

varieties of cotton grown in the farm. Perhaps, a detailed study of this problem may help to trace the original host plant of Pempheres.

Regarding the two points raised by Mr. Krishna Ayyar (non-inclusion of bhendi as an host plant in the joint paper and the Farm Manager's reply) and Mr. Gopala Menon's reply I leave it to the readers of your valuable journal to judge these on their own merits.

M. C. Cherian,
Government Entomologist.
13-7-'36

STOCK REARING IN THE TROPICS

Management of Cows. All cows are dried off six weeks before calving, or earlier, if their milk yield drops below 25 lb. When a cow is dried off, she may be given a dose of 1 lb. magnesium sulphate, though usually this is not necessary. She is then drafted into the dry cow herd, where she remains on dry cow rations until a month before she is due to calve. She then returns to the milking herd, and comes into the milking shed twice daily, along with the milking cows, and receives milking cow rations on the basis of a yield of two gallons. If she has had a calf before, she requires no further attention before calving, but if she is a calving heifer, or a known heavy milker, she has her udder washed and massaged twice daily, and is lightly milked for a week before calving. Such ante-natal milking should, however, be done very gently and care should be taken to avoid causing pain and consequent apprehension.

A good deal of importance has recently been attached to this question of pre-natal treatment at Pusa, where experience with the Sanhiwal herd has indicated not only a considerable increase in milk yield, but also a remarkable freedom from udder trouble. It is claimed, as an additional advantage, that this treatment makes the cow much more amenable to letting down her milk without the calf. It is not considered at Shika that at present this question is one of much importance. All that is wanted is to secure that the mammary glands are stimulated sufficiently to start secreting fully and immediately the cow calves. It would be most beneficial no doubt, in the event of any congestion of milk, sufficiently great to be likely to cause udder trouble, but this is of extremely rare occurrence with native cows. It is not considered therefore that the practice is worth the amount of extra work involved. By keeping a calving list, prepared month by month, some time ahead, it is possible to ensure that all heifers due to calve come up for observation in due course.

One week before an animal is due to calve, she is transferred into the calving pen. This should be kept very clean, the walls whitewashed after each calving and soiled litter removed daily. During this week the cow is given an extra supply of *dusa** to keep her bowels free, and if there is any sign of constipation, she should be given $\frac{3}{4}$ bottle of linseed oil.

At birth the calf's cord is not ligatured but is cut off, washed with a lysol solution and painted with iodine. Previous experience with tying the cord has been unfortunate. The afterbirth should come away of its own accord within 24 hours, but no action need be taken up to 48 hours. If at the end of this time it is still adhering, it has been found of assistance to twist the end of the afterbirth round a piece of stick and by twisting, exert slight pressure. This twisting should be increased hourly or a small weight attached, and in nearly every case the afterbirth will come away by itself. On no account should attempts be made to hasten its exit by hand, as it is most likely that inflammation will

* Bran of guinea corn (*Andropogon sorghum*).

ensure, and the cow almost certainly become barren, while there is a considerable risk of the operator getting an unpleasant skin infection.

Up to a few months ago, it was the custom to leave the calf with its mother for two days and two nights and not start milking proper until the third day. (Every cow, of course, is milked a little immediately she calves, in order to ensure a free flow for her calf). This practice has been criticised on the ground that it leads to the holding up of milk and reacts adversely upon the cow's ultimate yield. On the other hand, it is held by some that by removing the calf from the mother at birth, its health was being prejudiced, by its being deprived of its natural self-prescribed ration of *colostrum*. However, the length of the suckling period has been gradually reduced, without apparent harm to the offspring, and at the time of writing, all calves are removed from their dams at birth. Instead of *colostrum* the calf gets a laxative on the first three days of its life: on the first day one tea-spoon of linseed oil, on the second day the same plus one tea-spoon of castor oil; on the third day the castor oil is increased to three tea-spoonfuls. This amount of laxative seems to get rid of the *meconium* fairly well, and since the welfare of the calves is the major concern at Shika, the new routine is firmly established.

