FEEDING DAIRY COWS

By PROF. C. L. SMITH

The modern dairy cow is the product of evolution under the influence of care, feed and environment supplemented by careful selection, and by breeding in line, to fix and intensify characteristics.

The history of dairying emphasizes the value and importance of these five factors in the development of the improved dairy cow of today.

In her natural condition, a cow gave milk sufficient to maintain the calf until it was mature enough to gather its own sustenance; about three to four months, yielding during this period from 2,000 to 3,000 pounds of milk.

The calf was dropped at the time when the fresh spring grass furnished an abundance of succulent easily digested food, and ceased at about the time that food became less palatable and more difficult to masticate and digest.

Under domestic influences a man or woman took the place of the calf and by demanding the last drop, twice in every twenty-four hours induced the cow to produce more milk than she had been in the habit of doing when supplying only the needs of the calf. Next by supplying necessary food the period of lactation was extended and quantity increased.

Cows that developed a tendency to respond to the care and feed with more or better milk, were retained to a good old age. As their offspring was more numerous and their individual characteristics frequently transmitted the habit or capacity for turning food into milk was gradually increased and intensified in certain families, these special characteristics were further developed and intensified by care; such as providing succulent food in abundance, shelter from cold and rain, regular hours for milking and feeding and kind treatment.

The selection of males for breeding purposes from those cows which showed the highest average in both quality and quantity, gradually developed into fixed types; such as indicated by the recognized dairy breeds of today.

So well has this work been done that there are in the country many herds that average above 6,000 pounds of milk containing from 4 to 8 per cent of butter fat. There are many individual cows with records running from 10,000 to 15,000 pounds of milk per annum, a few that run 20,000 pounds or more; while the per cent of butter fat varies from 2.40 to 6 per cent.

In the home butter tests of the American Guernsey Cattle Club for the year 1899 the first prize was won by Lily Ella, a five-year-old, owned by J. H. Beirne, of Oakfield, Wis. She produced in one year 12,282 pounds of milk averaging 6.42 per cent of butter fat, making 912.5 pounds of butter.

The fact that all records known above 16,000 pounds of milk per annum were made by cows that were receiving the best care and feed, that they had behind them a long line of ancestors of exceptional capacity for turning food into milk, indicates that each of these factors, care, feed, environment, selection and breed, are all essential for the highest measure of success.

Throughout the Northwest where progress and improvement have been the most remarkable and satisfactory during the past decade, the dairymen have radically changed the natural order by arranging the breeding so that the calves are born in late autumn or early winter. Having learned by practical experience that with the right kind of shelter, care and feed, the cow that drops her calf in November, will, during the following months—the usual milking period—produce from 20 to 30 per cent more milk than the same cow could or would produce if the calf came in May.

They also learned that the four most profitable months in a well managed dairy are the four winter months, December, January, February and March.

It followed logically that to successfully carry out this system provision must be made for food and shelter. Also a variety of dry forage, grain, roots or ensilage, either in whole or part grown on the farm and conveniently stored for economical winter feeding.

This food should be palatable, nutritious, easily digested and contain all the elements necessary to sustain life and produce milk, without any unnecessary waste. To check as far as possible against any unnecessary waste the modern dairyman endeavors to arrange the combination of forage and grain, so that the cow will have what is called a balanced ration, i. e., a ration containing the elements of nutrition in the same relative proportions that the animal uses them for maintenance and for the production of milk.

To determine the amount and proportion of these various elements thousands of test experiments have been tried both in Europe and America. While in some minor matters the variation in the results and conclusions are contradictory and confusing, the numerous practical feeding experiments conducted along the lines indicated by the generally accepted feeding standards, have shown that they are approximately correct. So nearly correct at least that under normal conditions the closer the feeder conforms to the standard ration, the larger the product per unit of food consumed.

The character of the farm, location, productive capacity, cost of labor, climatic conditions, market values, by-products now so extensively used as cattle foods, all have a modified influence upon the selection of feeds and their combination for the most economic feeding.

Where Indian corn thrives luxuriantly, or in pioneer settlements, where wild hay is abundant and cheap, a combination having a wide ratio, say 1 to 10 might be an economical ration, while in the absence of Indian corn, but with alfalfa or red clover abundant and cheap, a narrow ratio 1 to 5 might be the best.

I have, however, visited many of the successful and unsuccessful dairies from the Atlantic to the Pacific and from Minnesota to Texas, discussing feeding problems, investigating local conditions, market value of feed-stuffs, productive capacity of the farm, composition and cost of ration being fed, and amount of product. I have never found a dairyman feeding a ration narrower than 1 to 5 that could not have made a more economical combination by changing to 1-5-5 or 1 to 6. Such narrow rations are, however, rare, and I have found them only in the alfalfa districts.

The most common error is to make a wide ration sometimes running as far as 1 to 15. The instances are very rare, however, where the prices of feed stuffs or local conditions are such as to make a ration wider than 1 to 8 an economical ration for a cow giving a good flow of milk.

One other observation that I think worth calling attention to is that other things being equal, the greater the variety in the ration the better it is relished and assimilated by the animal. I might go farther and say that when there is a difference of even 20 per cent in the cost of grains of the same nutritive ratio it will pay to mix them rather than feed all of a kind.

If the feed is all to be grown on the farm, then crops should be so arranged as to furnish a variety of those kinds and in such quantities as to provide as nearly as possible a balanced ration. Except in rare instances it has been found more convenient and profitable to purchase a portion, at least, of the grain ration. In Minnesota, bran, shorts, oilmeal, glutenmeal, one or all of them, are found profitable and economical additions for mixing with the farm-grown grains, both by adding to the variety and balancing the ratio.

