

Of all the nutrients, it is the most important and valuable, for no other can take place in this essential flesh-forming work. Without it, or if it is in insufficient quantities, the animal cannot thrive, grow or produce milk.

Fat or Oil.—Of the non-nitrogenous constituents, fat has the highest nutritive value. It is used in the animal for the production of fat—the fat of the body and of the milk; for the generation of vital heat, and as a source of energy or power to do work.

Carbohydrates.—These include starch, sugar and allied substances, which as a rule constitute the larger part of the dry matter of a feed. Their function in the animal is to produce heat and energy (for which purpose they are less valuable weight for weight than fat) and under certain circumstances they may become a source of body fat.

Fibre.—This is the least valuable of the nutrients. In composition and function it is similar to the carbohydrates, but it is less valuable to the animal by reason of its being less digestible. An excess of fibre, especially if it is of a woody nature, depresses the digestibility of the other nutrients and thus may reduce the value of an otherwise excellent feeding stuff. A certain amount of fibre is required to give bulk to the feed, to ensure a constant out of the feed through the stomach and intestines, but this is secured in the usual roughages—hay, ensilage, etc.

Ash.—This is the mineral matter taken from the soil by the plant in its growth. It is composed chiefly of lime, magnesia, potash and soda combined with phosphoric and other acids. In the animal it assists in the formation of bone (largely phosphate of lime) and furnishes that small quantity of mineral matter found in all animal tissues.

The farmer buys feeding stuffs chiefly to enrich his home-grown fodders and grains with protein and fat, and thus make them more effective; in other words, to make a well-balanced ration. The value of purchased feeds will depend chiefly, therefore, on their percentages of protein and fat, and, to some extent, on a low fibre content. If such be the case, it is obvious that the character of the farmer's grains and roughages will in a large degree determine the character and the amount of the concentrates to be purchased. The richer in protein the home-grown grains and fodders, the smaller will be the amount of the high-priced mill feeds necessary to purchase. This consideration is an important one and it should induce the farmer, as far as it may be practicable, not only to grow as much of his feed as possible, but to see to it that it is of the kind that furnishes in the highest degree obtainable the necessary protein. As an example of what may be effected by paying attention to this matter, the case of timothy and clover hays may be cited. These differ markedly in their protein content and hence in their nutritive value. Clover hay frequently possesses twice the amount of protein found in timothy. Hence the question, not merely of the amount of feed necessary to buy, but also its character, will be largely determined by the nature of the hay grown. The more protein the farmer can supply from his own crops the less he will find it necessary to buy; and in all probability the more profitable will be his feeding operations.

Various methods have been proposed and used for arriving at a comparative value of feeding stuffs. Some of these, by reason that they are rather complicated and involve the use of coefficients of digestibility, energy values, etc., are not generally applicable in every day work on the farm; others are comparatively simple of operation and, though not yielding results of the same order of accuracy as the more elaborate methods, they furnish results sufficiently close to the truth for the practical purposes of the farmer. One of these simpler methods we may now describe.

We have said that the farmer buys feeding stuffs chiefly to enrich his home-grown fodders and feeds with protein and fat. The value of these purchased feeds will depend therefore, primarily and chiefly, on their percentages of *Protein* and *Fat*. We can, therefore, compare feeds on this basis and obtain the price per protein-fat unit in the several meals under consideration.