

Dairy Cattle Nutrition

energy, protein, mineral and vitamin requirements for maintenance and production

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All problems in dairy cattle nutrition can not be solved merely by furnishing the proper nutrients in the proper amounts. Other factors such as palatability, suitability, and economy must always be considered.

In general, rations must contain energy, protein, minerals and vitamins. Energy can be supplied to the animal through carbohydrates, fats or proteins.

The requirement for protein, which is actually a requirement for amino acids, can not be met by any other nutrient. In cattle the rumen, or paunch, furnishes almost a perfect environment for bacteria and protozoa which can use urea and similar compounds in building up their own body proteins. These microorganisms are in turn digested by the cow. There are, however, limitations to the amount which can be converted to protein by these bacteria. The ordinary limit for urea replacement is set at a maximum of 30% of the protein—the amount depends upon the percentage of total protein in the ration.

The minerals which are considered to be essential for cattle and which must be present in the ration in adequate amounts are calcium, phosphorus, sodium, potassium, chlorine, magnesium, iron, sulfur, iodine, manganese, copper, cobalt and possibly zinc, although the experimental evidence on zinc is still not definite.

Vitamin Requirements

Vitamin A as such or in the form of carotene is required in the ration, although cattle can store sufficient amounts to carry them over short periods of deficiency in the feed.

If the animals do not have access to plenty of sunlight, then the vitamin D content of the diet must be considered.

There is some evidence that under certain conditions vitamin E may be important in the nutrition of cattle although its role is uncertain and data on this vitamin for cattle are very meager.

Under practically all known conditions we need not consider the B vitamins when compounding feed mixtures for cattle.

By the purified diet technique it has been recently shown that calves require some of the B vitamins for growth when fed entirely on a synthetic ration.

There is no conclusive evidence showing

a need for these vitamins when calves are raised on natural feeds. This is again due to the synthetic powers of the rumen bacteria. There are some indications that the synthesis of vitamins by the rumen bacteria can be influenced by feeding. For these reasons under some instances the amounts synthesized may be inadequate.

Vitamin C—ascorbic acid—is evidently synthesized within the tissues of the cow since dietary vitamin C is destroyed in the digestive tract, yet the animal does not suffer from vitamin C deficiency. The synthesis of this vitamin, however, may be closely associated with the vitamin A nutrition of the animal.

The foregoing general nutritional requirements apply equally well to dairy cattle and beef cattle.

Growing Heifers

Recently a study was undertaken to obtain more information on the protein and energy requirements of growing heifers.

It was noted that a calf starter containing 13% digestible protein when fed with a mixed hay containing only 5% digestible protein will supply sufficient protein to satisfy the requirements.

For heifers of from 200 to 300 pounds a starter containing 11% digestible protein, fed with the same hay, will be sufficient for the requirements.

The heifers were changed from the calf starter to a fitting ration containing approximately 12% digestible protein. With a daily allowance of four pounds of such a grain mixture it was not necessary to feed growing animals a legume hay or even a mixed grass-legume hay to supply sufficient protein. Plenty of good quality grass hay in addition to 3-4 pounds of fitting ration will supply sufficient protein for growing heifers up to 1,000 pounds.

There is no harmful effect of feeding more protein than is actually required by the animal, but if low-cost protein feeds are available it may be desirable to use them. Very often higher protein rations are more palatable than lower protein rations which may cover the requirement. The increased palatability may induce the animal to eat more total feed and therefore produce more satisfactorily.

There is often a tendency to underestimate the energy requirements of ani-

mals. Therefore the owner should be sure that his growing replacement heifers receive plenty of feed. Animals on a higher energy intake make more efficient use of a given protein level.

Work done by researchers elsewhere showed that 6-12 grams of calcium daily from birth to two years of age are sufficient for the growth of calves. A ratio of calcium to phosphorus of 1:1 to 2:1 is considered ideal. Somewhat higher ratios are not detrimental, however, provided the phosphorus allowance is gradually increased from six to 12 grams as the animal grows from 100 to 600 pounds. On the basis of limited experimental evidence these allowances of calcium and phosphorus were tentatively recommended by the National Research Council Committee on Dairy Cattle Nutrition.

Values for the carotene allowance are calculated using 6 mg. of carotene per 100 pounds body weight for growing cattle. A number of studies indicate that this level should be entirely satisfactory since several workers have shown that approximately 1.5 mg. of carotene per 100 pounds will prevent night blindness.

Although vitamin D is known to be required, insufficient data are available to make allowances for the more mature animals.

It is known that the requirements for reproduction are considerably above those for maintenance during the last third of the gestation period. Increased allowances for reproduction need not be made before the last two to three months.

Milk Production

The protein allowance for milk production above the maintenance requirement of the cow usually is considered to be at least 125% of the amount of protein in the milk.

