Dairy Economy in Ceylon under Present Conditions of Production

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Introduction

AS a rule nobody would or could be expected to take up any business enterprise which is not likely to be an economically sound commercial undertaking. Therefore when considering the insignificant role played by the dairy industry in this country one might in the first instance come to the conclusion that this is mainly due to the fact that milk production is not economic under prevailing conditions, as otherwise more activity in this field of agriculture should be expected. But if one goes a step further and compares conditions for milk production here with those found in some of the more advanced dairy countries, it would be found that there is enough evidence to show that dairying could be made a good way of earning a living if properly organized and integrated with other agricultural activities.

The desirability of developing a dairy industry in the country cannot be questioned. From a national point of view such a development is not only fully justified, but also very essential in order to meet the very severe shortage of liquid milk and dairy products in the human diet, and also because the fertility of Ceylon's soils cannot be maintained if livestock, especially cattle and buffaloes, are not more incorporated into the present system of farming. There are more reasons which could be mentioned all favouring the development of this industry and mixed systems of farming, but I shall in this paper confine myself to the more commercial aspects of milk production and thereby, I hope, help to convince the individual farmers that, viewed from their stand point, this industry is economically fully justified.

It is well known that there are several adverse conditions in this country, which tend to discourage the development of dairying. First of all there is the fact that the climatic conditions in Ceylon as a whole are unfavourable for the maintenance of high yielding pure-bred stock of European breeds and secondly that the indigenous cattle and buffalo population are extremely poor producers. Many failures have been experienced in tropical countries, including Ceylon, where attempts have been made to transplant high-producing European stock, and particularly specialized dairy stock, to areas where the environmental conditions differ materially from those in their native home or from other places where they have performed satisfactorily. In recent years, however, the superior heat-regulating ability of Zebu cattle has been fully realized and the trends in most tropical countries is now to utilize Zebu cattle or cross-bred stock, the latter having been found to be intermediate in respect of tolerance to tropical environments.

It will take several decades of work before the average level of production from Zebu cattle and crossbreds will reach standards comparable to those in advanced dairy countries where European stock are kept, but there is evidence that it will be the only way by which the problem can be efficiently and economically tackled. The Department of Agriculture

has already initiated breeding programmes on these lines and one farm is devoted especially to the improvement of the local Sinhala cattle. These breeding programmes and experiments will not only provide useful data for the formulation of the Island's long-term breeding policy, but will also be a valuable contribution to livestock work in the tropics in general.

Cattle breeding, however, is a very slow process and the improvements indicated cannot be expected to solve *to-day's* problem of milk production. In this connection it should be remembered, that while the importance of carefully-planned breeding cannot be over emphasized, the nutritional aspects of dairy cattle are equally important and in this field breeders of cattle and buffaloes in Ceylon would be able to bring about vast and immediate improvements. The position to-day is that not only is there a very small proportion of the cow population utilized for milk production, but the majority of the animals are not looked after at all. Those looked after well are nurtured to a large extent on purchased foods which naturally must result in a high cost of production. Cattle breeders are now fortunate in that good stud bulls are available and a general improvement of the cattle population need not be very far off if use is made of these bulls, and these alone. But this will result in no improvement in regard to productivity if the general level of feeding throughout the country is not going to be very considerably improved.

Although the present rather poor stock available will effect the economics of dairying to a great extent and thus causes a further obstacle to those who embark on milk production as a business enterprise, it should not prevent people with initiative making an economic success of it. The cattle breeders in this country should not merely sit back and wait for better animals, but along with improvement of stock make full use of existing facilities for milk production. In regard to the more specialized dairies, there is a good number of stock available (mainly crossbreds) which could be used for this purpose and this type of stock could rapidly be increased if dairy owners would bring to a stop the enormous wastage of calf life which at present is far too common. In regard to rural areas cattle are numerous in nearly all Ceylon villages, yet it is the rare exception to see a cow being milked. A common explanation for this is that the cows available give so little milk that they are not worth milking, but this explanation cannot be accepted in general as many of these cows with better care and proper feeding could yield a quantity of milk which would be sufficient for most families.