When the cow calves she continues to receive rations at the rate proportional to a two-gallon yield. In actual practice, she is fed *ad lib.* for some four weeks after calving, or until such time as she has definitely passed the crest of her flow. One's aim should of course be to reach that maximum as quickly, and to maintain it as long as possible. This can only be done by giving every newly-calved cow individual attention, and by breaking down any tendency on her part to hold up her milk by milking her frequently. With calving heifers, it is often necessary to milk up to ten times a day, before one can be certain that no milk is being withheld, and all cows are milked at least five times daily for the first three weeks of their lactation period. In spite of all care, blind quarters are occasionally found, and experience here is that it is better to get rid of such animals at once, as treatment is nearly always unsatisfactory. It is difficult, if not impossible to cure, and there is no known formula for making the necessary correction in the record of the cow's milk yield. Care is taken to see that as soon as a cow's milk yield drops, her ration are proportionately reduced, as otherwise she is simply putting on unnecessary fat.

Calf Rearing. When the calf is taken away from its mother it is put into an individual calf-pen and well bedded down. Each pen has a ticket showing weight at birth, and weekly increase of weight. The calf remains in these pens for one month or until it has to make room for a new arrival. During that period it receives its mother's milk at least three times per day. If the cow will let down her milk without her calf so much the better and this is a tendency which is very strongly encouraged. Roughly, the following quantities of milk are fed to calves:—

Birth to one month	...	5 lb. per day.
1—2 months	...	6 "
3—4 "	...	8 "
5—7 "	...	10 "

These quantities vary with individual cases, and it is better during the first month of a calf's life to err on the light side, as a calf's stomach is unable to cope with large quantities of milk. The milk after being drawn from the cow is heated up to blood-heat before being fed. All calves have free access to bran from birth and although they seldom touch it during the first two weeks, it is advisable to have it there. The total amount of milk fed to a calf is about 175 gallons.

From the individual pens the calves are moved into a pen at the side of the milking shed, holding from four to six animals each. As soon as an individual pen is vacated, the floor is washed out with a disinfectant solution, and the walls re-whitewashed before a new tenant enters. At one time the calves that had to go into the milking shed to induce their dams to let down milk, were segregated from those that never entered it, but this is no longer done. From these pens the animals move into one or other of three pens where they are graded according to size and age, a fourth pen is reserved for convalescent cases while they are segregated from their fellows. Good housing in the dry weather, when the diurnal variation of temperature is great, and the early hours of the morning quite cold, plays an important part in keeping the calves healthy.

The calves are drafted from this last series of pens when they reach eight months old, and here the first segregation of sexes occurs. Calves have in the autumn been drafted straight into the feeding experiment, but during the spring and summer months, the sexes are penned separately. The females are taken into the Dry Season Feeding Experiments, while the males out of inferior dams are castrated.

As soon as heifers are served they go into the "calving heifers" herd where they get special feeding as laid down in the table of rations.

In the early autumn (September) the castrated males are handed over to "mixed" farmers through the Superintendent of Agriculture concerned.

Before a calf is one month old it should be drenched once with turpentine and linseed oil against round worms (6 ozs. turpentine in 20 ozs. linseed).

After it is one month old it should be drenched against wireworms with copper sulphate and mustard at fortnightly intervals, at rates varying with weights. Drenching with copper sulphate and mustard every fortnight is routine for calves, sheep and goats throughout the wet season and up to the end of November. It is considered worth while drenching at 4-30 a. m. or earlier in order to give the drug a fair chance of acting before the morning milking.

