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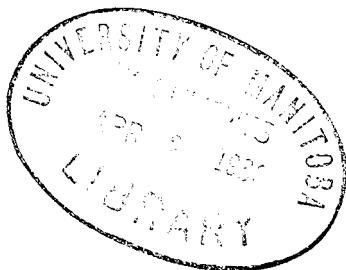
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Feeding Beet Pulp to Lambs.

—BY—

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Feeding Beet Pulp to Lambs.

BY H. H. GRIFFIN.

The establishment of beet sugar factories in Colorado placed the pulp at the command of the farmer for use as stock food after the extraction of sugar. The writer realized that there would be much demand on the part of feeders for reliable information in regard to the value of this product for sheep feeding, as the feeding was done principally for this purpose and probably would be for years to come. The writer further realized that this demand would be emphasized in times of short corn crops in the east and consequent high-priced corn in the Arkansas valley.

It was the wish of the writer to do some experimental feeding with this product in the way of comparing it with corn for fattening sheep. By the kindness of Mr. F. M. Harsin, of Rockyford, 250 head of lambs were placed at our disposal to make a test.

The experiment was planned as follows: One car load of lambs was to be divided into two lots. Each lot was to receive the same amount of alfalfa hay daily. One lot was to be fed corn as it is customary to feed corn in this country. The other lot was to receive pulp in lieu of corn in such amount as would be deemed best for the purpose of making the comparison.

Further, it was intended to incidentally note the effect of the pulp upon the health of the sheep, on the amount of water drank, upon the quality of the meat, and to note how pulp-fed lambs would ship to market as compared to corn-fed lambs. The writer realized that in the latter proposition was, to a great extent, the crucial test of its value.

These lambs were a grade lot from the San Luis valley. Mr. Harsin had put them on hay and corn the first week in November. At the time the Station received them, in December, they were getting 7 oz. of corn per head per day. They were weighed into the Station's pens on the 24th day of December, 1900, 125 in each pen. The weight of pen I was 7,632 pounds or an average of 61 pounds per head; of pen II, 7,772 pounds or an average of 62 pounds per head. Each lot was given the same amount of hay daily. But few of the lambs took to pulp readily. It was ten days before all the lambs in pen II were eating pulp. Pen I was continued on 7 oz. of corn per head daily.

February 21st a stampede of the sheep occurred by which a

few of the corn-fed lambs became mixed with those fed on pulp. They had not been marked, but as those not used to pulp refused to eat it, the separation was easily made.

Both lots were weighed January 3d, and thereafter as often as fortnightly. Pen I weighed 7,710 pounds and pen II 7,744 pounds, so that by the time pen II was eating pulp both lots weighed practically the same.

Pen I was now increased to 9 oz. of corn per head per day. Pen II was consuming 500 pounds of pulp daily, four pounds per head daily, equivalent to 6.4 oz. of dry matter. They were wasting some of this amount of pulp. Both lots were taking practically the same amount of hay, two pounds per head daily. Pen II was held to about 500 pounds of pulp daily until February 2d. At this time the pulp was increased to 750 pounds daily for three days, after which it was increased to 1,000 pounds daily.

It was found that the lambs would not consume this amount of pulp, and that there was also a diminution in the amount of hay eaten. Consequently, in three days the pulp was reduced to about 800 pounds daily, an average of about $6\frac{1}{2}$ pounds per head. The amount fluctuated some because of the waste which occurred. Lot II was continued on this amount of pulp until March 4th.

The corn-fed sheep—pen I—were fed in the same way, gradually increasing the corn, as is the general practice in this section. January 14th they were increased to 11 oz., on February 2d to 13 oz., on March 5th to 16 oz. per head per day. One pound daily per head was the greatest amount because it was difficult to secure corn, and further because the dry matter being fed the pulp lot did not equal in amount that fed the corn lot.

It was apparent that the supply of pulp would be exhausted before the lambs would be in proper condition for market. For this reason it was planned to add corn to the pulp ration and as soon as possible get the corn up to such an amount as the dry matter in the pulp and corn would equal that in the corn lot. Accordingly, on March 5th, the pulp was reduced to 400 pounds daily and 6 oz. of corn added per head daily. The corn lot—pen I—was getting one pound of corn per head daily.

