

formation, and their attachment to the body, for milk is something that comes from a mother cow's beneficence, something that was intended for something else than the giver, while the beef making is stinginess supreme, keeping all, and only giving back on the block of slaughter.

The fourth consideration is the vital organization, shown in part by well developed basket, yet not prominent forward of the front legs, but indicated by width. This gives the cow a wide heart girth, still maintaining the wedge form from lower to top line. Just how milk is generated, or formed, is not known, but it is a fact that in some way it is formed out of the blood, and large milk producer means large blood-supplying power, a large heart to propel it, and well developed lungs to carry on the work assigned to them. All of this demands plenty of room for the vital organs, so that they are not confined to restricted space, or hampered in their action. One point should not be overlooked. In insisting upon the wedge form, it should not be at the expense of shoulders, narrow at the base, for vitality should be maintained, and can be only with strongly developed vital organs. One rare sign in the cow portrayed, is three well developed milk veins, large and tortuous, the third one of full size and extending along the center of the abdomen, and entering the body through a well defined milk hole. Just back of the forward legs, a "sign" possessed by no other cow in the herd.

We might here refer also to what is known as "touch," a quality of hide and hair, a soft, oily and elastic condition. The higher the quality, if that expresses it, the more sure the judge is that the cow is well wrought throughout, and has a fine organism. Here is a great field for research and observation. Do signs and forms have anything to do with milk yield, or is it a fact that milk goes in any and all forms, with a somewhat close relation to uniformity? The experience and observation of a thousand dairymen, collected and tabulated, from cows actually at work, would be of great value, especially if brought before the dairymen, and their attention fastened upon it. Dairy knowledge is all-essential, and in these days of re-construction and readjustment of our affairs to make them accord with the times that are demanding it, no dairyman can know too much about his dairy; for, as it is, thousands of unthinking men are actually keeping their dairies instead of their dairies keeping them.

—J. G. in "N. Y. Tribune."

THE DAIRY COST OF PRODUCTION.

VALUABLE RESUME OF PROF.
HAECKER'S EXPERIMENTS
FOR 5 YEARS.

Report of an Investigation that every Farmer and Dairyman should study carefully—How to choose the Dairy Type of Cows.

At our Experiment Station, said Prof. T. L. Haecker, in addressing the United States National Butter and Cheese Makers' Convention in February of this year, at Owatonna, Minn., during the past four or five years, I have devoted nearly all of my time to one subject, and that is cost of production. I started out in this work, in a sort of general way,

thinking perhaps we could get some information that would show the farmer what it would cost to make a pound of butter. Fortunately, we had a very mixed herd at St. Anthony Park. It was composed of various breeds of cattle and various types. The work was carried on for one year, weighing every ration before it was given to the cow, and then making a record of that ration. When the cow was milked, the milk was weighed and tested for fat, which you see involved a great deal of work. After this work had been carried on for one year, some very curious facts began to make their appearance. We compared the Holsteins with the Jerseys, the Short-horns with the Guernseys and the natives, and tried in that way to get some results as to what was the best breed; and what was the result? Simply this: The figures show that certain cows of any one breed would produce much better results than others of the same breed under exactly the same conditions; so nothing satisfactory resulted from this comparison. After the year's work was completed, and I noted this peculiar variation between the different cows, the question arose, why does this cow produce butter for 8 cents while that one charges us 16 cents? Why does this Holstein produce butter for 9 cents, while the other Holstein charges 17 1/2 cents? Why does this Short-horn produce butter for 12.2 cents, while another Short-horn charges us 18.2 cents?

Instead of pursuing this course further, we adopted another plan, making two divisions of the herd, putting the cows that charged the most for butter on the one side, and those that charged least for butter on the other. On the one side were Short-horns, Jerseys, Guernseys, Holsteins and natives; and the same was the case on the other side. We found that the cows that had a tendency to lay on flesh gave on an average 267 pounds of butter fat per annum at a cost of 13.8 cents per pound, while the spare cows in the other group gave on an average 337 pounds of butter fat at a cost of 11.6 cents per pound.



TYPES OF DAIRY CATTLE—
JERSEY.

I also observed that some in the group of spare cows did not do as well as others as to the amount of both butter yield and the cost of production. Examining the beefy group, I noticed similar variations, and, after carefully comparing the record of each animal in the herd with the annual yield and cost of feed, I noticed that the greater the inclination to lay on flesh, the greater was the cost of butter production.