The dangerous time of a calf's life is from birth till six weeks old. During that time they must be watched most carefully. The first sign of anything wrong is usually diarrhoea. When this occurs the animal should be put straight into the "hospital", dosed with castor oil, and not given any milk for 12 hours. If at the end of that time there are signs that the scour is lessening, small quantities of milk and hot water (50/50) may be fed at intervals of three hours, but the animal should not be put back on its full rations too soon. In some cases this treatment will cure in a day or so, but unfortunately in the majority of cases, convalescence is a very long business entailing constant supervision. Many different measures have been tried, with varying success, but prevention is better than cure, and the secret of successful calf-rearing is considered at Shika to be cleanliness, cement floors, and absence of overcrowding until the calves are over two months old. Towards this end, it is essential, among other things, to see that all calves have clean litter, that the udder of each cow is properly washed before she is milked, that the calf's mouth is washed and dried after it has had its drink (this lessens the attacks of flies and reduces the loss of hair round the mouth), that milkers wash their hands frequently during milking time, and above all, that buckets should be well washed between individual milkings. To avoid overcrowding, draft the biggest calves into the segregation pens as soon as possible.

External parasites (lice and fleas) need not be anticipated until the animal is two to three months old and is living on a floor of litter. A daily inspection of the animals should then be carried out and whenever lice are noticed, the stock should all be dipped with arsenic dip (1 in 250) in a small bath. At the same

time the bedding should be burned and walls re-whitewashed. Other dips have been tried such as emulsified soap and kerosene, tobacco and mustard, but Cooper's arsenic dip seems the most satisfactory. Care should be taken to see that young calves do not get chilled and therefore the dip should be slightly warmed, the animals should be dried afterwards, and the dipping should not be done very early in the morning.

Feeding of Cows. The West African Zebu cow in the hands of the Fulani herdsman leads a nomadic life grazing from one part of the country to another, being forced by the drying-up of streams and water-holes to move southward as the severity of the dry season increases in the more desiccated north. Poor as the natural grazing is known to be for eight months in the year, the Zebu cow exists on it alone and receives no concentrates. If she exhibits signs of 'pica', she may be given a little native cattle 'lick', consisting of salts of soda and potash, but that is all. In these circumstances, reproduction entails a severe drain on her constitution and the loss in body-weight during her lactation period is appalling. Among native owned herds, annual calving is exceptional, biennial and triennial calvers being the rule, and it seems fairly certain that this reluctance to breed regularly and often is an inhibition evolved by the animal through generations of privation, to combat the hard conditions in which she has her existence.

From investigations carried out among the Fulani, it seems accurate to state that the milk yield of their cows varies in inverse proportion to the periodicity of calving. One factor which practically by itself will upset this correlation, is the adequate feeding of balanced rations, and it has been proved at Shika that if this is seen to, the bulk of the cows will (and do) calve down regularly once a year.

The whole aim in fixing the rations of the breeding stock is therefore so to maintain their condition that their milking performance is a true record of their capabilities. This applies equally to young female stock as to mature cows, for if an animal's development is retarded at any period of its life prior to or during the time it is recorded, it not only affects its own record but masks the true value of its sire. All animals (except the working stock) are weighed at monthly intervals and an inspection of these weights enables one to see whether an animal is doing properly or not.

Feeding of Breeding Bulls and Working Bullocks. While a bull is running with a herd of cows, he is fed *ad lib*, regardless of season. This is to ensure that he keeps in good form, for if he allows a cow to come in season without serving her, then he is seriously affecting her record.

During the cropping season (April to August) all working beasts should be fed *ad lib*. They have to work very hard indeed, especially at the beginning of the season, and unless personal attention is given to their feeding they will be unable to stand up to their task. Their health must also be watched, and though fortunately at Shika, there has been very little serious sickness, apart from the usual sprains, cuts and abrasions that require no special mention, there is always the risk of trypanosomiasis. All likely breeding grounds are regularly cleaned and there is consequently no 'fly', but there is always the risk of mechanical transmission, in view of the fact that the majority of the animals here is purchased stock.

Liver flukes are however abundant, and a *post mortem* never fails to show this parasite or indications of its presence. All marshes and drinking pools are treated with copper sulphate (one part in a million) at three monthly intervals to kill the snail hosts. Animals that appear to be infected are treated with small doses of tartar emetic, only slightly more than half the doses generally recommended for animals suffering from trypanosomiasis. (From the *Tropical Agriculture*. Vol. XIII, No. 6 June 1936, pp. 151-153).