March 27th the corn in the pulp lot—pen II—was increased to 10 oz. of corn daily; the pulp and corn were estimated to contain the same amount of dry matter as the one pound of corn pen I was receiving. Both lots were continued on this ration until the lambs were shipped, on April 16th.

Both lots were weighed at the Station on April 13th. Pen I, which was now reduced to 122 sheep, weighed 10,532 pounds, an average of 86.3 pounds. Pen II (123 sheep) weighed 10,340 pounds, an average of 84 pounds per head.

April 16th the lambs were put on the cars for shipment to

Kansas City. Pen I (121 sheep) then weighed 10,490 pounds, an average of 86.7 pounds per head. Pen II (122 sheep) weighed 10,373 pounds, an average of 85 pounds per head. One sheep from pen II, while being driven to the cars, broke its leg and was not shipped. Four sheep were killed in pen I, two of which were butchered. Pen I thus gained 1.7 pounds per head more than pen II, comparing the weights from January 3d to the close of the feeding.

The weather of December 30th to January 1st was severe, averaging -6° on the 31st, but the gain made by the lambs was fairly good.

TABLE I.

| PERIOD. | No. Days. | Hay. Lbs. | Refuse. Lbs. | Corn. Lbs. | Water. Lbs. | Gain. Lbs. |
|----------------------------|-----------|--------------|-----------------|---------------|----------------|---------------|
| December 24-30..... | 7 | 1,494 | 52 | 351 | 1,783 | |
| December 31—January 4..... | 5 | 1,134 | 86 | 291 | 1,575 | 78 |
| January 5-14..... | 10 | 2,504 | 355 | 708 | 4,050 | 279 |
| January 15-24..... | 10 | 2,250 | 350 | 860 | 4,040 | 513 |
| January 25—February 2..... | 9 | 2,125 | 516 | 781 | 3,175 | 74 |
| February 3-13..... | 11 | 2,250 | 325 | 1,000 | 3,625 | 316 |
| February 14-23..... | 10 | 2,500 | 270 | 1,100 | 4,605 | |
| February 24—March 5..... | 10 | 2,500 | 621 | 1,012½ | 5,360 | 818 |
| Total..... | 72 | 16,757 | 2,575 | 6,103½ | 29,213 | 2,078 |
| March 6-27..... | 22 | 5,588 | 780 | 2,750 | 11,900 | 652 |
| March 28—April 13..... | 17 | 4,178 | 533 | 2,090 | 7,200 | 128 |
| April 14-16..... | 3 | 680 | 200 | 302 | | 44 + |
| Total..... | 114 | 27,203 | 4,088 | 11,245½ | 48,313 | 2,902+ |

TABLE II.

| PERIOD. | No. Days. | Hay. | Refuse | Pulp. | Refuse | Corn. | Water. | Gain. |
|----------------------------|-----------|--------|--------|--------|--------|--------|--------|-------|
| December 24-30..... | 7 | 1,527 | 44 | 1,780 | 195 | | 1,275 | |
| December 31—January 4..... | 5 | 1,134 | 66 | 2,325 | 41 | | 575 | -28 |
| January 5-14..... | 10 | 2,504 | 379 | 5,038 | 92 | | 1,300 | 216 |
| January 15-24..... | 10 | 2,250 | 270 | 5,020 | 79 | | 1,675 | 257 |
| January 25—February 2..... | 9 | 2,125 | 263 | 4,732 | 22 | | 1,050 | 131 |
| February 3-12..... | 10 | 2,250 | 386 | 8,671 | 369 | | 300 | 276 |
| February 13-23..... | 11 | 2,500 | 338 | 8,969 | 98 | | 365 | |
| February 24—March 5..... | 10 | 2,500 | 661 | 7,757 | 102 | | 665 | 588 |
| Total..... | 72 | 16,790 | 3,412 | 44,292 | 998 | | 7,205 | 1,710 |
| March 6-27..... | 22 | 5,588 | 870 | 9,371 | 46 | 988 | 5,075 | |
| March 28-April 16..... | 20 | 5,607 | 1,073 | 6,825 | | 1,607½ | 3,425 | 498 |
| Totals..... | 114 | 27,985 | 4,355 | 60,468 | 1,044 | 2,595½ | 15,705 | 2,678 |