Economic Problems

Turning to the actual problems of economy the factors deciding the final result of production are—

(1) Demand and price of milk and surplus stock.

(2) Cost of production, inclusive of replacement of herds.

Mention has already been made of the fact that there is a ready demand for milk of good quality, or rather a severe shortage, and this is likely to be so for many years ahead. As regards the price of milk a good deal of variation exists throughout the country—the

maximum prices being paid in urban areas, particularly in the Colombo area, and the lowest in rural districts where very little milk is produced and the marketing has not yet been organized to any extent. For the country as a whole, a price varying from 35-40 cents per pint (Rs. 2.80-Rs. 3.20 per gallon) for non-pasteurised milk of good quality, may be considered as representing the price most producers would be able to obtain. When compared with prices paid for milk to producers in other countries it is evident that the above price is very favourable:

	Rs. c.	
Price per gallon in Ceylon	3 20	approx.
,, ,, ,, U. K.	1 45	,,
,, ,, ,, Sweden	1 35	,,
,, ,, ,, Australia	1 30	,,
,, ,, ,, South Africa ..	1 15	,,
,, ,, ,, U. S. A.	1 65	,,
,, ,, ,, Denmark	1 28	,,

On the average, producers in Ceylon are paid two and a half times as much as in the above mentioned countries which may be considered representative of some dairy regions.

While the disposal of milk is entirely a problem of getting the marketing facilities, &c., developed, the position in regard to disposal of surplus stock is different. The demand for meat of cattle and buffaloes is very limited and the prices which can be obtained for culled cows, undesirable male stock, and such animals which have passed their productive period are therefore very low, compared with prices paid in some countries with a developed dairy industry. This disadvantage, however, is to some extent counteracted by the fact that in Ceylon a fairly good demand exists for draught bullocks and buffalo males for paddy cultivation, unlike in the other countries mentioned.

		Rs. c.	
Average price for beef in Ceylon	= approximately	0 27	per lb. live weight
,, ,, ,, ,, U. S. A.	= ,,	0 95	,, ,,
,, ,, ,, ,, Denmark	= ,,	0 72	,, ,,
,, ,, ,, ,, U. K.	= ,,	0 80	,, ,,

There is practically no market for veal or meat of extra good quality in Ceylon and no system of grading meat has been introduced as a consequence thereof. It will be seen from the above list of prices that in the other countries prices of beef are so high that culled cows and old animals can normally be disposed of at prices which bring in enough money to pay for their replacement, or at least a very good part of this cost, whereas in Ceylon this is not the case. The dairy farmer in this country is therefore faced with another drawback in his economy to which more mention will be made under " replacement cost ". There is yet another income which arises from dairying: cattle manure, the value of which is difficult to assess as it is only in rare cases that it is sold from dairy farms. Cattle manure has a special high value on such farms where, besides dairying, intensive systems

of agricultural production are adopted. Just as the utilization of nourishing foods by live-stock has become a matter of prime importance, so the question of fertilizing the soil by animal manure has become a fundamental problem.

Factors Determining Cost of Production

The cost of production on broad lines is determined by the following:—

(1) *Level of production or average production per cow.*

(2) *Intensity of feeding and food costs, viz.* :—

(*a*) *home-grown foods,*

(*b*) *purchased foods.*

(3) *Cost of labour.*

(4) *Cost of replacement (including wastage by death).*

(5) *Overhead and miscellaneous costs.*

High average production per cow in a herd tends to increase the profit as good cows are more economic converters of feeding stuffs into milk than low yielders. This is because a very considerable part of the food consumed by dairy stock is utilized for body maintenance, heat production, &c., and this requirement for maintenance varies only according to body size, but is the same for low and high yielding cows. This therefore means that each unit of milk produced from a high producer will be cheaper than the unit produced by low yielders. For instance for a cow producing about 250 gallons of milk with 4 per cent. fat in a year only about 35 per cent. of the ration will actually be utilized for milk production while the other 65 per cent. of the ration will be used for maintaining her body ; whereas the figures for a cow producing about 850 gallons of milk per year of the same quality would be approximately 65 per cent. and 35 per cent. respectively. The figures given below clearly illustrate the greater economy derived at by an increased production per cow.