As the coarse fodders, cereal grains and grasses usually grown are comparatively poor in protein, the clovers and peas are the readiest and most economical source of home-grown protein. Wheat and oats, when grown together, furnish a good home-grown grain that when ground and mixed with some of the more nitrogenous products, as glutenmeal, oilmeal or cottonseedmeal, 20 per cent glutenmeal, 80 per cent wheat and oat chop, will give a nutritive ratio of 1 to 7 in the grain, with one-third of the forage clover, or pea and oat hay, the ration will be fairly balanced, will furnish variety and may be largely home grown.

The silo is continually growing in favor. It aids in securing a cheap, palatable, succulent food. Corn is the forage most commonly used, but as it is poor in protein it may be most economically fed in connection with clover hay and a grain ration containing 30 per cent or more of the concentrated feeds that are rich in protein. If corn ensilage forms one-half or more of the forage ration, then the grain ration should be combined so as to have a ratio of about 1 to 5. The average cow, however, will hardly handle profitably more than one or two pounds per day of cottonseed, gluten or linseed meal. The by-products of the flour mills—bran, shorts, middlings—are the most economical sources of supply for the major portion of the grain ration for the northwestern dairyman.

Some of the dairymen have made the mistake of accepting feeding standards and suggested combinations as prescriptions to be taken according to directions. Such feeders often meet with disappointment and charge their failure to errors of the chemist or experimenter who formulated the standard ration.

So far as standard rations and nutritive ratios are given for purposes of practical and economical feeding of farm animals, they are suggestive and general, indicating a general direction that if modified to conditions, environment and temper of the animal, may prove a valuable aid in increasing the product, lessen the cost of production and avoid unnecessary waste.

The German feeding standards have been accounted approximately correct, but to be modified by varying conditions. The American experiments, conducted with the greatest care but under varying conditions, indicate that the German standards are a safe basis from which to formulate a rule of practice. These give as necessary for a mature animal weighing 1,000 pounds 18 pounds of dry matter containing 8.8 pounds of digestible organic matter of which seven-tenths of a pound shall be protein, one-tenth of a pound fat and 8 pounds of carbohydrate, or ether extract, as it is commonly called in the bulletins. For milk production the German tables add to the necessary maintenance ration for each pound of milk: Protein, .08; carbohydrate, 0.18; fat, 0.01.

Two experiments, extending over a period of 154 days, conducted by Prof. T. L. Haecker at the Minnesota Experiment Station, in which the feed given 12 cows was weighed, a careful record kept of food consumed and milk produced the result was, after providing the Standard Maintenance Ration: Protein, 0.05; carbohydrate, 0.22; fat, 0.017, for each pound of milk produced. As the conditions under which the experiment was conducted were like those found in well managed dairies in the northwest, and the feeds used were those available here. I prefer to use Prof. Haecker's figures rather than the German table, as I have always held that the feeding of a wider ration than that provided by the German standard was both practical nd economical in Minnesota.

Starting from this basis, we find no conflict between the practical results in the dairy and the theory of the laboratory, that as the quantity of milk increases the character of the ration should be varied from a maintenance ratio of 1 to 11 to a ratio of 1 to 5 for a cow giving 40 pounds of milk.

Another recognized and accepted fact is, that while a maintenance ration may be in a large part, or even entirely, composed of dry forage, as hay, corn fodder, and straw, for even a moderate milk ration one-third, at least, of the digestible nutriment should be in some form of grain, while with extra large milkers it is found economical to furnish two-thirds of the nutrition in the grain ration. In general practice it is quite common to find a forage ration of clover, alfalfa or pea and oat hay, combined with timothy or other grasses, sorghum or corn fodder, that just about equals the maintenance ration, with a ratio of 1 to 10 or 11. All the animals in the herd are fed approximately the same amount of forage, with a combination grain ration of which bran and shorts form from 40 to 60 per cent of the whole, mixed on the basis of 1 to 5, this mixed grain being fed the cows at the average of about one pound of grain for each two and one-half pounds of milk.

Always bear in mind that any form or kind of ration will secure the best results when modified in harmony with the tastes, habits and temper of the animal to be fed, the cost of food, the labor involved, and the price of the product. All these factors exercise an influence upon results that may frequently make a wide departure from the "Standard ration" both convenient and economical, the most carefully prepared formulas may in a measure guide judgment. They can never take its place.

To successfully carry out such an economical system of feeding necessitates a thorough and intelligent system of crops, a given number of acres of clover, corn, wheat and oats, barley and roots, arranging these several crops with intelligent consideration of soil, climate, productive capacity of the farm and the labor involved.

There is no doubt in my mind, after years of experience in growing feed, feeding and a careful study of feeding problems in connection with my duties as a dairy inspector, that the cheapest, most satisfactory, most palatable and most economical way in which the forage ration can be supplied is with clover hay and corn ensilage. Owing to the large per cent of water in the ensilage, allow for 10 cows for 200 days: Sixty thousand pounds ensilage, 20,000 pounds clover hay, 16,000 pounds mixed grain. This will make the average allowance for each cow 30 pounds ensilage, 10 pounds clover hay, 8 pounds grain.

If the dairyman does not have a silo, the best thing to do is to build one; if that cannot be done, then use the fodder corn. Three acres of well-prepared ground should produce enough for the 10 cows 200 days. Four to five acres of wheat and oats should furnish one-half the grain ration. Corn or barley may be grown instead, and it will prove a measure of economy to purchase some bran, shorts, oilmeal or glutenmeal.

The intelligent dairyman, while feeding as near as he can conveniently to the standard ration, usually prefers to feed a little over, rather than under the amount. A small surplus over that actually needed for maintenance and normal productions no doubt stimulates production.

The extent to which the feeder can

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