THE NUTRITION OF INDIAN CATTLE*

ANIMAL nutrition as a subject of research in the laboratory has received considerable attention in other countries for some time past, but the results which have been obtained have not been adequately discussed in relation to the conditions pertaining to cattle in India. This is no doubt due to the fact that we have not yet gathered sufficient knowledge about the dietary requirements of Indian cattle for various purposes, nor do we know much about the nutritional condition of our cattle in relation to their resistance to disease. The information which has been obtained so far is mostly contained in technical publications and as such is not readily available or intelligible to the ordinary farmer. For this reason it is thought desirable to present in a general way some of the known facts concerning the rôle of nutrition in relation to various cattle problems. In this article, which is the first one of a series, we shall deal with some of the nutritional factors which affect breeding operations.

The important cattle requirements in India are the heavy milking type and animals for draught purposes, and animal breeding for these dual requirements has received considerable attention. The production of beef cattle which is of great importance in Western countries, is not of so much importance in India owing to the religious beliefs and practices prevalent, but a great demand exists for better class hides and for bones and bone meal as fertilizers. Cattle manure is also an extremely valuable fertilizer, but unfortunately the dung is used more as a fuel than as a manure. According to an interesting report issued by Colonel A. Olver and Mr. M. Vaidyanathan of the Imperial Council of Agricultural Research, it is estimated that the total cash value of animal products in India amounts to about 2,000 crores of rupees and is appreciably higher than the cash value of the crops. The importance of the study of cattle-breeding from various standpoints is thus obvious.

It is now generally realised by nutritional workers that diet has a great effect on the condition of animals, and though in certain respects genetical considerations of breed, etc., prevail most, the nature of the diet may act as the limiting factor in the performance of these animals. Thus it is known that to keep up the efficiency of a draught animal or of the performance of a milch cow it is necessary to provide each with the type of ration best suited to its particular need. This has been the general experience of a large number of workers though we lack accurate knowledge about the dietary needs of a working bullock. It is also known that a good breed will deteriorate if kept for a long time on a defective ration, and it is probable that the observed degeneration of most of the indigenous cows in India is to a large extent dependent on the undernutrition and malnutrition suffered by them. The quality of the milk produced is also directly related to the quality of the ration supplied and the position of this problem may be briefly summed up as follows :-

---

*By K. C. Sen, D.Sc., Biochemist, Imperial Institute of Veterinary Research, Muktesar, in "Agriculture and Live-Stock in India."—Vol. III Part VI. November, 1933.

Since milk is a secretion designed primarily to keep the calves in vigour and make their normal growth possible during the early stages of life, it must contain all the substances essential for animal growth. Also, these important constituents of milk must come ultimately from the food supplied, as it is known that the mammalian body does not synthesize many of the things which are of most importance for animal growth. This means that in order to keep up the high dietetic value of milk, a proper and sufficient amount of nutrition must be supplied to the dam. A large amount of work has been done to show that if an animal is kept indoors, or stall-fed, usually on artificial foods of restricted nature, the milk may be lacking or be highly deficient in these important physiologically active substances and this will act very unfavourably on the condition of the calves. Also, the ration is likely to be deficient in proteins and minerals which means that the animal herself is going down in health and that, since minerals are important and essential constituents of milk, their deficiency may be a limiting factor in the milk production. This is one of the reasons why in many heavy milkers there is a sudden diminution of milk yield after a preliminary period of high milk production, and the stunted growth of farm animals in many parts of India is also probably connected with the same factors.

It will be interesting at this point to give an illustration of what can be done to improve the performance of dairy cattle by judicious feeding.

One of our dairy cows, Tili, IV, No. 113, bred at Muktesar is a half-bred, Holstein-Sindhi, born on 14th January, 1925. In her first lactation she gave 2,496 lb. of milk in the first 300 days and in her second lactation 2,438 lb. only. The ration consisted of the usual concentrates and grass or hay and grazing was allowed. This milk yield was considered to be low, and it was decided to give 4 oz. of bone flour per day from the dry period after the second lactation. At the same time some of the fields where these cows are grazed were well manured. In the third lactation the milk yield for the corresponding period was 4,064 lb., *i.e.*, an increase of about 1,600 lb. The feeding of bone flour was continued throughout the third lactation period and the subsequent dry period and improved grazing was also provided. In her fourth lactation, she has already given 10,000 lb. of milk in 293 days, the average butter fat being 3·5 per cent., and the maximum daily yield of milk being 44 lb. We consider that this remarkable increase in milk production is to a large extent due to better dieting of the animal.