TABLE III.

| DATE. | PEN I. | | | | PEN II. | | | |
|-----------------------|------------|----------------|------------|---------------|------------|----------------|------------|--------------|
| | No. Sheep. | Gross Wt. Lbs. | Gain. Lbs. | Wt. Per Head. | No. Sheep. | Gross Wt. Lbs. | Gain. Lbs. | Wt Per Head. |
| December 24..... | 125 | 7,632 | | 61.0 | 125 | 7,772 | | 62.1 |
| January 3..... | 125 | 7,710 | 78 | 61.6 | 125 | 7,744 | -28 | 61.9 |
| January 14..... | 125 | 7,989 | 279 | 63.9 | 125 | 7,960 | 216 | 63.7 |
| January 24..... | 125 | 8,502 | 513 | 68.0 | 125 | 8,217 | 257 | 65.7 |
| February 2..... | 125 | 8,576 | 74 | 68.6 | 125 | 8,348 | 131 | 66.7 |
| February 12..... | 125 | 8,892 | 316 | 71.0 | 125 | 8,624 | 276 | 69.0 |
| March 5..... | 125 | 9,710 | 818 | 77.6 | 125 | 9,482 | 858 | 75.8 |
| March 27..... | 124 | 10,362 | 652 | 83.5 | 124 | 9,952 | 470 | 80.2 |
| April 13..... | 122 | 10,532 | 170 | 86.5 | 123 | 10,340 | 388 | 84.0 |
| April 16..... | 121 | 10,490 | -42 | 86.6 | 123-122 | 10,450-10,373 | 90 | 85.0 |
| April 18 (K. C.)..... | 120 | 9,280 | -1,210 | 77.3 | 117 | 8,880 | -493 | 75.9 |

TABLE IV.

| Date. | Weather. | Water Drank Pen II—Lbs. | Water Consumed as Pulp, Pen II, lbs. | Total Water Con- sumed, Pen II, lbs. | Water Drank Pen I—Lbs. |
|-------------|-----------|----------------------------|---|---|---------------------------|
| January 1. | Cold | 100 | 390 | 490 | 300 |
| January 15. | Mild | 115 | 441 | 556 | 315 |
| February 1. | Cold | 100 | 461 | 561 | 300 |
| February 8. | Cool | 0 | 900 | 900 | 300 |
| March 1. | Very Warm | 100 | 750 | 850 | 575 |
| March 15. | .. | 325 | 375 | 700 | 675 |
| April 1. | Stormy | 50 | 360 | 410 | 200 |
| Total. | | 790 | 3,677 | 4,467 | 2,665 |

Feeding experiments nearly always show a lack of uniformity in gains, though the weather and kind and amount of food may be constant.

Comparing the gain with the amount of food eaten, the pulp lot compares quite favorably with the corn-fed lot. Were the test to stop here, favorable claims could be made for the pulp. The crucial test came in the shipping. The lambs were forty hours on the way from Rockyford to Kansas City without feed. The shipping showed that the pulp lot were weak-boned and had but little stamina; that the flesh was soft and shrank immensely, giving a much worse appearance than the corn-fed ones.

On the cars four sheep died and one was crippled in the pulp-fed lot; one was crippled in the corn-fed lot. The lambs sold for \$4.80 per cwt., the market being from \$4.60 to \$5.00 that day. The pulp lot in Kansas City had an average weight of 75.8 pounds. The corn lot had an average weight in Kansas City of 77.3 pounds. In shipment the corn lot lost 9.4 pounds per head, and the pulp lot 9.2 pounds. The amount each lot shrank is practically the same. The four dead sheep were, of course, a total loss, which with three crippled (one corn-fed) ones indicates the lack of strength as compared with the other sheep. The attendant stated that the pulp lot sold higher than they would have had not they been on the market in small numbers with corn-fed lambs. Thus while the average weights are about the same, the deaths in pen II and the general appearance of the lot plainly evidenced that they did not ship nearly so well as the corn-fed lot.

