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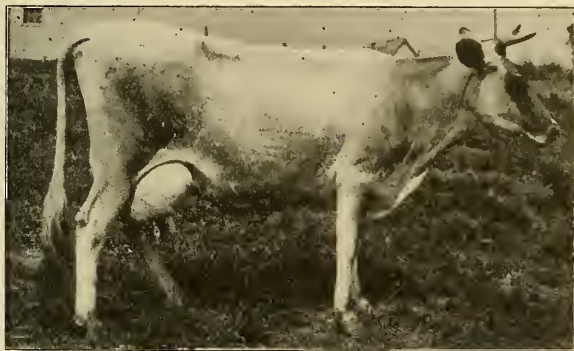
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WEST VIRGINIA UNIVERSITY
AGRICULTURAL EXPERIMENT STATION
MORGANTOWN, W. VA.

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Feeding Experiments With Milch Cows.



BY J. H. STEWART AND HORACE ATWOOD

[The Bulletins and Reports of this Station will be mailed free to any citizen of West Virginia upon written application. Address Director of Agricultural Experiment Station, Morgantown, W. Va.]

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FEEDING EXPERIMENTS WITH MILCH COWS.

In feeding cows for the production of milk it is important not only to produce a large flow of milk, but also to produce this milk cheaply. Dairymen in West Virginia should be able to produce a sufficient amount of roughage, such as hay and silage, for their herds, but a large part of the grain ration, or concentrates, must necessarily be purchased. Now, it is conceivable that a certain increase in the milk yield produced by an increase in the amount of grain that is fed may be produced at an actual loss, the cost of the increased amount of grain overbalancing the value of the extra milk. Or to state the matter somewhat differently it is possible that under certain conditions a balanced ration may not be the most economical one to feed owing to the relatively high cost of the concentrates.

In order to begin the study of this problem two tests have been carried out during the past winter.

EXPERIMENT I.

The first test was begun January 12, 1906, and was continued for twenty days. Eight cows were used in the experiment which was divided into two periods of ten days each. The cows were divided as nearly as possible into two similar lots of four each according to their previous milk yields.

The following table shows the important data regarding the cows used in the test:

| Cow | Breed | Age | Weight | Calved |
|-----|-------------------|---------|------------|---------------|
| 5 | Grade Jersey | 11 yrs. | 910 pounds | Nov. 11, 1905 |
| 6 | Registered Jersey | 5 " | 760 " | June 8, " |
| 7 | Registered Jersey | 9 " | 935 " | March 7, " |
| 8 | Native | 6 " | 935 " | Nov. 26, " |
| 9 | Registered Jersey | 7 " | 920 " | Nov. 10, " |
| 10 | Grade Jersey | 10 " | 965 " | March 14, " |
| 11 | Grade Jersey | 6 " | 700 " | Oct. 18, " |
| 15 | Grade Jersey | 8 " | 890 " | Aug. 20, " |

The table shows that all but three of the cows had been in milk for considerable lengths of time.

During the first period lot 1, consisting of cows 5, 7, 10 and 11, received 40 pounds of silage and 6 pounds of grain per day. The grain consisted of a mixture of equal parts by weight of corn meal, cotton seed meal and wheat bran. Lot 2 consisting of cows 6, 8, 9 and 15, received 30 pounds of silage and 9 pounds of grain per day. At noon both lots received all of the timothy hay that they would eat.

The following table shows the amount of feed consumed by each cow during the first period, and the number of pounds of milk produced.

| | Cow | Silage. | Hay | Grain. | Pounds Milk. |
|-------|--------|---------|-----|--------|--------------|
| LOT 1 | 5 | 400 | 45 | 60 | 254 |
| | 7 | 387 | 35 | 60 | 95 |
| | 10 | 394.5 | 35 | 60 | 113.5 |
| | 11 | 388 | 20 | 60 | 199.5 |
| | Total. | 1569.5 | 135 | 240 | 662 |

| | Cow | Silage | Hay | Grain | Pounds Milk |
|-------|--------|--------|--------|-------|-------------|
| LOT 2 | 6 | 291 | 36.25 | 86 | 130.25 |
| | 8 | 300 | 43.25 | 89.5 | 309.50 |
| | 9 | 286.25 | 33.50 | 90 | 117.75 |
| | 15 | 299.25 | 37.25 | 89.5 | 189.75 |
| | Total. | 1176.5 | 150.25 | 355.0 | 747.25 |

The table shows that lot 2, receiving the heavier grain ration led in milk production, giving an excess over lot 1 of 85.25 pounds.