Milk supply is, however, only one of the various questions with which a farmer has to deal in his breeding operations. Obviously in this connection, he will endeavour to keep his animals free from infectious disease and keep up the fertility to the maximum. Thus he would expect a high birth rate in his herd, and the calves should be normal and healthy ones. Occasionally, however, he finds that some of his animals have aborted or that the calves are very weak and may either die or have to be destroyed soon after birth. The question of contagious bovine abortion is an important one when dealing with problems of cattle-breeding, but as yet it has not come under the domain of nutritional disorders and has to be left out of the present discussions. But it is known to many laboratory

workers that we have often to deal with cases of abortion which are non-specific in origin. It has been known for some time past that malnutrition, especially deficiency of lime or phosphorus or both in the ration, may lead to either sterility or abortion in the female. Sometimes there may not be any abortion, but the calf is weak and may not survive long. Thus it was demonstrated about twenty years ago by some American workers that a lime-deficient diet produced abortion in cows or lead to the birth of weak calves. A deficiency of lime is very common amongst stall-fed animals because though they get a large amount of concentrates supplying a sufficient amount of protein and a comparatively large amount of phosphorus, there are no good sources of lime in the ration unless a large amount of rich pasture, such as lucerne or clover, or a good type of hay or silage is also added. Lime deficiency therefore usually occurs where no grazing can be obtained and better types of fodder are not available. One of the commonest symptoms of this lime deficiency in animals is their attempt to eat earth and mud in their pens, and it ought to be realised that all young animals have a great craving for minerals owing to their high requirement for bone construction.

Another important mineral which effects the fertility of domestic animals is phosphorus. It has been found that natural pasture in many parts of the world is highly deficient in this mineral, and as such many indigenous cattle develop a condition known as aphosphorosis due to lack of this mineral in their food. The animals become emaciated, get a depraved appetite such as chewing of bones, carcases or refuse matters, are prone to infectious diseases and become partially or completely sterile. The addition of a phosphorous-rich substance in the diet, such as bone meal (which incidentally, contains a large amount of lime as well) improves their condition. A good deal of work has been carried out in America and in South Africa, and it has been found that phosphorus starvation in cattle leads to diminished fertility and diminished milk yield. Thus in one experiment it was found that the addition of bone meal to the ration raised the milk yield by 40 per cent. and increased the average number of calves born in a herd by 30 per cent. It is thus apparent that sterility can be produced by a phosphorus-deficient diet and this fact is of great importance in India because, it is known, the natural pastures in this country are highly deficient in phosphorus. In the case of well managed dairies this deficiency may not immediately lead to any untoward symptoms owing to their supplying a large amount of concentrates, but the importance of this deficiency may be easily perceived in the case of less well managed herds in the villages. Thus it is common knowledge that in many parts of the country, the cattle are emaciated, mortality is high and sterility is common. It is, of course, not possible to say how much of these defects are due to gross undernutrition and how much to malnutrition. Obviously, however, the intelligent farmer has to see that his animals are not kept on mineral deficient diets, because apart from the question of fertility, other disorders might be encountered which are directly or indirectly due to faulty rationing. Fortunately milk fever, which is a common cause of trouble in Western countries, rarely occurs in India, but anæmia, goitre, rickets, osteoporosis, unthriftiness and staring coat, emaciation and loss of condition, pica, etc., are all known to occur due to faulty mineral metabolism and in all these cases one has immediately to rectify the errors of dieting. Attempts have also been made to correlate the greater prevalence of tuberculosis and Johne's disease in heavy milking cows with a lime deficiency in the ration.

There are some other minerals which seem also to have an effect in breeding operations. Thus it is believed that an excess of fluorine in the diet may cause sterility. This, of course, may occur in practice only in fluorine-rich areas, especially where flour-spar deposits occur. This substance is found in India in certain parts of the Central Provinces (Raipur District) and in some places in the Punjab and Madras Presidency. Another important mineral is iodine. It has been found that in iodine-deficient areas, endemic goitre tends to occur and breeding difficulties in domestic animals are experienced. In stall-fed animals also, there may be a relative deficiency of iodine in the food which adversely effects reproduction.