Cows (same live weight 1,100 lb.)	*I*	*II*	*III*	*IV*	*V*
Milk production per year in lb. : .	4,400	6,600	8,800	11,000	13,200
Food units fed per year	2,100	2,500	2,900	3,300	3,700
Milk production per food unit	2·09	2·64	3·03	3·34	3·56
Increase in return per food unit	—	0·55	0·39	0·31	0·22

(By Nannenson Sweden)

The figures demonstrate how the production of milk per food unit fed increases from 2.09 to 3.56 lb., it is, therefore, quite evident that it is much more economical to keep very good cows than low-producing ones, but this, however, does not of necessity mean

that low producers are always uneconomical animals to keep. Whether it will pay or not to keep cows of a low level of production is entirely determined by the conditions of production in the particular area or country. Most of the milking cows available in Ceylon would certainly be considered uneconomic animals in advanced dairy countries, but under our conditions of production they could, if well looked after, bring in a good profit.

2. Food cost is the greatest single item in the cost of producing milk and the profit or loss that accrues from milk production is, to a very large extent, determined by the cost and efficiency of the ration. Each cow has a definite hereditary maximum producing capacity. The extent to which her production reaches this capacity is determined by the quantity and quality of the food given. It is profitable to feed each cow so that she can approach the highest production of which she is capable, but the use of additional feed would be wasteful, as it would result in accumulating unnecessary body fat that would *further* increase the food required for maintenance. Thus milk yield response to extra food reacts in much the same way as crop yields when dressed with extra fertilizers. The first additional pound of concentrates produces more extra milk than the second or subsequent ones, and eventually the rations may be increased to a stage where the response to extra food is negligible. The table above shows that the return per extra food unit fed declines as milk production increases. When milk production increases from 4,400 to 6,600 lb. the gain per extra feed unit is 0.55 lb. but with the same increase from 11,000 to 13,000 lb. it is only 0.22 lb. Furthermore, it must be stressed that for very high production of milk and increasing part of the feed must be of top quality (concentrated food rich in protein), and this would mean that the actual gain by extra feed would be less than indicated above as the average cost per unit fed would also increase. The above circumstances are only applicable in such cases where the ration is well computed furnishing the cow with all her nutritional requirements. If a ration is badly computed, e.g., if it lacks in one or more of the important components, which is often the case particularly in regard to proteins, then the result is a poor milk return and high cost of production. Such bad feeding technique is very common in this country, chiefly because cheap feeding is the main consideration, and this neglect of the cows requirements leads invariably to poor economy in dairying. Turning again to the question of intensity of feeding, it should always be borne in mind that the production optimum and the economic optimum are not always reached at the same level of feeding. The optimum production of milk will as a rule be reached only after a certain amount of over-feeding has taken place. This is for the reason that though the return of milk obtained from each additional unit of the *production ration* fed reaches a point where it starts declining, as shown in the table above, the return per additional unit of *total ration* fed, viz., the maintenance and production ration togther, will continue to increase to a certain point beyond this limit, as the maintenance ration remains the same. The production optimum is the point where the maximum return of milk is obtained from one unit of the *total ration* fed, while the economic optimum of production can be either higher or lower depending on current prices of food and milk, &c. The economic optimum will be at the point where for the last rupee spent one gets exactly one rupee's worth of product back. Thus if the price of milk is very high compared with the cost of food and other expenses involved, then it pays to adopt heavy feeding, while if the opposite is the case, the intensity of feeding should be adjusted accordingly ; but under-feeding should, however, never be done as it will

always pay better to utilize the production capacity of the cows fully rather than to reduce the number of cows during such times when very low prices of milk prevail. The adequate but economical feeding of each dairy cow in the herd is probably the dairy farmer's greatest managerial problem. Its satisfactory solution is lacking in most unprofitable dairy enterprises.

