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SOME FACTORS TO BE CONSIDERED IN PURCHASING FEED FOR FARM ANIMALS*

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Facts and Figures of Value to Dairymen Who Will Have to Buy Part of Their Feed This Winter—How to Determine the Value of Feeding Stuffs—Importance of Digestibility, Palatability and Variety in the Ration

THREE factors stand out prominently in successful dairy production: First, the man; second, the cow; and third, the feed. It is only a phase of the latter subject that I am to discuss here.

We need to realize in order to comprehend the feeding problem in dairy production that the dairy cow is an animated machine that has for her mission the conversion of feed into milk. Cow machines vary immensely in their efficiency. If we are to realize the most out of our feeds, we must, as a matter of course, see that they are fed to efficient cows.

Just what happens to the feed after it is consumed by the cow is a debatable question. As Ex-Governor Hoard, of Wisconsin, says, the inside of the cow is a dark place, and no man has yet been able to fathom all the mysteries wrapped up in the inside workings of her body.

MILK A GUIDE TO FEEDING

There is, however, one fundamental principle that applies to cow machines as well as to all other machines, viz., that there must be in the feed ample and a properly proportioned supply of the raw materials that go to make up the finished product. What does the dairy cow need? If we analyze the product she manufactures, milk, we will get our cue. On an average, whole milk contains approximately the following ingredients:

Water	87.22 per cent.
Ash	.71 per cent.
Casein and albumen	3.50 per cent.
Sugar	4.88 per cent.
Fat	3.69 per cent.

It stands to reason that the dairy cow in manufacturing this product must have the raw material, out of which the ingredients mentioned are formed, and must have it in sufficient quantity and in the right proportion. In addition to this, she must first of all be supplied with sufficient food material for the maintenance of her own body.

The first step in supplying the needs of our dairy cow is the analyzing of the different feed stuffs, and then submitting them to the chemical laboratory of the cow's stomach, and see how much and in what proportion the various feeding stuffs will supply the desired ingredients. In studying these feed stuffs there are several important factors to be considered.

DIGESTIBILITY OF FEEDS

The total composition of a feeding stuff gives very little idea of its feeding value. Only that portion of the feed which can be digested and assimilated can in any way serve the animal for maintenance, growth or productive purposes. The disposition of the energy values in feeds is illustrated in the following table, constructed by H. P. Armsby, and published in the "Cyclopedia of American Agriculture."

ENERGY PER HUNDRED POUNDS	Clover hay.	Corn meal.
Total energy	172,100 Cals.	170,900 Cals.
Losses in dung	73,600 Cals.	15,700 Cals.
Losses in urine	11,500 Cals.	6,500 Cals.
Losses in marsh gas	12,300 Cals.	15,900 Cals.
Total loss	97,400 Cals.	38,100 Cals.
Remainder	74,700 Cals.	132,800 Cals.

This table takes the energy contained in the protein, carbohydrates, and other extract and places them under the name of calories. (A calorie represents the amount of energy required to raise one pound of water four degrees F. in temperature). It will be noticed from this table that clover hay contains more calories a cwt. than does corn meal, but it will also be noticed that the losses in the case of clover hay are much greater than in the case of corn meal, and that the remainder of the energy available for the use of the animal in its digestive and assimilative processes is much greater in corn meal.

The digestibility of a feed is a vital point in measuring its value, as it is the only part of the feed that can be used in the nourishment of animals. An animal hard at work needs to be fed plenty of grain in order to furnish the maximum pounds of nutrients that it is able to handle.

Many authorities measure the value of feed by its total digestible nutrients. This has been proved not to be entirely correct, for although a feed is digestible, it may contain more bulk, require a large amount of energy in chewing, in secreting digestive juices, and in warming up extra water for a suitable solvent. This is called by some, "the facility of digestion."

At the Connecticut Experiment Station (Storrs) an experiment was carried on with two 1,000 pound cows fed on a maintenance ration of 6 1-4 lbs. of corn meal containing 4 1-2 lbs. of digestible nutrients. The same cows required for maintenance 13 1-2 lbs. of mixed hay containing 7.1 lbs. of digestible nutrients. In this instance one pound of digestible nutrients in corn was equal to 1.67 lbs. in mixed hay. Another experiment with pigs showed that 230 lbs. of digestible nutrients in skimmilk were required to produce 100 lbs. of gain. With skimmilk and shorts there were required 258 lbs. of digestible nutrients, and with shorts, 294 lbs.

MILK EASIEST TO DIGEST

All things considered, milk would rank first in facility of digestion, followed by concentrates, and roughage last. With roughage the facility of digestion is greater with early cut than late cut hay. It is greater with silage than corn stover.

An experiment with horses by Zunts and Hagerman, of Germany, shows the nutritive value of different feeding stuffs as follows:

Feeding Stuff	Dry Matter	Total digestible nutrients	Labor expended in chewing and digestion.	True nutritive value in terms of nutrients.
Medium hay (aver. quality)	85	39	21	18
Alfalfa hay cut first of bloom	84	45	22	23
Red clover hay	84	41	24	17
Winter wheat straw	86	18	30	—12
Oats (medium quality)	87	61	12	49
Maize	87	78	8	70
Field beans	86	72	11	61
Peas	86	69	10	59
Linseed cake	88	69	13	56
Potatoes	25	23	3	20
Carrots	15	11	2	9

It will be noticed from this table that 39 per cent of the nutrients of medium hay are digestible, 21 per cent of its nutrients are used up in chewing and digestion, leaving only 13 per cent as representing the net nutritive value. In a similar manner alfalfa hay has a net nutritive value of 23 per cent, clover hay 17 per cent. Wheat straw, however, required more energy in chewing and digesting than it contained in its digestible nutrients, making the net nutritive value, 12 per cent. less than nothing. It will be noticed that the grain contains a much higher percentage of net nutritive value.

ABOUT FEEDING STANDARDS

To furnish a finished animal product the animal must be supplied with the right kind and right quantity of raw material. The standards that have been adopted as a result of numerous experiments indicate how much protein, carbohydrates and ether extract they need under various conditions and circumstances. While these standards are by no means absolute they serve our purpose as guides.

Our farm feeds usually contain ample quantities of carbohydrates and ether extract, but where alfalfa and clover are not grown in large quantities, there is a likelihood of being a deficiency in protein, and when buying concentrated feeds, we usually buy them, not for the carbohydrates, but for the protein.

Before purchasing these we need to settle whether we need protein nutrients or total nutrients.

Words From an Appreciative Reader

Mr. Editor,—Farm and Dairy is all right. We have taken it for years, and it is now as necessary to our business of farming as is our manure spreader. We wouldn't like to do without either, especially Farm and Dairy. We are delighted to note how rapidly your circulation is extending. Not a bit faster, however, than the merit of your journal deserves.—J. C. Campbell, Simcoe Co., Ont.

*From an address by Prof. Otis before the American Farmers' Institute recently.