We have discussed the rôle of some minerals in relation to fertility. Some other factors, also of nutritional origin, may now be briefly mentioned. Attempts have been made to correlate vitamin deficiency with sterility. It is known now that the absence of vitamin E, present in many vegetables, notably lettuce, and in cereal embryos, specially wheat, and of vitamin A, present in cod liver oil, in milk and other substances, causes degeneration of the germinal epithelium and hence sterility. Vitamins B and D have also been studied in this connection, but no definite conclusions have been reached. It is realised, however, that many of the positive results obtained in this connection may not be true under field conditions. There is, however, a possibility that, under an intensive system of dairying with stall-fed animals, specially where green pasture is not available, there may be a deficiency of vitamins A and D, which will induce degeneration of the epithelial tissue on the one hand, and a metabolic derangement of lime and phosphorus on the other hand. These conditions may lead, in actual practice, to certain breeding difficulties, such as birth of blind calves or weaklings which are a source of constant trouble in some well-established dairy farms in North and North-Western India. A striking case of this nature is a calf which was born blind, the dam being a heavy milker. In addition to blindness, there was a teratomatous growth on the eye balls, and the nose bone was twisted. In other cases, twisted neck or other bony deformities occur with blindness, and the trouble seems to be very common in Sind and Baluchistan. Apart from these deficiencies, a hypo—or hyper-function of some of the endocrine organs, such as the thyroid and pituitary, may cause sterility, but these deranged endocrine functions are likely to be correlated with unbalanced rations supplied to the animals. These points as well as others related to some contagious diseases have been reviewed in a recent publication of the Imperial Bureau of Animal Nutrition which has been reprinted in the June, 1933 issue of the Indian Journal of Veterinary Science and Animal Husbandry, and may be read with profit.

In concluding this article, mention may be made of some attempts to improve the quality of the cattle in this country and some interesting observations that have been recorded. The most systematic and successful attempt to improve the cattle of a province has been made in the Punjab and there we are now in possession of three good breeds, viz. : Hariana as a dual function animal, Sahiwal as a milking breed and Dhanni as a draught animal. A very curious fact is that most of the good animals in India come from the tracts where rainfall is low and water is scarcely available. With the increase in the irrigated areas and consequent increase of crop production, grazing areas are getting fewer and animals coming

from irrigated tracts are much inferior in condition so far as their performance is concerned, and, moreover, these animals are more susceptible to parasitic infections and disease in general. This observation is of the highest importance to agriculturists and animal-husbandmen alike, and attempts should be made to find out if this difference in disease susceptibility and in performance is due to climatic considerations, to nutritional differences or to any other causes. The Punjab experiments, however, have shown how much it is possible to improve the local breeds by selective breeding and judicious feeding, and experiments made in Pusa support the idea that good animals can be raised from almost any breed of animal available in India provided the degeneration has not proceeded too far.

Improvement in cattle breeding operations in this country therefore involves a number of considerations, such as better control of disease, provision of good pedigree bulls and castration of scrub animals, provision of more grazing by opening up suitable forest areas, conserving the excess pasture and fodder by ensilage, drying, etc., so as to be able to provide a suitable diet throughout the year. It will be obvious that in many of these considerations a knowledge of the nutritional requirements of his animals will be of great asset to the farmer, and many of the difficulties experienced by him, *e.g.*, irregular breeding and questions connected with fertility in the herd, as well as many of the disorders of nutritional origin, may be overcome if attention is paid to proper dieting. As an industrial proposition, since cattle are of value both while living as well as when dead, it is essential that the cattle breeding question should be approached from the broadest standpoint and attempts to get the utmost return out of the animals while living, and also the best value for their hides, horns and bones when dead. It is not always realised after an animal is dead, that its hide, bones and horns are products of the nutritional and metabolic adjustments which took place throughout the years while the animal was living, and that their value will depend to a certain extent on these factors. It is likely also that the susceptibility of cattle to some parasitic infections, which diminish the value of their hides so enormously, may be modified to some extent by dietary modifications, but nothing definite on this subject can be stated at present. Considerable research will be necessary before we can correlate nutritional deficiencies with susceptibility of the animal body to the various types of parasitic infections and disease in general, but the tendencies in modern nutritional works indicate that a close relationship exists between the dietary supply to and the disease-resistance mechanism of the animal body.