FARM AND DAIRY
& RURAL HOME

We Welcome Practical Progressive Ideas

The Recognized Exponent of Dairying in Canada

Trade increases the wealth and glory of a country; but its real strength and stamina are to be looked for among the cultivators of the land.—*Lord Chatham.*

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Balancing the Ration of the Dairy Cow

Information on Feeds and Feeding that will Assist the Inexperienced Feeder

SOME of the best feeders of dairy cows never heard of such a thing as a scientifically balanced ration. Through long experience in the handling of dairy cattle for milk production, they are able to produce results without scientific aid. One of the best feeders I have ever known, a Scottish herdsman, had never spent a day in an agricultural college, and although he had some knowledge of the difference between protein, carbohydrates, and fat, he never made use of it when devising rations. He had been brought up on a big dairy farm in Scotland and, as well as his own long personal experience, had also inherited the knowledge gleaned by his father and his father's father in feeding 80 milch cows on the same farm. But what of the young man who has had no such practical training? The writer of the following letter for instance:

"Will you tell me something about compounding rations? Father has turned the farm over to us boys, and my brother and I are going in for winter dairying, shipping our milk to Toronto, a distance of 55 miles. We have 12 cows freshening this fall and early winter. I want to know how to feed them right. Please start telling me from the beginning. I do not know the meaning of any such terms as balanced rations, nutritive ratio, carbohydrates, fat, and so forth. I have seen all these terms in Farm and Dairy in the six months I have been reading the paper. You take it for granted that your readers know all about them. Here is one who doesn't. I want to be a scientific feeder. Will you help me?"

A Good Starting Point

This young man was probably brought up on a farm where the stock were just roughed through the winter. He had not been taught anything of the value of feeds or of their mixing. For such a one as he, a knowledge of scientific feeding will be invaluable. I do not pretend that knowing how to balance a ration properly is all that is necessary to good feeding. It is merely a starting point, but it is a good place from which to start.

Let us start at the beginning. The substances that enter into the composition of plants and of animals may be divided into three grand divisions, protein, carbohydrates, and fats. The protein substances differ from the other two in that they contain nitrogen. When it comes to purchasing feeding stuffs the price will be dictated largely by the proportion of protein that it contains. Flesh or lean meat is almost pure protein and the muscular tissue of the body is built up altogether from the protein in the food consumed. The starches and sugars are examples of carbohydrates. There are only traces of these in the animal body, but they are used to supply energy, heat, and to produce fat. For instance, the fat in milk comes largely from the carbohydrates and fats contained in the food. In plants the fats generally take the form of oils. The carbohydrates and fats perform largely the same functions in nourishing the animal body, and hence they are interchangeable in balancing a ration for a dairy cow, one pound of fat being considered equal to 2.4 pounds of carbohydrates.

What Balancing a Ration Is

A certain proportion of both of these groups of food nutrients, the protein on the one hand and the carbohydrates and fat on the other, are necessary to the feeding of any animal. If we could determine how much of both of these are necessary to keep up the body of the cow and to enable her to make milk and could also determine how much of these ingredients are found in all the food stuffs commonly used, we could then figure out in what quantity and in what combination the various food stuffs should be given. This is what we call balancing a ration.

Chemists have determined for us the composition of all food stuffs and the digestible nutrients in all of the common ones are given in the table on this page. Take corn ensilage, for instance. We find that it contains only 20.9 pounds of food material in 100 pounds of ensilage: the rest is water. Of this .9 per cent. is protein; 11.3 per cent. carbohydrates, and .7 per cent. fat. It will be seen that the protein content is very small. Cotton seed meal, on the other hand, has a very high protein content; 37.2 or over one-third of its whole weight is protein.