The financial account based on the Kansas City returns stands as follows:

| | | |
|--|----------------|------------------|
| 117 lambs (fed on pulp), 8,880 lbs., at \$4.80 |\$426.24. | Per head, \$3.64 |
| 120 lambs (fed on corn), 9,280 lbs., at 4.80 | 445.44. | Per head, 3.71 |
| Balance in favor of the corn | 19.20. | Per head, .07 |

If the lambs had been fed pulp exclusively until the time of shipment, I have every reason to believe that the per cent. of loss would have been much greater. Salt was given both lots twice per week, the pulp lot getting one-third more than the others. Evidently lambs fed on pulp should be given plenty of salt because of the absence of bone-forming material in the food.

March 20th one lamb from each lot was sold to local butchers

to test the quality and appearance of the meat. March 28th two more lambs, one from each pen, were sold for the same purpose. Both lots dressed well and the proportion of dressed meat was about the same. The corn-fed flesh was considered some best in color and the carcass showed a good proportion of fat on the outside. The carcass of the pulp-fed lamb showed the most fat on the inside.

The meat from each lot was of good quality and but little, if any, difference could be noted. At the time of loading on the cars one of the pulp lot broke a leg. The lamb was killed and dressed, but it dressed out very poorly. There was but little fat and the meat was of poor quality. This was a typical Navajo sheep, which may account for the failure to put on fat.

As pen II did not become accustomed to pulp until January 3d, the only safe comparison of gains that can be made is for a feeding period of 60 days between January 3d and March 5th.

Referring to table I, we find that for this period pen I ate 5,590 pounds of corn and gained 2,000 pounds. Pen II ate 41,117 pounds of pulp and gained 1,728 pounds. Both lots had eaten practically the same amount of hay. It required 2.79 pounds of corn, in addition to the hay, to make one pound of gain. It required 23.78 pounds of pulp, in addition to the hay, to make one pound of gain. These figures, reduced to their equivalents in dry matter, make 2.37 pounds and 2.34 pounds, respectively. The amount of gain corresponds very closely to the amount of dry matter in the food. Were the pulp so condensed that the same amount of food material could be consumed as of corn, it can fairly be said the results would be equal. These results are based upon the weights at the shipping yards and not at the point to which the lambs were shipped.

Pulp is not a condensed food and the capacity of the animal to take it is limited. The results from the pulp may be partially due to the cooling and regulating effect it may have upon the system. The office of the pulp would seem to be as follows:

On account of its cooling and regulating effect on the system, and bulky, succulent nature, it would be a good thing to feed for some time after taking lambs from the range and putting them on dry hay. For the first two months of feeding the feeder does not care so much for the fat put on the animal as he does for the growth and for the enlargement of the animal's digestive capacity. The alfalfa produces the growth and enough pulp can be consumed to fatten as fast as is desired in the early stages of the feeding.

After the first two months of feeding I believe the lambs should be gradually accustomed to corn, and for the last six weeks of the feeding the pulp should be kept from them entirely.

What, then, is the value of a ton of pulp for feeding to lambs as compared with corn, based upon the results obtained in this feeding trial? The computations so far in this bulletin have been made

upon the supposition that pulp contains 90 per cent. water, which is about right for the pulp we fed. One ton of pulp, therefore, contains 200 pounds of feeding material. For comparison we will consider corn worth, at the cars, 75 cents per cwt. A ton of pulp may be said to be worth \$1.50, could it be fed without any outlay for transportation.

The great consideration in estimating the value of the pulp is the matter of transportation. For convenience we will estimate the feeder is such a distance from a factory that it costs him \$1.00 per ton to deliver corn to his yards. The corn at above rates costs him, then, 80 cents gross per cwt. It will take practically the same time to deliver a ton of pulp as it does a ton of corn. It has cost, then, to get the pulp \$1.00 per ton. This would leave 50 cents for the value of a ton at the factory. If the pulp is shipped then the freight charges must also be deducted to obtain the price which the feeder so situated may afford to pay for the pulp at the factory.