During the second period of ten days the cows in lot 1 received the heavy grain ration and those in lot 2 the light grain ration.

The following table shows the feed consumed and the milk produced during the second period:

| | Cow | Silage. | Hay | Grain. | Pounds Milk. |
|-------|--------|---------|--------|--------|--------------|
| LOT 1 | 5 | 299 | 42.25 | 90 | 255.25 |
| | 7 | 296.5 | 38.25 | 90 | 74.50 |
| | 10 | 294.75 | 39.25 | 90 | 104.75 |
| | 11 | 299.5 | 18 | 90 | 186.00 |
| | Total. | 1189.75 | 137.75 | 360 | 620.50 |
| LOT 2 | 6 | 348.75 | 30.75 | 60 | 118.50 |
| | 8 | 400 | 49 | 60 | 302.25 |
| | 9 | 367 | 26.75 | 60 | 104.50 |
| | 15 | 393.75 | 36 | 60 | 186.00 |
| | Total. | 1509.50 | 142.50 | 240 | 711.25 |

The table shows that lot 2 which received the light grain ration led in milk production during this period also, the excess being 91.75 pounds. That is, the cows in lot 2 when fed both on the heavy grain ration and the light grain ration led in milk production, the excess yields during both periods, being practically identical. We may therefore conclude that the two rations were equally efficient.

This test shows that when cows are receiving nine pounds of grain and thirty pounds of silage as in this experiment there can be substituted for three pounds of the grain, nine or ten pounds of silage without decreasing the milk flow. Silage is usually valued at about \$2.50 per ton. At this figure ten pounds would cost one and one-fourth cents, while the three pounds of grain would cost about four cents. Hence we may conclude that the ration containing only six pounds of grain was in this experiment the more profitable one to feed.

The average ration for lot 1 during period 1, consisted of 39.2 pounds of silage, 3.4 pounds of hay, and 2 pounds each of corn meal, cotton seed meal and wheat bran. According to the generally accepted tables this contained 16.52 pounds dry matter; 1.58 pounds digestible protein, 8.37 pounds digestible carbohydrates and .75 pounds of ether extract, the nutritive ratio being 1:6.3.

Lot 2 received during the same period an average daily ration consisting of 29.4 pounds of silage, 3.75 pounds of hay, and 2.96 pounds each of corn meal, cotton seed meal and wheat bran. This ration contained 17.36 pounds dry matter, 2.08 pounds digestible protein; 8.61 pounds of digestible carbohydrates and .84 pounds of ether extract, the nutritive ratio being 1:5.04.

According to the Lehmann standard both rations were deficient in dry matter for cows of this size, and the nutritive ratio of the second ration was slightly too narrow.

SUMMARY OF THIS TEST.

The wider ration, having a nutritive ratio of 1:6.3, and containing the smaller amount of concentrates or grain, was not only equally as efficient as the narrower ration but it was cheaper as well.

EXPERIMENT II.

This test began February 15th, and was continued for three periods of fifteen days each. Seven cows were used. During the first and last periods they received five pounds of grain per head per day, while during the second period this was increased to 8 pounds per day.

During the entire experiment practically all the silage was fed, in the morning and at night, that the cows would eat up clean the amount depending upon the individual requirements of each animal. Timothy hay was fed at noon and what was not eaten, was weighed and subtracted from the amount fed.