Digestible Nutrients in Common Feeding Stuffs

Name of feed	Dry matter in 100 lbs.	Digestible nutrients in 100 lbs. Protein.	Carbohydrates.	Fat
Corn	89.1	7.9	66.7	4.3
Gluten meal	91.8	25.8	43.5	11
Gluten feed	92.7	20.4	48.4	8.8
Wheat	89.5	10.2	69.2	1.7
Dark Feeding flour	99.3	13.5	61.3	2
Wheat bran	88.1	12.2	39.2	2.7
Wheat shorts	88.2	12.2	50	3.8
Wheat middlings	87.9	12.8	53	3.4
Rye	88.4	9.9	67.6	1.1
Barley	89.1	8.7	65.6	1.6
Brewers' grains(wet)	24.3	3.9	9.3	1.4
Brewers'grains(dried)	91.8	15.7	36.3	5.1
Oats	89	9.7	47.3	4.7
Buckwheat	87.4	7.7	49.2	1.8
Linseed meal—				
Old process	90.8	29.3	32.7	7
New process	89.9	28.2	40.1	2.8
Cotton seed meal	91.8	37.2	16.9	12.2
Peas	89.5	16.8	51.8	.7
ROUGHAGE				
Fodder corn (cured)	57.8	2.5	34.6	1.2
Corn stover (cured)	59.5	1.7	32.4	.7
Timothy hay	86.8	2.8	43.4	1.4
Wheat straw	91.4	.4	36.3	.4
Oat straw	90.8	1.2	38.6	.8
Barley	85.8	.7	41.2	.6
LEGUME HAY				
Red clover (med.)	84.7	6.8	35.8	1.7
Red clover mammoth	78.8	5.7	32	1.9
Alsike clover	90.3	8.4	42.5	1.5
Alfalfa	91.6	11	39.6	1.2
Pea vine straw	86.4	4.3	37.3	.8
SILAGE				
Corn	20.9	.9	11.3	.7
Clover	28	2	13.5	1
Alfalfa	27.5	3	8.5	1.9
ROOTS AND TUBERS				
Potato	21.1	.9	16.3	.1
Mangels	9.1	1.1	5.4	.1
Flat turnip	9.5	1	7.2	.2
Rutabaga	11.4	1	8.1	.2
Carrot	11.4	.8	7.8	.2
MISCELLANEOUS				
Beet pulp	10.2	.6	7.3	
Cows' milk	12.8	3.6	4.9	3.7
Separator skim milk	9.4	2.9	5.2	.3
Butter milk	9.9	3.9	4	1.1
Whey	6.6	.8	4.7	.3

What a Cow Needs

Various investigators have figured out just how much a dairy cow needs of all of these substances to be properly nourished. Two of these investigators, Messrs. Wolff and Lehmann, figure that a cow giving 22 pounds of milk daily and weighing 1,000 pounds, should have a ration composed as follows:

- 29 pounds of dry matter
- 2.5 pounds of protein.
- 13 pounds of carbohydrates
- .5 pounds of fat.

This ration is said to have a nutritive ratio of 1 to 5.7. That is, for every pound of protein in the ration there are 5.7 pounds of carbohydrates, or its equivalent. To find the amount of carbohydrates, we multiply the fat by 2.4, and add it to the carbohydrates. It has been proved in the experience of hundreds of good dairymen that the Wolff-Lehmann standard is approximately correct and a good feeder aims to have a combination of feeds that will have about the same quantity of each of the ingredients as determined by Wolff and Lehmann.

Why Not Ensilage Alone?

A ration that has a lot of carbohydrates, but very little protein, will not give good results. Neither will a ration in which there is too much protein and too little carbohydrates. For instance, if a man were to attempt to feed milch cows on ensilage exclusively, and I have seen men foolish enough to do this, the cows will fail in milk flow immediately, and in flesh as well. If we refer to corn silage again we find that it contains only .9 per cent. of protein, while according to the Wolff-Lehmann standard a cow requires 2.5 pounds daily. In order to get enough protein from corn ensilage alone, a cow

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