Feed costs for both purchased and farm-grown food is from 60-80 per cent. of the total expenses per cow. A study and analysis of feeding practices and costs is the dairy farmer's most important means for increasing his profit by either (1) reducing costs without reducing income, or (2) considerably increasing his income without greatly increasing his costs.

In livestock feeding maximum use should be made of the lowest-cost nutrients and minimum use of highest-cost nutrients. The lowest-cost nutrients are roughages grown on the farm fed fresh or as hay and silage. Of all farm-grown food pasture is the most economical source of nutrients for dairy herds, as the cows walk to the fields and do their own foraging thus saving labour and equipment costs. The contribution of roughages to rations for dairy cows in Ceylon is, however, far too small. Most roughages fed are of unsatisfactory quality, consisting mainly of coarse fodder grasses most of which are harvested at too mature an age and therefore providing fodder which has only little nutritive value for milk production. There is in this country immense scope for that of grass land and fodder production (improvement and expansion). Appropriate measures in this field would not only bring about considerably increased, but also a much cheaper production of milk. Furthermore, such crops would fit well into a rotation with other crops including paddy. The failure on the part of the dairy farmers to grow sufficient and good quality roughage (including pasture) for feeding their stock is one of the main causes for the very poor results obtained in most dairy farms and holdings.

The circumstances indicated above should, however, not lead to the conclusion that in case such development takes place purchased concentrates could be done away with entirely. It is true that very good yields can be obtained by feeding roughage and pasture alone, but this calls for a very high quality of roughage and considerable skill in management. As a rule the most economical production of milk is obtained when purchased concentrated foods are used for supplementing the home-grown food. The main purpose of feeding concentrates is to provide each cow with nutrients adequate in quantity and quality to maintain production at the maximum level of which the cow is capable. Concentrated food supply ingredients that may be lacking in the other foodstuffs and the proportion of concentrated foods in the ration should always be such that it also ensures efficient utilization of the roughage fed. Whether it is economical or not to feed more concentrated food than is actually required for balancing the ration depends entirely on the prices of (1) milk, and (2) concentrates. Under favourable conditions it might often be economical to make intensive use of concentrated feeds. Ceylon is fortunate in that good concentrated food is available at a very reasonable price. I have in mind in particular, coconut cake, which is produced in large quantities locally. Coconut cake or poonac is an excellent cattle food which may safely constitute about 70-80 per cent. of the concentrate mixture as both in regard to proteins and starch, it is well balanced for milk production.

When a large percentage of coconut cake is used the remainder of the ration, 20-30 per cent. could be made up of other locally-produced ingredients such as fish meal, rice bran, grains and pulses all of which are likely to be produced in the future in increasing amounts. Ceylon need not therefore look to other countries for cattle food if good use is made of locally-produced concentrates and adequate amount of pasturage and roughages are fed. In spite of this fact, it is very common to hear complaints about the high prices of cattle food and that because of this the production of milk is not an economical proposition. The figures given below should, however, help to convince dairymen that prices here are very low, and if milk cannot be produced profitably in spite of a such favourable relationship between the prices of concentrates and of milk then the reason for this is most likely because not enough attention has been devoted to the production of farm-grown fodder. I am not here referring to the congested town dairies, but to others which are well placed for land.