To further carry on investigation in this line and have it cover a period when an exact record could be kept of all feed consumed by each cow, an accurate record was kept during the winter of the amount and kind of food consumed by each cow and the amount of milk and butter fat produced. In summing up the winter's work, variations similar to those observed in the yearly record were noticed; this is, that, as a general result,

the cow with a beefy tendency was shown to be less profitable than the spare cow, but there were variations in each group, and the next point to be solved was why this variation. I found that the dairy value of a cow was not in every instance measured by her tendency, or lack of tendency, to lay on flesh, but that there were other conditions bearing on the problem. By this time we had lost all interest in breeds and breed tests, for we began to see that the question of economical butter production involved fundamental principles underlying and governing animal nutrition.

The herd was carefully divided into four groups based upon conformation.

In the first group we placed the cows having a strong tendency to grow meat; of these, Fanny and Dido were almost typical beef cows, while Sully was not formed quite so strong along beef lines; in fact, she came very near being a specimen of the combination cow, and her performance is in harmony with her type.

Group one charged us for feed on an average 17.5 cents for a pound of butter fat.

The second group was composed of cows that had less tendency to lay on flesh, yet were quite plump and smooth at the close of the winter's work, and charged us for feed on an average 15 cents for a pound of butter fat.

Group three was composed of all the cows that were square and angular in conformation, but lacked in depth through the middle of the body; and they charged us on an average 14.0 cents a pound for butter fat.

All the other cows in the herd were assigned to the fourth group, which is fairly represented by Dora, and comprised about half the herd. They charged on an average 12.1 cents to produce a pound of butter fat; and what seemed the most remarkable feature in that winter's work was the fact that all the cows in the herd corresponding to this type charged less for butter fat than did any cow in the other groups, and the more spare and deeper they were through the middle of the body the less they charged for butter fat.

The next work taken up was to ascertain the value of wheat for feeding to dairy cows. This was carried on in the early part of the winter with quite varied results. Some cows returned us only 77 cents worth of butter per bushel of wheat consumed. Some returned us 90 cents. One cow gave us \$1.26, another \$1.31 and the fourth \$1.57 for every bushel of wheat consumed, when butter was 20 cents per pound. Again, comparing the record made by each cow with the amount of wheat consumed, we found that the cow that gave the least return, carried the most flesh; those making best returns belonged to the fourth group; the more spare the cow and the deeper the body, the greater the return for wheat consumed. We also carried on two other experiments, including last winter and the winter before, and I now call your attention to part of this work. First, let me refer to the cow Dora, the representative of group IV., and Olive, of group III. They have been at our station for several years; Olive, I think, since 1890. Every ration they took during that time has been weighed and charged up to them at market prices. Here we have the two shapes of spare cows, both having been under the same treatment. Now, I wish to call your attention to just one point, and that is this, an animal having great depth through the middle of the

body has large digestive capacity. In other words, the measure of the middle of the body is an index of the amount of food that an animal can digest. These two cows have about the same



TYPES OF DAIRY CATTLE—AYR-
SHIRE.

weight; and one of them, Dora, can take 16 pounds of digestible food per day, Olive only 12 pounds, and knowing that neither of them has a tendency to convert food into flesh, the cow that can eat 16 pounds of digestible nutrients per day will give a larger return than the one which can eat only 12 pounds per day.

The next problem is the amount of food that a cow needs for food of support; that is, the amount of food that she will need to maintain her own body, for she never will convert any of her own food into milk until she has had enough for her individual need. Taking our three winters' work, we find that it takes nearly one pound of digestible food to support 100 pounds of cow per day. Each of these cows weigh 800 pounds, but one of them eats 16 pounds of digestible food and uses eight pounds for herself, so she gives us just one-half the benefit of her food. The other one eats 12 pounds and uses eight for herself, so she gives us only one-third the benefit; the other two-thirds she uses for herself. Or in other words, with one we are an equal partner, while with the other we have only a third interest in the business.

Now, we will take up another type of cow; one that converts part of her food into milk and part into beef. Every Monday morning we cast a ledger balance with every animal in the dairy herd. We figure up how much each one has cost us that week for board, and how much has been returned to us. Ethel is a beauty, and I am afraid that this is the style of cow that nine-tenths of the farmers would buy.

Prof. Haecker here exhibited a chart by way of illustration of the cost of producing a pound of butter from the cows during the winter. Take two cows Houston came in the 30th of November and Ethel the 20th of December, so they were under fairly similar conditions. We found that the first week Ethel gave 12.2 pounds of butter at a cost, for feed, of three cents and 97-100 of a cow, while Houston gave 13 pounds of butter at a cost of four cents and 1-100 of a cent being, practically, four cents per pound in both cases. Of course, just now, the food stuffs are very low, and it makes an extra good showing; but the point I am getting at, is the comparative cost. Here we have weekly reports of the two cows, beginning the first of the year, and continuing until the third day of May, when they were turned out to pasture, at which time Ethel was charging me 11.7 cents for feed, for a pound of butter, while Houston was charging me only 4.8 cents.

It should be observed that, at the beginning of their period of lactation, the