The following table shows the important data regarding the cows used in the test:

| Cow. | Breed. | Age. | Weight. | Calved. |
|------|-------------------|------|---------|---------------|
| 4 | Registered Jersey | 7 | 795 | Aug. 21, 1905 |
| 5 | Grade Jersey | 11 | 910 | Nov. 11, 1905 |
| 8 | Native | 6 | 955 | Nov. 26, 1905 |
| 11 | Grade Jersey | 6 | 700 | Oct. 1, 1905 |
| 12 | Grade Jersey | 6 | 985 | — ? 1904 |
| 15 | Grade Jersey | 8 | 890 | Oct. 18 1905 |
| 16 | Native | 6 | 1145 | July 19, 1905 |

The grain that was fed consisted of a mixture of equal parts by weight of wheat bran and cotton seed meal. The silage was of good quality, the corn having been well eared and practically mature when placed in the silo.

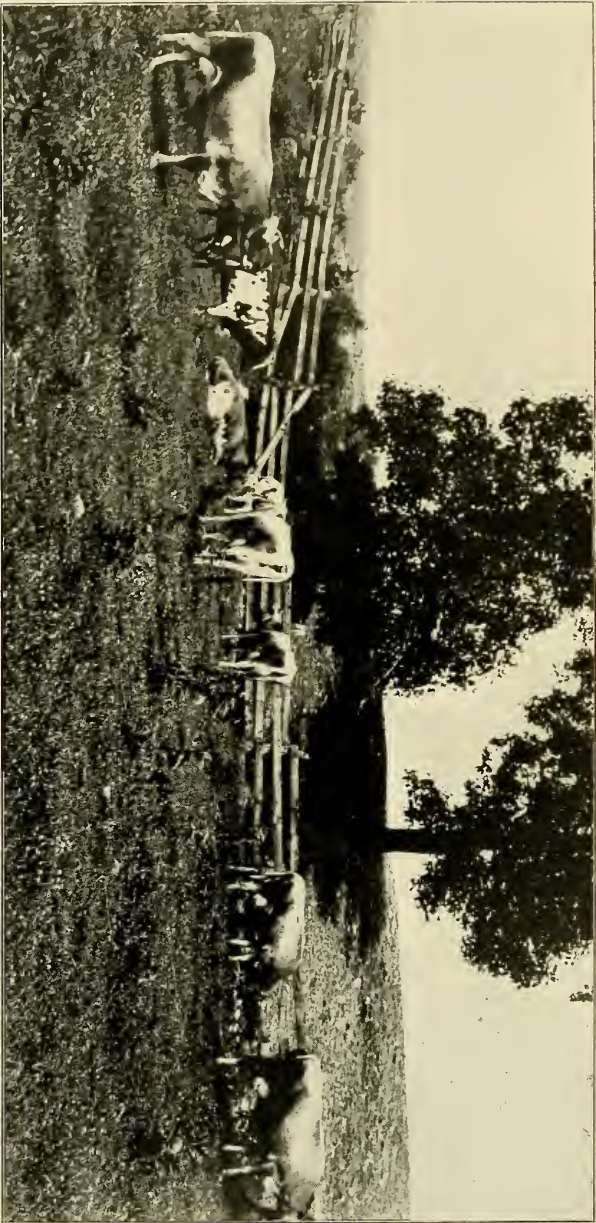
The following tables give the amounts of silage, hay and grain consumed by each animal and the amount of milk produced during the three periods of fifteen days:

PERIOD ONE.

| Cow. | Silage. | Hay. | Grain. | Pounds Milk. |
|--------|---------|--------|--------|--------------|
| 4 | 591.75 | 58.25 | 75 | 286.50 |
| 5 | 832.75 | 34.00 | 75 | 352.50 |
| 8 | 838.50 | 57.75 | 75 | 439.25 |
| 11 | 583.25 | 29.75 | 75 | 287.25 |
| 12 | 750.75 | 48.25 | 75 | 244.75 |
| 15 | 688.00 | 54.25 | 75 | 244.75 |
| 16 | 803.25 | 52.25 | 75 | 317.50 |
| Total. | 5088.25 | 334.50 | 525 | 2172.25 |

PERIOD TWO.