Approximate average prices for concentrates (mixtures) for dairy cattle in various countries in relation to the price of milk are as follows:—

	Per lb. *Rs. c.*	
U. K.	0 24	One gallon of milk pays for 6 lb. concentrates
Sweden	0 22	„ „ „ „ „ „ 6 „ „
U. S. A.	0 21	„ „ „ „ „ „ 7⅔ „ „
Denmark	0 22	„ „ „ „ „ „ 5⅔ „ „
South Africa	0 15	„ „ „ „ „ „ 7½ „ „
Ceylon	0 12	„ „ „ „ „ „ 25 „ „

3. There is no statistical data available in Ceylon to show the labour required for dairy farming, but there is no doubt that considerably more labour is used here than in more advanced dairy countries. Labour saving equipment has not yet been brought into use, except in a very few cases, neither is it likely to be so for some years to come as the present wages paid in Ceylon do not encourage such development. In this connection it might be mentioned that machine-milking would be more expensive than hand-milking under present conditions and that mechanical milking does not offer other advantages which justify its introduction as yet. Labour is not at present a limiting factor in the Island's dairy economy in contrast to many other countries where this presents many difficulties.

Labour is readily available here and the wages comparatively low:

In U. K. one gallon milk pays for	⅔	hours wages approx.
„ Sweden „ „	⅔	„ „
„ U. S. A. „ „	½	„ „
„ Denmark „ „	⅔	„ „
„ S. Africa „ „	2⅓	„ „
„ Ceylon „ „	10	„ „

If we consider a labourer's wages for the year in terms of lb. milk sold at prices prevailing in the particular country then it would work out thus:

In the U. K.	35,000 lb.	of milk are required to pay one year's wages for a labourer
,, ,, Denmark	38,000 ,,	,, ,, ,, ,, ,, ,, ,,
,, ,, U. S. A.	58,000 ,,	,, ,, ,, ,, ,, ,, ,,
,, ,, Sweden	38,000 ,,	,, ,, ,, ,, ,, ,, ,,
,, ,, Ceylon	3,200 ,,	,, ,, ,, ,, ,, ,, ,,

The average production per cow for instance in Denmark is approximately 8,000 lb. and thus the entire production of 4.6 cows is required for the payment of the wages of a labourer for a year. In Ceylon taking for granted that the average production per cow is 1,100 lb. 3 cows would similarly pay one year's wages for a labourer.

4. The maintenance of a herd of milking cows, at a satisfactory level of production requires the replacement of about one out of five or 20 per cent. of the average number of cows each year. Losses by death (of cows) would as a rule average about 2 per cent. and culling for production and disease will remove the other 18 per cent. These figures will of course vary widely from year to year and from herd to herd, but the above figures are a rough guide to replacement needs. If replacements are purchased as cows, as it happens in some of the town dairies, then the replacement would be much higher probably 30 to 50 per cent.

The yearly cost of replacements is determined by the difference between the cost of rearing or buying the new cow and the price which is obtained for the one sold out, and also by the average number of its productive years in the herd.

$$\text{Replacement cost per year} = \frac{\text{Cost of rearing (or purchase)—sale price of old cows}}{\text{Number of years in production.}}$$

But to the above must also be added wastage by death of young stock intended for replacement.

It is common in Ceylon for dairy farmers to provide their own replacements by rearing a sufficient number of heifers, but in some cases people prefer to buy their replacements at a comparatively high cost rather than take the trouble of bringing up calves born on the farm. The latter system is, in this country, causing severe losses of potentialities of milking stock as the mortality among calves in such dairies is extremely high.

It is true that the cost of rearing heifers up to milking age is high and that this expenditure is a heavy item in dairying. But it is one on which too much saving should not be effected as inadequate feeding during the growing period often creates weakness which later tend to reduce the milking capacity and frequently paves the way for a breakdown if the animal is subjected to any serious strain. In stead efforts should be made to bring up heifers so that they come into production at an early age. It makes a great deal difference to the economy whether heifers start producing when $2\frac{1}{2}$ years or $3\frac{1}{2}$-$4\frac{1}{2}$ years old, as is most commonly the case in Ceylon, although there is evidence to show that heifers can reach maturity here if well looked after, as early as in most western countries. It should also be kept in mind that poorly-fed heifers seldom make cows with strong constitution, but far

too often they have to be disposed of after a few years of production. The latter has a very great influence on the economics of dairying as it costs approximately twice as much to produce one gallon of milk from a cow leaving the herd after 2 lactations as from a cow which has given five lactations.