Let us inquire for a moment as to the amount of labor required to transport the same amount of feeding material in pulp as there is contained in ten tons of corn. We will suppose that the feeder is such a distance from the station that he can haul the above amount of corn in 15 hours, or at the rate of one ton in one and one-half hours. The trip can be made with pulp in about the same time, but two and one-half tons of pulp can be hauled at each load because it is of the same bulk as two tons of corn. To haul a ton, which contains 200 pounds of feeding material, the cost then is \$1.50. To get a ton of feeding material in the pulp it will take 12 hours; to get the ten tons of feeding matter it will require 120 hours. The cost at 30 cents per hour for man and team will be \$4.50 for the delivery of the corn, and \$36.00 for the delivery of the pulp.

It may be said that the farmer has the pulp as a by-product of the beet business, and that it will be a waste unless he utilizes it for feed.

Under similar conditions for which the above estimate is made, let us see what it may be considered worth to such a farmer for lamb feeding. The corn will cost him 77 cents per hundred weight (approximately) at the feeding yards. The pulp has cost him only the delivery, or \$36.00, which equals 36 cents per ton, or 18 cents per hundred weight dry matter; 77 cents minus 18 cents equals 59 cents, the value per hundred weight of the dry pulp. As there are 200 pounds in each ton, then 59 cents \times 2 cents, or \$1.18. From this must be deducted the expense of delivering the pulp (labor of handling), together with the labor necessary to get the pulp from the silo to the sheep - a total of not less than 20 cents per ton. Deduct this from the \$1.18 will leave 98 cents per ton as the value that may be attached to it by a farmer so situated.

Mr. Rhodes, of Las Animas, has feeding yards about one mile from the depot. He delivered a considerable amount of pulp to his yards in the fall of 1901. The pulp cost him at the factory 25 cents per ton and the freight was 30 cents per ton, making it cost 55 cents at the railway station. He used a four-horse team and one man to deliver the pulp. He estimates that the total cost delivered at the pen was 75 cents per ton, and when fed from the silo the total cost was 85 cents per ton.

The Station received from the factory 86,410 pounds of pulp, of which 59,576 pounds were eaten by the lambs, leaving 26,834 pounds, or 32 per cent., as the amount of waste or loss. This may be considered as a maximum waste, as we had no silo in which to store the pulp.

Some trouble was experienced in feeding the pulp in very cold weather on account of freezing. At such times it was found necessary to wait until about 9 o'clock in the morning before feeding. Again in the afternoon it was necessary to feed at 3 or 4 o'clock so that the pulp could be eaten without freezing. With large lots of sheep this would be a matter of much consideration.

A record was kept of the amount of water drank by each pen, and is given in table II. The result is interesting, as the question is often asked: "How is it that the animals can consume so much watery material in addition to other food?"

The table shows that, including the water in the pulp, the total amount of water consumed by pen II was greater than that received by pen I. The feeding of pulp is simply one way of furnishing the water supply.

The experience in feeding pulp by different people, 1901, shows that where the animals are confined in pens that the yards become extremely wet. Such conditions are not favorable for the growth of the animal and reduce the benefits derived from the food.

SUMMARY.

Sugar beet pulp contains about 90 per cent. of water, hence there is but 200 pounds of feeding material in a ton.

From weighings made on the sub-station farm the results show about equal gains in weight for the dry matter in the corn and in

the pulp when each are combined with alfalfa.

Hence one ton of pulp is equal to 200 pounds of corn.

Owing to the bulky nature of the pulp not enough of it can be consumed by lambs to produce sufficient fat to finish them; hence it should be fed to the greatest extent at the commencement of feeding.

What is fed in the latter part of the feeding period should be used as an appetizer and a regulator of the bowels rather than for the fat it produces.

Pulp fed in large quantities produces a soft flesh.

The matter of transportation is a very essential one for the farmer to consider in the utilization of pulp. For the profitable use the yards must be near the factory or to railway facilities.

When large quantities of pulp are fed to animals confined in small lots the lots become very foul, much to the discomfort of the animals and loss to the feeder.