| Cow. | Silage. | Hay. | Grain. | Pounds Milk. |
|--------|---------|--------|--------|--------------|
| 4 | 529.25 | 55.00 | 120 | 285.00 |
| 5 | 823.50 | 33.75 | 120 | 374.25 |
| 8 | 853.50 | 55.00 | 120 | 464.50 |
| 11 | 554.75 | 28.25 | 120 | 284.25 |
| 12 | 740.00 | 45.25 | 120 | 244.50 |
| 15 | 576.00 | 52.25 | 120 | 215.25 |
| 16 | 726.75 | 48.75 | 120 | 323.00 |
| Total. | 4803.75 | 318.25 | 840 | 2190.75 |



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PERIOD THREE.

| Cow. | Silage. | Hay. | Grain. | Pounds Milk. |
|--------|---------|--------|--------|--------------|
| 4 | 616.00 | 37.25 | 75 | 253.00 |
| 5 | 868.00 | 13.25 | 75 | 340.75 |
| 8 | 1057.50 | 34.00 | 75 | 448.50 |
| 11 | 704.50 | 16.50 | 75 | 272.00 |
| 12 | 917.50 | 29.75 | 75 | 252.00 |
| 15 | 696.00 | 35.00 | 75 | 179.75 |
| 16 | 867.00 | 34.75 | 75 | 305.00 |
| Total. | 5726.50 | 200.50 | 525 | 2051.00 |

As the period of lactation advances it is a general rule that the milk flow diminishes in quantity, so in order to draw conclusions from this test it is necessary to average the results of the first and last periods, and compare this average with the results obtained during the second period. In the following table these results are brought together in convenient shape for comparison:

| Period | Silage | Hay | Grain | Pounds Milk |
|-----------------------|---------|--------|-------|-------------|
| 1 | 5088.25 | 334.50 | 525 | 2172.25 |
| 3 | 5726.50 | 200.50 | 525 | 2051.00 |
| Average of 1 and 3 | 5407.37 | 267.50 | 525 | 2111.62 |
| 2 | 4803.75 | 318.25 | 840 | 2190.75 |

The table shows that the average milk production for the second period was 79.13 pounds larger than the average production during periods 1 and 3. To produce this excess yield of 79.13 pounds of milk the cows consumed 315 pounds of grain and 50.75 pounds of hay more, and 603.62 pounds less of silage than was consumed of these feeds during the average of periods 1 and 3.

Valuing the cotton seed meal at \$30.00, and the bran at \$24.00 per ton, the 315 pounds of grain would cost \$4.25, and valuing the hay at \$12.00 per ton the 50 pounds would be worth 30 cents or a total of \$4.55. From this sum should be subtracted the value of the silage which at \$2.50 per ton amounts to 75 cents, leaving a balance of \$3.80, which represents the cost of 79.13 pounds, or practically 39 quarts of milk, making this extra milk cost about 10 cents per quart. As milk is seldom, if ever, worth 10 cents per quart on the farm, we may conclude that in this experiment also, the ration containing the smaller amount of grain was the more profitable one to feed.

The average ration fed during periods 1 and 3 consisted of 51.5 pounds of silage; 2.5 pounds of hay; and 2½ pounds each of wheat bran and cotton seed meal. This ration contained 17.43 pounds of dry matter, and of digestible constituents 1.78 pounds of protein; 8.32 pounds of carbohydrates; .78 pound of ether extract; and with a nutritive ratio of 1:5.6.

The ration fed during the second period consisted of 45.7 pounds silage; 3 pounds of hay; and 4 pounds each of wheat bran and cotton seed meal. The ration contained 19.46 pounds of dry matter; 2.49 pounds of digestible protein; 8.74 pounds of digestible carbohydrates; .98 pound of ether extract and with a nutritive ratio of 1:4.4.

According to the Lehmann standard both rations were deficient in dry matter. During this test the cows were fed liberally, and it would have been practically impossible to have made them consume any more silage or hay.

During the first and third periods the nutritive ratio of the ration agrees almost exactly with the Lehmann standard for cows giving about 20 pounds of milk daily; while in the second period the ratio is somewhat too narrow.

SUMMARY AND CONCLUSION.

Realizing that definite conclusions can not be drawn in feeding trials of this nature from two short tests, yet these experiments indicate that when a dairyman has plenty of good corn silage it will not be wise to feed more than five or six pounds per day of a mixture of cotton seed meal and wheat bran to cows of the average size employed in this test.

