughages fed, for a large proportion of the cow's food intake in commercial production always consist of home-grown forages or grazing. High-producing animals have not the capacity to hold the bulk of food required to supply sufficient nourishment to support high yields where the feeding stuffs are of low quality and contain much fibre: this is the main cause for low yields under commercial conditions.

The seasonal variation in the milk yields will then give a measure of the feeding value for milk production of the forages used during the different months of the year. These have been calculated from milk records obtained under tropical conditions in Jamaica and Trinidad: the yields of milk are low during the "dry season" (December to March) and rise with the onset of the "wet season", but begin to fall again before the end of the wet season. A comparison with the seasonal variations in England shows that the primary influence is, as stated above, the amount and quality of the grasses and forages, for a comparison with rainfalls and temperatures shows that, while in the Temperate Zone the growth of grass in the winter months is limited by temperature and begins as this rises in the spring (rather earlier in the South-Norfolk, than in the North-Cumberland), in the Tropics the growth of the grass is limited by rainfall and begins with the onset of the wet season, and is reduced during any intervening short dry period.

That these seasonal differences in milk yields are due to the effects of climate on the plant and so on the nutrition of the cow (in addition to any direct action the temperature or rainfall may have on the animal) is also shown by the fact that in Jamaica during wet "dry seasons" (1925, 1927) the yields are much above those in dry "dry seasons" (1926, 1928).

Thus the main problem of feeding in the Tropics would appear to be the supply of high protein, low fibre and if possible, succulent foods during the dry season. Ensilage of grass or forage crops in the early stages of growth in either the tower or pit silo, or irrigation of pastures are methods which are being used with success. Forages on the whole in the Tropics like those in England during the hot weather soon develop fibre and become bulky and unsuited for milk production. Much variation exists however among the different grasses and there is much scope for the selection of low fibre and high protein species. Digestibility trials of those in common

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use, are also now being made at the Imperial College of Tropical Agriculture in Trinidad. In the Temperate Zones, the deep rooting and high protein leguminous plants such as lucerne and white clover supply a high protein feed during the summer months and these not only supply suitable food for growing and milking animals but also raise the fertility of the soil by fixing nitrogen. At present no such leguminous crops are cultivated in the West Indies, and the discovery and use of such would do much to improve cattle production in the Tropics.

While deficiencies of home-grown forage crops for high milk production can be made up in European countries by the use of the comparatively abundant bye-products of industrial manufacture (oil cakes, meals, etc.) and in Temperate Zone by the rotational cereal (oats) and pulse (bean) crops grown, these products are difficult to obtain and are expensive in the Tropics. The local production of coconut meal may in the future supply such a product but the prevailing tendency in the West Indies for the cultivation of trees and perennial crops to the exclusion of annual crops (which is encouraged by the nature of the climate) will always limit the local supply of concentrated feeding stuffs of this nature and render their importation necessary for high production. One of the functions of the animal in agriculture is to form a means of cashing those crops, or bye-products of crops, which are not fitted for human consumption direct. Of the staple crops which are grown in the West Indies, the sugar cane is almost the only one which supplies such bye-products suitable for feeding cows: the tops in the cutting season and the mollasses form useful feeding stuffs and a variety called Uba cane which produces an abundance of leafy growth, is particularly valuable for this purpose. A peak in the milk production curve about February in Trinidad is probably due to the use of these fresh cane tops during the cutting season. It is necessary that improvements in feeding should go hand in hand with breeding, for unless this is done the nutrition will either limit the yield of cows with high milk capabilities or undermine their constitution so that they die at an early age.

Management.—The problems of management vary greatly in different districts according to the availability of pasturage, etc., and the details, although very important, can only in a few cases be drawn into general statements. Under natural conditions cattle graze in the early morning and evening and lie in the shade during the middle of the day when the sun is hot. Housing during this part of the day not only falls in with this natural desire for shade but allows of the feeding of concentrates according to yield and may be used to increase the intake of water (by the addition of a little mollasses to it: and concentrates if in meal form may also be fed in this way). Provision of shade, and so the continuance of feeding throughout the day, is in some areas in Jamaica obtained by the use of the Peruvian rain tree (*Pithecolobium saman*) which allows grass to grow under it: a combination of these trees with small wired-in paddocks receiving water from neighbouring irrigated land and managed by a system of rotational grazing, appeared to give excellent results during the dry season.

Breeding.—Cattle in the Tropics have not been improved to the same extent for either milk or meat production as they have been in the Temperate Zone. From time to time importations of South American, European and Indian (Zebu) cattle have taken place and the present native stock, the survivors of these various importations, is very mixed. Various methods of improvement have been tried and the following are the main conclusions reached:

(a) *Selection of Native Stock.*—This method is very slow. Great difficulty is experienced in breaking in the animals to be milked; having been used mainly for work purposes, they do not let down their milk unless a calf is being suckled or other means are taken and they frequently fail

to breed again until the calf is weaned or the milk yield falls. Possible methods of overcoming this difficulty are the haltering of young stock to induce docility and the selection of sires from docile dams. The method of selection of this stock would, however, prove slow although not impossible.

