The Dairy.*

It is impossible to exaggerate the importance of pure milk supply in any country : it is especially so in a country like India. Like all industries, the industry of dairying is still in its infancy in India. A tropical country, such as ours, suffers from many maladies : cholera, typhus claim many victims annually : infant mortality is still very high in spite of the advance of medical science. People ltttle realise what a terrible source of infection milk is unless properly cared for. Milk, as you know, is a complete food. It is the entire food of the young ; it sustains the weak and the old and is within the reach of the rich and poor and it behoves every man in the country to take the utmost care in giving the purest milk possible for his children.

In spite of this extreme importance, let us see how things stand at the present day. Let us take the Presidency town of Madras : you are all familiar with the degrees of dilutions your milk undergoes as it passes into the hands of the consumer. It is only the favoured few who possess their own cows that escape the villany of the Madras milkman. It is well known that prices for milk are fixed according to the proportion of water added and the public are prepared to purchase whichever quality they can afford. There is at the present day no legal measure to prosecute a man who dilutes the milk unless it can be proved that the milk had been poisoned. In England on the other hand, the percentage of fat required to be found in a sample of milk is fixed so that a dishonest dairyman may be brought to book any day.

In an Indian home milk is still the chief dietary article. It is utilised for the following purposes : (1) milk to be taken as such (2) milk for curds or butter milk and (3) milk for ghee. Whether it is intended for milk, curds or ghee, all milk is subjected to boiling. This is very necessary specially when we realise the sources of infection. If it is intended for curds or butter milk, when lukewarm a small

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quantity of old butter-milk is added which curdles the milk; this then is churned by means of a hand churner. Imagine the cleanliness of the operation! Water, neither boiled nor filtered is added up to any quantity desired and fingers and hands are freely utilised in the removal of butter from the butter-milk. In a hot country like India, people pay the utmost importance to butter milk which is pleasantly acid in taste and cooling to the system. It is considered as food and the housewife is not anxious to remove all the fat from it. The richer it is the better the taste and the better it is patronised. Butter is then removed and hardly washed. It is then clarified to be made into ghee. I shall later on endeavour to show you the defects of the various processes, but at the present moment I shall content myself only with the description of them.

The various dairy products of the country undergo free adulteration at the hands of the trader. I have already referred to the adulteration of milk with water. It sometimes happens that where there is a demand for pure cows' milk, milkmen are tempted to dilute buffaloes' milk and pass it for cows' as the former is nearly twice as rich as cows' Butter is sometimes adulterated with flour to increase the weight. In ghee many vegetable oils are mixed e.g., gingelly, safflower, groundnut etc. In extreme cases animal fat is also mixed with it. Cows' ghee is considered to possess medicinal properties and to pass off buffaloes' ghee as such, it is not uncommon to colour it with saffron. This is roughly then the state of things with regard to Dairying in this Presidency at the present day.

If we now turn our attention to the modern methods of dealing with the production and manipulation of the dairy products, we find great many differences. Firstly, take the production of milk. A fair amount of success has been attained by successful feeding of dairy animals with concentrated food in this country. There is, however, much room for improvement. Very little attention is being paid to the cow while in health or in sickness. Proper housing against cold at night and heat by day, particular attention during the calving period and immediately after, care and proper management when ill,

are matters to which very little attention is paid in this country. Even with regard to feeding, the dairyman is content with giving nutritious oil cakes. This no doubt helps in giving rich milk. This however, is not enough. The *quantity* ought also to be increased. The more milk a cow gives the more money it brings. This can be brought about by giving succulent fodders in the rations in addition to oil cakes. No doubt proper housing and care of cattle and proper feeding are very important, but these are by no means enough. It is the breeding of right sort of animals suited for dairy purposes that should draw the attention of the man who starts dairying. He should produce an animal which combines in itself the quantity as well as the quality in milk. Experience has shown that it costs practically the same to feed a poor milker as a heavy yielder. Here then comes the skill of a scientific farmer. There is a branch of dairying which is outside the scope of the present lecture and I shall therefore confine myself to dairying proper and leave this most fascinating branch to abler hands than mine to deal. I can only say that this is a work which requires a deal of patience, an observant eye, a love for the animal and business aptitude. The work is slow but most promising. We have been working at the College at Coimbatore for several years and although I am glad to say that we are seeing steady improvement with regard to the yield of milk by careful breeding, it has been a very slow work. We are persevering because we know we shall reap our reward in good time.

We have so far considered the production of milk and what factors influence the quality and quantity to be obtained. The question of *treatment* of milk should then be considered. It is unfortunate that it is sadly neglected in this country. We all know that milk is the most easily contaminated of all dietary articles. Dust is the surest source of infection. With it, it carries millions of pathogenic organisms invisible to the naked eye. Hence the importance of clean cows, clean udders, clean vessels and clean hands. Nor is this all. Even smell taints the milk. Feeding cattle with onions or turnips leaves the characteristic smell in the milk. Smoke does the same. Milk may be contaminated by still another means-

namely—our ever present enemy—the housefly! Straining of milk from dirt and keeping it in vessels and rooms free from flies seem to be the methods within the means of the ordinary dairyman. We are learning every day regarding the harmful bacteria. Thanks to science, we have now measures which control the evil effects and pasteurisation and refrigeration have come to our rescue. By these methods we kill organisms which cannot stand either too much heat or too much cold and when once this is done and the dairy is cleanly maintained, the sources of infection are brought to a minimum.

