

Making Up the Dairy Ration

The Science of Ration Making is Simple When Understood By C. R. George

EVERY breeder of dairy cattle should know how to select feeds and compute a ration. Not that a separate and exact ration should be calculated for each cow, for the consensus of opinion is that this is either necessary nor practical. A thorough study of the principles of feeding and practice in the figuring of rations does, however, help the feeder to become more familiar with the feed requirements of his cows and the composition and qualities of the available feeds. This information will serve as a guide to the feeder in his every-day practical work and thus enable him to feed more economically. The good live stock feeders of the past have been men who mastered the problems of feeding by a life-time of experience. With them it has been an art. They have learned by making a trial and observing results. The principles which they learned were handed down from father to son, and through two or three generations of experience they were able to produce wonderful results. Then it was that "the eye of the master fattened his cattle." But with the development of modern science this has been changed. Let no one think, however, that the old "art" of feeding has been supplanted or that it can be disregarded by the present-day feeders. Rather let us preserve their methods and traditions, and by supplementing them with the more modern principles it will be possible to develop better feeders than the world has even known and to do so without spending a life-time in the making.

These newer principles are based on the work of the chemist, who can analyze our common feeds and determine the kind and amount of food nutrients that each contains, and upon the work of the nutrition expert who can not only find out what part of these food nutrients can be digested, but can also determine how much of the digestible nutrients are needed by the different classes of animals. These findings have all been reduced to a mathematical basis, and by rather simple calculations it is possible to determine the approximate requirement of an animal and the amount and kinds of feeds that will supply these requirements.

Food Nutrients and Their Function.

All feeds are composed of a large number of definite chemical compounds. Those compounds, or groups of compounds of the same general composition, that may aid in the support of animal life, are termed food nutrients. Protein, carbohydrates and fat are the principal nutrients to be considered in computing a ration, although mineral matter, water and air are equally as important to the proper nourishment of the cow.

Protein—This is a term used to designate the group of nutrients containing nitrogen which may be found either in the feeds, in the body of the animal or in the milk produced. The animal uses protein to build and repair its muscles, connective tissues, skin, hair, horn, etc., and to carry on certain life processes, consequently it is a very essential nutrient. The portion that can be digested is termed "digestible protein."

Carbohydrates—The term "carbohydrates" is used to designate a group of nutrients that includes principally the starches and sugars. They are most extensively found in such feeds as corn, hominy and molasses, and are used by the animal as a source of heat and energy and to build fatty tissue.

Fats—Another group of nutrients, commonly termed "fats," includes all fats and oils. These fats are made up of the same chemical elements as the carbohydrates and perform much the same function in the animal body. However,

they are often grouped separately for the reason that the heat or energy-producing value of a unit weight of "fats" is approximately two and a quarter times that of the carbohydrates.

Total Digestible Nutrients—All these nutrients, including the protein as well as the carbohydrates and fats, have a certain value as a source of heat and energy for the body. In this respect protein is practically equal to the carbohydrates, while the value of "fats" is approximately two and a quarter times greater. For the sake of convenience in figuring rations, the energy-producing or fuel values of these nutrients has been reduced to or common basis, and the units of value are designated as pounds of "total would thus include the digestible protein, plus the digestible carbohydrates, plus the digestible fat multiplied by 2.25.

The relative usefulness of the different feeds to the cow depends largely upon the amount of digestible food nutrients which each actually furnishes. The common dairy feeds vary widely in their content of the different digestible nutrients. This permits of considerable choice in selecting feeds, and every feeder should become acquainted with the composition of available feeds, so he can select the best and cheapest sources of his feed nutrients.

Requirements of a Good Ration.

Every good dairy ration should meet the following requirements:

1. It must contain a sufficient quantity of feed to supply the digestible nutrients necessary for the maintenance of the cow and the production of the normal milk flow.
2. The relative proportions or balance of these nutrients must be suited to the needs of the cow.
3. The feed must be palatable.
4. The grain mixture must have a fair degree of bulkiness.
5. The ration should have a slightly laxative effect upon the cow.

