FEED evaluation is an economic problem. Among nutritionist agronomists and representatives of animal production one finds the desire to express the value of a feed in one figure indicating a physiologically significant characteristic. To obtain such a figure, the various components of feeds are graded according to their physiological importance. Those grades are then multiplied by the amounts of the components present in the feed. The value of the feed is then given as the sum of these weighted grades.

The argument for one system of feed evaluation of this type starts with a correct premise: "One cannot say that one essential feed constituent is more essential than another," but continues with a wrong deduction: "therefore all essential components of a ration have the same feed value," and ends with an absurd conclusion: "Since 20 pounds of protein in a dairy ration have the same feed value as 100 pounds carbohydrates in the same ration, the feed value per pound of protein must be 5 times as high as that per pound of carbohydrate."

The value of a feed for dairy feeding was consequently calculated as five times its protein content plus its carbohydrate content. The later attempts to calculate feed values in one figure based on estimates of the physiological importance of each constituent are less obviously wrong but even so this application of a mathematical trick to add cabbages and kings is fallacious.

Only substances that are physiologically important have feed value but physiological importance does not determine feed value.

Is there any single substance more important for mammalian life than oxygen? Yet oxygen has no feed value. Of very great importance also is water, yet water has no feed value. Why have oxygen and water no feed value despite their great physiological importance? Because we get them for nothing. Protein and carbohydrates have feed value because we have to pay for them.

Feed evaluation is an economical problem and feed values should be expressed in Dollars. If a dairy farmer can obtain corn for $38 a ton and wheat for $37 a ton, which is the better buy? That is a problem for feed evaluation.

Replacement Equivalents

Definition—To answer this question the economist needs information from the physiologist. He needs to know how much wheat in his dairy ration will replace one ton of corn with respect to feed value. We shall consider the nutritive content of various feeds in terms of that in starch as "starch equivalent."


do the same for other feeds. Thus, if steers resulting from addition of starch, gluten, oil, cellulose, and various feeds to a basic ration, we can calculate the net energy of each of the two feeds.

By difference trials in a respiration chamber Kellner measured net energy as increase in fat production and used this to calculate the net energy in one figure indicating the physiological signification of the feed components. The postulate that the net energy of a ration is the sum of the net energy of each of the two feeds.

Kellner expressed the net energy in the various feeds in terms of that in starch as "starch equivalent."

The Scandinavian Feed Units are based on replacement equivalents based on the postulate that feeds are equivalent when they contain the same amount of digestible nutrients (TDN).

Wolff, who originated the TDN system, recognized its limitations; it does not properly reflect relative nutritive effect of roughages compared to concentrates.

Armsby attempted to overcome this deficiency by expressing nutritive content as "therms." Net energy was measured as increase in fat production (heat increment) resulting from addition of starch, gluten, oil, celluose, and various feeds to a basic ration. This use of a reference substance instead of a carbohydrate as standard is of great advantage for feed evaluation.

The system of Total Digestible Nutrients (TDN) is of great advantage for feed evaluation, but later degenerated to the postulate that feeds are equivalent when they contain the same amount of material soluble in water, acid, alkali, and a pound of salt, then, would have a hay value of 10 pounds of hay! The system of Total Digestible Nutrients is the better buy! That is a problem for feed evaluation.

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