Many studies here and elsewhere have been made of the desired concentration of protein in the concentrate mixture for dairy cows. Over a number of years there seemed to be only a slight advantage for mixtures containing 20% and 24% protein. When the grain allowances are liberal a mixture containing 15% protein may be adequate for all kinds of hay. However, when protein concentrates are readily available at a reasonable price

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RAISINS

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operation of selecting, grasping and cutting a grape cluster.

These exceptions are the focal points in the entire procedure and so additional analysis was undertaken to simplify them.

An analysis by means of an Operator Chart indicated that the bulk of the work in the operation of selecting, grasping and cutting, is now done by one hand while the picker's other hand remains idle for a good part of the time.

Cutting Device

A cutting device is being developed which will balance the work load equally between the hands and keep them both busy during the entire operation.

The method of picking grapes using the cutting device is to be identical with that of using the knife except for the cutting operation. In the cutting operation, a cluster is isolated and grasped in each hand. Each cluster is held in the cupped hand, supported by the lower three fingers. With each cluster thus supported, the thumb and index finger place the cutting device about each stem and cut the stem. The cut clusters are then deposited on the tray below the vine.

Factors such as the end of the season and insufficient time to train pickers in the use of the cutting device made it impossible to collect quantitative data on its efficiency. Additional data will need to be collected in the next harvest season.

From past experience in converting one-handed jobs to two-handed jobs, an increase in output of 30%-40% can be expected with such a change.

Recommendations

The adoption of the Tray Carrier is recommended as standard equipment to be supplied and maintained by the grower. Standardization of method and usage may be achieved if the grower supplies and maintains these trays and eliminates the continued use of the picking pan, supplied by the picker.

Trays should be placed in the aisles on both sides of the rows so that a picker can work down one row and up the next.

Working conditions in the very hot fields could be improved by a minimum remedy which would result in greater productivity—if the case of steel mills can be used as a guide—which is the provision of cold drinking water and salt-tablet dispensers in the main aisles of the fields. The cost is insignificant and the resulting increased productivity would compensate the grower by getting the crop off the vine more quickly.

The use of two-handed cutting-devices for cutting grape clusters needs more

study. Before specific recommendations can be made more investigations should be conducted on: 1, the Turning operations; 2, the purpose and need for Bundling or Rolling; and 3, the possibilities of combining Bundling and Boxing and of the methods of Boxing.

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BEANS

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been conspicuous because of the chlorotic foliage in contrast to the dark green of the normal plants. By September 9th, this appearance was reversed as the normal plants were yellowed from maturity and the treated area was comparatively darker in color because of delay in maturity.

Zinc deficiency symptoms frequently are markedly accentuated in old corral sites within little leaf areas. In other areas this deficiency is often found only in corral sites or Indian camps. Trees in such areas have shown striking response to zinc.

Deficiency Suspected

Zinc deficiency has been suspected a few times in annual plants in San Joaquin County, but prior to the treatments on these beans, there had been no known recorded case of response to zinc applications in any California annual. Soils in which fruit and nut trees will become worthless if not supplied with zinc usually are excellent for a wide variety of annual crop plants, including those known to develop deficiency symptoms elsewhere.

The bean field under observation adjoins an orchard district where little leaf is not known to be a problem.

No abnormality in the previous bean crops had been noted, although it had been observed that previous plantings of barley lodged badly in the corral area and in some years were crowded out by excessive weed growth.

Beans had been planted on this field since 1941, with the exception of 1944 and 1945 when the field was planted to grain.

The history of the land is known back to 1850 when the barn and corral were constructed. In 1900 the barn and corrals were removed and until 1940 the land was cropped to hay, grain and pasture. It was levelled for irrigation in 1940.

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an allowance of 18% seems wise, especially if the roughage is of low quality. Probably under most conditions a 16% or 18% mixture will be adequate. When the hay is largely nonlegume the higher level should probably be chosen. When good alfalfa hay is fed a mixture of farm-grown grains furnishing about 12% protein is probably adequate.

Calcium and Phosphorus

Milk is a rich source of both calcium and phosphorus. One pound of milk contains, on the average, 0.54 gm. of calcium and 0.45 gm. of phosphorus. Experimental work has shown that high-producing cows can not assimilate enough calcium and phosphorus to meet their needs during the early part of lactation. The needs for milk production are met by drawing minerals from the bones. This loss is made up during the lactation period and during the dry period. The heavy drain on the calcium and phosphorus reserves necessitates a liberal feed supply.

Considerable work has shown that furnishing approximately double the amounts of calcium and phosphorus in the milk is sufficient to cover the needs. This allowance is in addition to the maintenance requirement of 10 grams per 1,000 pounds.

In a number of cases accurate estimates of the nutritional requirements must await further research.

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INSECTICIDES

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control. Such a practice is likely to be hazardous, because the disadvantages associated with the chlorinated hydrocarbons frequently become more pronounced as the amounts applied are increased.

With these new insecticides there are many problems that have as yet not been completely solved. They must be used with a degree of caution, and the most good, with resultant satisfaction, can be obtained if they are applied only where needed, and then at a concentration no higher than necessary to produce control.

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