(b) *Importation of European stock and grading up of native stock with these.*—At first very good results were obtained by this process but just as it is found difficult to keep and breed pure European stock in the Tropics commercially because of a variety of causes which require further study and analysis (disease resistance, heat regulation, etc., but summarized as constitutional disabilities), so the stock which had been graded up by the use of European bulls for three or more generations failed to produce much milk and became degenerate. Table I for example, shows that in the Tropics a very well-bred Guernsey bull used on high grade European cows reduced rather than increased the milk yields.

Table I

Progeny of a Guernsey bull used on high grade European cows		
Corrected Mature Milk Yields		Lb.
Average of 11 dams	5,200
Average of 11 daughters	4,800
		- 400

Of the various European breeds tried, the short-horn and Ayrshire appear to have a constitution least suited to the Tropics and signs of degeneration appeared at a lower concentration of their blood than those of other breeds (Friesian, Jersey, Red Poll) more adaptable to tropical conditions. It would appear that a long thick coat and white skin are inimical characters in the Tropics. Periodic clipping is essential for the health of such animals. The methods of importing pure European stocks and the grading of native cattle to such stocks appear to offer no solution of the problem of breeding commercial dairy cattle in the Tropics.

(c) *European cattle—Zebu crosses.*—The Zebu has been very little improved for milk production and has a poor udder development, but it has a constitution eminently suited to the Tropics. On the other hand European cattle have a well developed udder, but their constitution is unsuited to the Tropics and for this reason the body is not sufficiently vigorous under commercial conditions in the Tropics, to support the udder and high milk production. Crosses between the two types, however, have both constitution and udder development and so give better production, particularly life production than the pure breeds. This is not merely a matter of hybrid vigour for different European breeds crossed together in the Tropics give no better results than those breeds when pure. On the other hand it was surprising to find that the use of a pure Zebu bull on high grade European cows (although he came from lower milk yielding strain) increased instead of lowered the yields (see Table II).

Table II

Progeny of a Zebu (Montgomery) bull used on high grade European cows.		
Corrected Mature Milk Yields		Lb.
Average of 10 dams	4,730
Average of 10 daughters	5,700
		+ 970

It is believed that both constitution and udder development are multiple factor characters in inheritance and this being so it would follow that, cattle having many chromosomes, the inheritance of these characters is fairly accurately described by Galton's law of blending inheritance or percentages of blood. If this is so the first point to determine is what proportions of Zebu and European blood give the best results under any climatic conditions. According to results obtained in Jamaica $\frac{1}{4}$ to $\frac{1}{8}$ of Zebu blood appears to give the best results. Conditions here, however, are not so severe as may exist elsewhere in the Tropics, where a higher proportion of Zebu blood may be required. These results are taken from lactation periods in the years 1923-28 only and probably a more certain estimate of the proportion of Zebu blood best suited to commercial milk production would be obtained if the life production of the different grades were considered. As the proportion of European blood is increased from half to three quarters and seven-eighths so the average lactation yield will go up, but the cows do not last so long in the herd and their life production becomes less. Promiscuous and repeated cross-breeding, however, does not lead anywhere, although the trial of the different European breeds has been necessary in the beginning to find out which were best. Once this is determined it is better to keep to one breed and its crosses with the Zebu and avoid that promiscuous mixing of breeds which leads only to mongrels.

Although the fancy points such as colour and horns segregate sharply when the first crosses are bred together there is every indication that the commercial qualities of constitution, body form and milk yield (which appear to be multiple factor characters) do not segregate sharply and only vary about a mean. If this mean produces a profitable commercial animal, the numbers to be weeded out will, therefore, be small, and there would appear to be no reason why a new breed of dairy cattle suited to the Tropics should not be produced by breeding together whichever grade of Zebu-European cross give the best results in a district. The Suffolk, Dorset Down and Corriedale breeds of sheep have been produced in this way.

The evolution of such a new breed could best be obtained by its being adopted on a large scale in a given area, so as to allow of interchange of blood between herds; and by the formation of a herd book which would act by segregating such animals from the common stock, a primary necessity in the creation of a new type. As with European cattle the chief difficulties would be met with the bulls; the cows could be selected on their milk yields but the bulls could only be selected by progeny tests.

Marketing.—The high temperature in the Tropics make this a troublesome matter; for without precautions the milk would not keep sweet long. Consequently it is found that, as in England many years ago the family cow is kept in towns and forage is brought in to feed her. Town dairies, where only a few hours elapse between milking and consumption are also numerous; but such milk is comparatively expensive to produce, due to the high cost of the land and the transport of food. Town dairies in Great Britain have almost disappeared since the pasteurization of milk has been adopted. In the West Indies clean milking, cooling, bottling and keeping the cans in cold storage and ice are being used in some districts, but these methods are comparatively expensive and while the extra cost is willingly paid by the European population the price is too high for the large proportion of the native population. As in Great Britain it would appear that pasteurization and bottling would afford the best means of ensuring a safe and cheap supply of milk for the bulk of the population. Such a process would, as it has done in England, extend the radius from which a town could collect its milk supply.