If milk is analysed it is found to contain fat, proteids, sugar and water. Fat is the richest of all the milk constituents and the value of milk is recognised by the amount of fat present in it. This fat is in the form of an emulsion in milk. It is, however, the lightest of all and when milk is allowed to settle, it rises. This property is taken advantage of and many methods are adopted to remove it for its better utilisation. It may be allowed to settle in shallow vessels from which it could be skimmed. By this process the separation is not thorough. Milk is therefore subjected to a centrifugal force by which milk is revolved at a very high rate (7,000 revolutions per minute) when the lighter particles are separated from the heavier and are separately collected. This is called cream. It is utilised in tea or coffee instead of milk but of course it is intensely rich.

This cream is allowed to ripen: coloured: then churned: washed: salted: dried and packed. In this country cold water is very essential. It means, ice has to be taken recourse to specially during the hot months. Cold water tends to make the butter hard and not greasy. It is important to wash the butter well to make it free of casein which otherwise interferes with its keeping qualities. Buttermilk which is drained from such a process has no value except for drenching cattle.

The separated milk has no value in England but it has been possible to create a market for it here because in large towns it is substituted for milk in tea or coffee and it should not be despised as it contains all nutritious matter excepting fat.

Talking about milk and its products, we are dealing with two different kinds of milk in India, namely the milk of cow and buffalo. The former is the ideal one for drinking: some people are particular about cows' milk probably due to a sentiment. The milk of buffalo is on the other hand nearly twice as rich as cows' and if the system of dairying is intended for butter making it is desirable to maintain a herd of buffaloes. If for both milk and butter, it goes without saying, that a mixed herd is the proper thing.

We shall now pause to consider the main difference between the indigenous and modern methods of dealing with dairy products. In the former, milk is converted into curds which contain fat, casein and albumen. The revolutions are necessarily slow. This means incomplete separation of butter. Again, a large portion of caseinous matter is removed along with butter, and this is not properly washed, which leads to the putrifaction of butter. Whereas in the modern methods, the milk before being ripened, undergoes a process of separation into cream and skimmed milk. The former contains entirely fat with a very small proportion of milk. It is then curdled, churned and washed to remove all casein. Fat globules which were in an emulsified form begin to coalesce. Water interferes also with the keeping qualities and therefore it is dried and salted.

There is still another difference: butter as butter has no value to the present day Indian. He wants it for ghee and since it is clarified, it does not pay him to wash it well or to take so much trouble.

How is the future outlook with regard to the introduction of new methods in dairying? Sanitation is making rapid strides and at no distant future, I believe dairies will be much more sanitarily managed than they are at the present day. They have besides to be run on business lines and unless this is done there is no scope of success. I shall try to indicate a few of the lines which I consider essential in making dairying pay.

First: A dairy breed has to be maintained. As a rule the Indian cow is a poor milker. Her average is about 4 lbs. a day,

whereas in England it is at least five times as much. The maximum that an Indian cow could give is about 20 lbs. whereas 45 lbs. is not infrequently obtained in England and America. This is a hereditary quality and can be increased by proper methods of breeding. Since this quality is transmitted by the male, it is incumbent that good dairy bulls should be maintained and hence the importance of *herd Registers* in which a record of the history of the bull is maintained.

Secondly: having got the right sort of breed we should attend to them carefully with regard to their housing and feeding. The cow is a milk-manufacturing machine. It utilises all the food given it. But too much of it tends it to put on fat. The cow should be in good condition but not too fat.

Thirdly: too much importance cannot be attached to the maintenance of milk records i. e., the quantity of milk given by a cow during the year. This is influenced by various causes but it is important to consider the dry period of the cow. If the dry period is unduly prolonged the quantity is lessened. The records also enable one to find which animal is paying and which is not and once this is obtained the undesirable cows should be sold off. These records have to be maintained for a number of years and should show the performance of each cow during the year under consideration and should include the date on which the cow had taken the bull, the date of calving, the number of days in milk, the dry period and so on.

Lastly paying attention to detail, cleanliness, consideration of methods which are most profitable and yet economical are other factors which would make dairying commercially successful.

There are, however, certain limitations with regard to the introduction of dairy farms throughtout the country in any extensive scale.

Firstly, it means heavy initial capital for the purchase of cattle, land, buildings and dairy equipment.

Secondly, dairying requires technical skill. It is not every one that can do it. Although it is easily learnt, a certain amount of experience is needed to be a successful dairyman.

Thirdly, to be successful a man must have business aptitude.

Fourthly, milk and its products undergo decomposition quickly and as such distance to which milk is transported is limited. Milk has to be pasteurised and requires cans for transport to any distance. Butter has not caught the fancy of the Indian consumer. We have to depend upon the European for its consumption as butter. It therefore restricts the places where dairy farms could be establised; they must be within reach of large towns for the disposal of butter as well as of separated milk.

But the prospects of their indroduction are fair although many people are ignorant of the success of such farms. They could be run on commercial lines with great profit and dairying is one of the cleanest industries known.

An Improved Sugarcane Mill and Jaggery making Furnace.*

Some of the old students will probably remember visiting the lands of M. R. Ry. R. Sivarama Ayyar, Avergal, B. A., B. L., of Ravanasamudram, Ambasamudram Taluk, Tinnevelly District. He has an oil engine (7½ B. H. P.) and pump by means of which water is pumped on to a stretch of land which had previously been often left waste. Sugarcane is cultivated by tenants on part of this land. The cane is crushed in an iron three roller mill driven by the 7½ B. H. P. engine, the juice is then pumped by means of a small centrifugal pump into the boiling pans. These have been built according to one of the earliest of Mr. Chatterton's plans. There are two sets of 3 pans, those in each set adjoining each other but each with a separate grate. Two fires in each set are maintained, and the smoke therefrom drawn under the third pan. The heat from this hardly suffices to boil down the juice in the third pan. Those who were at the exhibition will notice that this differs from Mr. Chatterton's latest furnace in the arrangement of the pans and fire grates. Mr. Sivarama Ayyar has kindly

*From the Director of Agriculture, Madras.