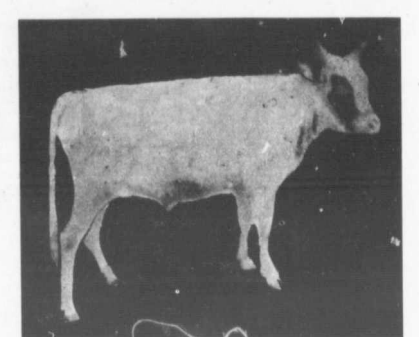




Minto of Woodruffe, son of Minnie Clyde, winner as First Prize Ayshire in Dairy Test, Ottawa, 1933. Owned by J. G. Clarke, Ottawa.

The Scientific Feeding of Dairy Cows

While Canada is a great dairy country and leads the world in cheese production, comparatively little attention is given to the scientific feeding of dairy cows. Our dairy men in a general way have a pretty good idea of cow feeding, and yet there is very much room for improvement. A little more attention to the feeding problem will mean increased profits from cow keeping.

Some of the earliest investigations in scientific cow feeding were made by Wolff. His feeding standard, which claims that a mature animal which is being fed a ration just to maintain its weight requires daily 18 pounds of dry matter, containing the following amount of digestible nutrients: 7 pounds protein, 8 pounds of carbohydrates and 1 pound of fat or ether extract per 1,000 pounds of live weight. By a maintenance ration is understood the amount of feed required by the animal to maintain its normal weight provided the animal is not producing milk or other products. The Wolff standard for dairy cows at work is 24 pounds dry matter containing digestible nutrients as follows: 2.5 pounds protein, 12.5 pounds carbohydrates, and 4 pounds fat per day per 1,000 pounds live weight.

Woll, of the Wisconsin Station, later recommended the following digestible nutrients for a dairy ration: 2.15 pounds protein, 12 to 13 pounds carbohydrates, and 74 pounds of fat. A number of other investigators have found that the Wolff maintenance ration was too large because when fed to animals at rest, a gain was obtained showing that more food was being fed than would maintain the animals at a constant weight.

Among those who made a careful study of this question was Prof. T. L. Haeccker, of the Minnesota Station. His wide experience in feeding dairy cattle led him to believe that the German (Woll) ration contained more protein than seemed necessary.

In a series of experiments during a period of three winters, Prof. Haeccker has shown that his barren dry cows, at rest in the stall, maintained their weight and even gained a slight amount on a ration containing 11.58 pounds of dry matter, having digestible nutrients as follows: .62 pounds protein, 5.75 pounds carbohydrates and 12 lbs. fat.

In Bulletin No. 79, he concludes: "It is tentatively suggested that the food of maintenance for a barren dry cow who at rest in stall be expressed in nutrients, 6 of a pound of protein, 6 pounds of

carbohydrates, and .1 of a pound of ether extract per 1,000 pounds live weight and when at work in a dairy with ordinary good care and comfortable quarters, 7 of a pound of protein, 7 pounds of carbohydrates, and .1 of a pound of ether extract be allowed per 1,000 pounds live weight or one-tenth as much per cwt.

After having determined what is a correct maintenance ration, Prof. Haeccker took up the question of how much protein and other nutrients a dairy cow should be fed. The majority of dairy farmers do not feed as narrow a ration as is recommended by Wolff or by Woll and still good results are obtained in many instances. The question then is, should a narrow ration with a nutritive ratio of 1:3.5, the Wolf-Lehman modified standard, or a wide ratio of 1:6.9 proposed by Woll, be followed? To solve this question, Prof. Haeccker set to work and fed his cows rations having different nutritive ratios, varying from 1:6.3 to 1:9.7, or practically from 1:6 to 1:10, and he found that the wide rations were as effective in the production of products as were the narrow rations. Records were kept of all food consumed, milk and butter fat produced, for a period of three years. Instead of recommending a definite dairy ration containing a definite amount of protein, the following conclusions were reached: First, that after deducting the nutrients required for maintenance, the amount of protein, carbohydrates and fats, a cow should be fed, depends upon her age, the amount of milk she produces and the amount of fat this milk contains. In regard to age, it may be said that this has reference only to the period before and after full maturity. That is, a heifer requires more nutrients for the production of a pound of milk and a definite quantity of butter fat, than does a mature cow. In other words, a "balanced ration" for dairy cows should not mean a definite nutritive ratio like 1:5 or 1:7 or one to any other number, but a certain number of pounds of digestible protein, carbohydrates and fats, the relative amount of which should depend upon the milk and fat yielded as well as upon the weight and age of the animal.