The cost of rearing heifers is considerably lower in Ceylon than in most other countries. In Ceylon, with present prices on cattle food, milk, &c., a heifer can be reared up to maturity for about Rs. 420 (average cost in Government cattle farms) while in the U. K. it costs about Rs. 600 and in the U. S. A. about Rs. 700. The average cost in Ceylon is, however, probably somewhat higher than indicated above, partly due to the high mortality among growing stock and partly because of late maturity due to inadequate feeding. The very low prices obtainable for the cows disposed of make the cost of replacements heavy while in most other countries such disposals tends to balance the cost of replacements.

In connection with replacement costs there is one managerial aspect which needs mention because it is very often neglected here or its importance overlooked. It is very common in Ceylon to find that in a milking herd only 30-50 per cent. of the cows are in milk, while the others are divided into what are called " dry " cows and pregnant cows. Such a state of affairs does not only indicate very poor management, but also results in poor economy. This is brought about by not serving the cows in time and thus prolonging the " dry period " during which they have to be fed although they are not productive. In a well-managed dairy farm there should be only a milking herd and a heavy pregnant herd and on an average 70-80 per cent. of the cows should be in milk. Service of cows at correct time ensures high birth rate and more animals for replacement and sale.

5. Overhead costs of depreciation and interest, &c., are no large items and they seldom have much effect on total costs and financial security. To have good stock and adequate facilities is an advantage, but a dairyman's financial strength can be weakened by heavy liabilities on non-essential facilities. Too much building area, &c., increases labour on maintenance. A small milking barn can accommodate many cows in successive groups, and a lower investment is required for the storage and handling of hay, silage and purchased cattle food when maximum use is made of pastures. Ceylon is fortunate in having such climatic conditions that only very simple and cheap housing is required ; and as regard equipment, &c., the capital investment can also be kept at a low level so long as labour is available at a reasonable price.

Miscellaneous costs comprise items like bull upkeep or stud fees, veterinary fees, medicine, consumable dairy stores (exclusive of cattle food) and other expenses directly chargeable to the dairy herd or necessarily incurred in milk production. Miscellaneous and overhead costs should, under Ceylon conditions, never amount to more than about 10 per cent. of the total cost of milk production and the effect of this group of expenditure items on the final economic result will, therefore, always be very limited.

An aspect of dairy farm organization still to be discussed is that of the size of herd in relation to availability of land. Generally speaking a well-organized dairy farm business is one where herd size is fitted to the amount of feed that can be produced most economically on the farm ; and where labour supply, buildings and equipment are fitted to size of herd.

Roughage production on the farm from both crops and pasture is a very important consideration, since farm grown forage is usually much cheaper than feed purchased and transported. Above all, however, the organization of dairy farming should be adjusted to conditions prevailing in the locality such as: market possibilities, value of land, availability of labour, system of agricultural cropping, producing capacity of available stock, and most important, a proper integration of other activities on the farm or holding if any, viz., paddy cultivation, coconut plantation, &c. The degree of intensity of dairy husbandry should be determined by the above conditions in order that the best possible economic result might be obtained.

In conclusion I should like to stress the importance of good management, as even the best of dairy farms will not be financially successful unless it is well managed. To employ good management practices all the while is the dairyman's safeguard in bad times and an assurance of higher profits in good times.

Summary

1. There is a general tendency in Ceylon to consider dairy farming as of minor importance in the agricultural economy and as an unattractive commercial undertaking. It is shown that this is not justified as dairy farming, even with the rather poor stock available, could be made a profitable business under present conditions of production.

2. The present relationship between food prices, labour cost and milk price is very favourable, but the failure on the part of Ceylon's dairymen to produce sufficient quantities of home-grown fodder accounts for poor economy in many dairy enterprises. There is in Ceylon immense scope for grassland and fodder production, improvement and expansion.

3. The art of management is the most important factor in the success of any dairy farm business.