6. It should be made up of a variety of feeds.

7. The feeds used must meet the above requirements most economically.

A ration that is deficient in one or more of the above requirements will not give the best results. Consequently the feeder should be well acquainted with these requirements and know how to select feeds that will meet them and thus satisfy every need of the cow. The problem of supplying the proper amount and proportion of food nutrients to the cow can best be solved by using a feeding standard which gives the amount of nutrients required by a cow for both maintenance and production. Feeds can then be selected to meet these requirements on the basis of their chemical composition. The other requirements such as palatability, bulk, etc., must be met through the selection of feeds that have these desired characteristics.

Maintenance Requirement for Cows.

A maintenance ration is one that furnishes just enough nutrients to keep the mature cow at constant weight when not producing milk or developing a fetus. It represents the non-productive part of the feed and includes approximately one-half of the amount consumed by the average cow. It is able to know the maintenance requirement so that the remaining nutrients that are available for productive purposes may also be known. The amounts of nutrients required for maintenance vary with the weight of the animal to be maintained as shown in the following table:

Weight of cow	Digestible Total digestible protein, pounds	nutrients, pounds
800	55	6.24
900	63	7.13
1,000	70	7.93
1,100	77	8.73
1,200	84	9.51
1,300	91	10.29
1,400	98	11.10

*From "Feeds and Feeding," by Henry and Morrison. Additional Requirement for Production.

After providing for maintenance, every milking cow must have an additional allowance for production. Aside from her maintenance the function or process of producing milk is very similar to that of a factory. She consumes additional feed and manufactures it into milk. To make a pound of milk of a given quality requires a rather definite amount of feed. To make two pounds of this same quality of milk will require twice as much feed. If, however, another cow manufactures a high or a lower quality of milk, she will require a corresponding larger or smaller amount of feed.

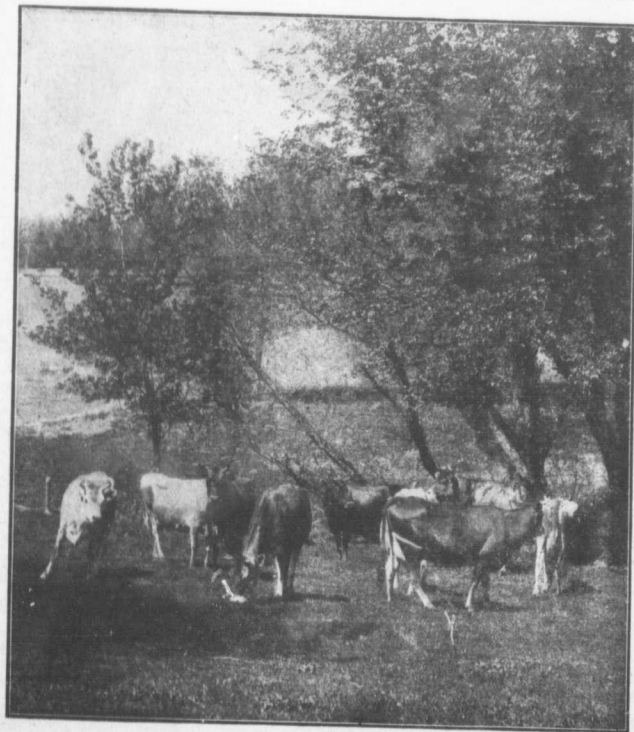
Table II. Additional Nutrients Required for Production.*
For each Digestible Total Di-pound of protein available milk test- pounds nutrients pounds

3.0%	.647 to .657	.368
3.5%	.659 to .661	.316
4.0%	.657 to .665	.346
4.5%	.657 to .669	.376
5.0%	.660 to .673	.402
5.5%	.661 to .677	.438
6.0%	.667 to .681	.454

*From "Feeds and Feeding," by Henry and Morrison.

The production requirement of a cow will, therefore, depend upon the quality and quantity of milk that she produces. The quality is determined by the per cent of butter fat that it contains and the quantity by the pounds of milk produced daily. Table II shows the amount of digestible protein and total digestible nutrients required for the production of one pound of milk containing different percentages of butter fat.

It will be noticed that, the maximum and minimum amounts of digestible protein, that it is advisable to feed, are indicated in the (Continued on page 16.)



Ration Making is Simple when Pasture is Abundant.