To enable farmers to ascertain the amount of food which should be fed to dairy cows, Prof. Haeccker determined exactly how much protein and other nutrients are required to produce a pound of milk, and the food for maintenance of the animal in question has been taken

care of. From his table of results we take the following, applicable to mature cows and heifers:

Net nutrients used by dairy animals for the production of 1 pound of milk, testing a given per cent. of fat.

Milk Testing	Carbohydrates	Protein	Ether Extract
2.5 per cent.	.362	.164	.0124
3.0 per cent.	.397	.181	.0136
3.5 per cent.	.432	.197	.0147
4.0 per cent.	.467	.214	.0159
4.5 per cent.	.502	.230	.0170
5.0 per cent.	.537	.247	.0182
5.5 per cent.	.572	.263	.0194
6.0 per cent.	.607	.280	.0206
Heifers			
2.5 per cent.	.380	.188	.0127
3.0 per cent.	.443	.217	.0148
3.5 per cent.	.505	.245	.0170
4.0 per cent.	.568	.273	.0192
4.5 per cent.	.630	.302	.0213
5.0 per cent.	.693	.330	.0235
5.5 per cent.	.755	.358	.0256
6.0 per cent.	.818	.387	.0278

Food of maintenance for both mature cows and heifers .07 pounds protein, 7 pounds carbohydrates, and .01 pounds ether extract.

To illustrate the use of the above table when calculating a ration for a mature cow, let us suppose we have a cow weighing 900 pounds, giving daily thirty pounds of milk testing 4 per cent. For maintenance food she would require nine times .07 lbs. protein, or .63 lbs.; 9 times 7 lbs. carbohydrates, or 63 lbs.; 9 times .01 lbs. ether extract, or .09 lbs. Consulting the table of mature cows giving 4 per cent. fat we find that she should be fed for each pound of milk produced (which in this case is 30), .0467 lbs. protein or 1.40 lbs.; 30 times .214 lbs. carbohydrates, or 6.42 lbs.; 30 times .0159 lbs. fat, or .58 lbs. Adding to this the food of maintenance as above figured we obtain a daily requirement for this cow of the following nutrients:

Protein, 2.03 lbs., carbohydrates, 7.22 lbs.; and fat .67 lbs. If, however, the cow weighed 1,100 lbs. and yielded 40 lbs. of milk testing 3.5 per cent. fat according to this method of figuring she would require the following nutrients for maintenance: Protein 7.7 lbs., carbohydrates 7.7 lbs., fat .11 lbs. For milk production, protein 1.73 lbs., carbohydrates 7.88 lbs., fat .59 lbs., or total protein 2.50 lbs., carbohydrates 15.58 lbs., and fat .70 lbs. The former ration would have a nutritive ratio of 1:7.1 and the latter 1:6.9. In regard to the amount of dry matter a sow should be fed, Prof. Haeccker finds that the Wolff standard which recommends 24 to 25 pounds of dry matter per 1,000 pounds of weight, is fairly correct for mature dairy cows. One important conclusion which we find in Bulletin 79 of the Minnesota Station is: "An excess of nutrient in a ration does not seem to increase materially the flow of milk or yield of butter fat, but results in an increase in body weight and a relative decrease in dairy products. While a diminished nutrient supply resulted in a decreased gain in live weight and a relative increase in dairy products."

The City Boarder

"Wat," said Farmer Wilkins to his city boarder, who was up early and looking round, "ben out to hear the haycock crow, I s'pose?" and he winked at the hired man.

"No," replied the city boarder, "I've been out tying a knot in a cord of wood."

Farmer Wilkins scowled at the hired man and wanted to know why he was not getting to work at milking those cows.—*The Furrow*.