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Preliminary Report
**Feeding Flax Straw
to Cattle**

Animal Husbandry Department
Agricultural Experiment Station
South Dakota State College
of Agriculture and Mechanic Arts
Brookings, S. D.

Flax Straw for Cattle

James W. Wilson, Turner Wright and Forrest Fenn

Introduction

This circular gives the results of feeding flax straw to cattle. Reports show that flax was introduced into New England and Virginia, in the early colonial days, and grown chiefly for its fiber. Later its cultivation as a seed crop spread westward with the settlement of new lands.

South Dakota ranks third among the states in the production of flax. In the statistical report, issued by the South Dakota Department of Agriculture, for 1930, we find that every county in the state is credited with growing flax. The largest acreage is reported from Perkins county in the West River country and the smallest from Union county in the Southeastern part of the state, which county is one of the smallest in the state. Of the 711,442 acres, 40,862 were grown west of the Missouri river. In this connection it might be well to state that according to the last census of the United States Department of Commerce, over one-third of the cattle population of the state is credited to the West River country.

The by-product of the industry, the straw, is still used for manufacturing purposes, but the chances are that more flax straw produced on the farms in South Dakota is used for feeding livestock than for manufacturing purposes.

Flax is grown quite generally on the new breaking of the prairie sod, while in the older sections it is grown on old ground in rotation and is known as the "cash" crop. Dr. A. N. Hume, agronomist of this station reports as follows: "The interest that growers have manifested in the crop is shown by the steady increase in acreage, from 193,000 in 1922 to 637,000 in 1929. Evidently this increase is a result of finding it possible to produce flax at a profit not only on "new breaking" but in recent years on cultivated lands. Here flax increasingly becomes a part of a systematic cropping, along with other small grains often following corn. One common sequence is (1) corn (2) small grain or flax (3) legume. This use in turn is due not only to the production of successful crops of flax, following corn for example, in the place often occupied by small grain, but likewise flax has been found to serve reasonably well as a nurse crop for such legumes as alfalfa or sweet clover. These legumes have been commonly seeded with wheat, oats, barley, and, in recent years in various places, also with flax. It is important that a systematic rotation afford the possibility for including a legume crop which helps maintain the nitrogen and humus content of soils. The evident fitness of flax to serve as a nurse crop goes far toward placing it as a standard crop for South Dakota farms."

The Experiment

Flax straw was fed cattle during the winters of 1930 and 1931. The straw was purchased from local growers, therefore, necessarily varied in composition.

The increase in acreage during the past few years, as above stated, likewise increased the demand for information as to the value of flax straw

as a feed. Let it be understood, however, that these results might not be applicable in feeding immature flax straw or grazing immature flax.

Some are of the opinion that the feeding of flax straw to pregnant animals should be avoided entirely. Others claim because of its fiber content, balls will be formed in the stomach of the animal and as a result materially interfere with digestion. These were the two principal factors we had in mind when we inaugurated this experiment. We knew from experience that cattle would eat flax straw and even a fattening steer consuming a full ration of corn would eat flax straw for variety. We further knew when cattle have access to a straw pile, part of which is flax straw, they will eat the flax straw in preference to the other straw. However, we decided to proceed cautiously, not to over-feed, but to determine about how long cattle could eat flax straw as the sole roughage ration without causing trouble, and if there were any irregularities to ascertain the cause of the same and suggest methods of prevention; also how long pregnant cows could live on flax straw as the sole roughage ration before they would abort, and if they aborted, what was the cause? Would the calves be abnormal, and if so, in what respect? Then again would the period of gestation be a factor in causing abortion by feeding flax straw? Also, would a ration consisting of part flax straw and part alfalfa hay be safer to feed than when all the roughage was flax straw?

In order to determine these facts we used 24 head of cattle each year, 12 cows and 12 yearling steers, the average of those found in this community. No effort was made to get cows of the same advancement in the period of gestation, and yet for this study, it was an advantage not to have them similar in this respect.

These cattle were divided into four different lots of 6 head each, 3 cows and 3 steers, and fed on the following rations:

- Lot I. Alfalfa hay.
- Lot II. Flax straw.
- Lot III. One-half as much alfalfa hay as cattle in Lot I were receiving and all the flax straw they wanted.
- Lot IV. One-fourth as much alfalfa hay as Lot I was getting and all the flax straw they would eat.

In addition each lot received a limited ration of ground corn, salt and water.

All cows proved to be pregnant when purchased, and for the second year's work, with two exceptions, were all bred to the same bull. Table No. I shows the number of days the cows, after they were put into the experiment, calved, for both 1930 and 1931. It also gives weight of calves except when they calved in the pasture and the condition of both calf and cow after calving.

TABLE NO. I
1930 Results 1931 Results
Lot I. Alfalfa Hay and Ground Corn

| No. cow | Days after experiment started cow calved | Weight of calf | Condition of calf | Days after experiment started cow calved | Weight of calf | Condition of calf |
|--|--|----------------|-------------------|--|----------------|-------------------|
| 33 | 26 | 60 | Small but strong | 214 | On pasture | Strong |
| 34 | 90 | 69 | Small but strong | 213 | On pasture | Strong |
| 23 | 98 | 90 | Strong | 134 | 68 | Strong |
| Lot II. Flax Straw and Ground Corn | | | | | | |
| 26 | 13 | 31 | Small but strong | 178 | 78 | Strong |
| 32 | 88 | 90 | Strong | 127 | | |
| 50 | 43 | 50 | Strong | 65 | 74 | Strong |
| Lot III. One-half Alfalfa Hay, Flax Straw, Ground Corn | | | | | | |
| 19 | 98 | 77 | Strong | 352 | On pasture | Strong |
| 24 | 142 | 81 | Strong | 247 | On pasture | Strong |
| 17 | 129 | 81 | Strong | 161 | 81 | Strong |
| Lot IV. One-quarter Alfalfa Hay, Flax Straw, Ground Corn | | | | | | |
| 37 | 106 | 60 | Strong | 260 | On pasture | Strong |
| 38 | 149 | 71 | Strong | 155 | 80 | Strong |
| 22 | 165 | | Strong | 213 | On pasture | Strong |

The results reported in Table No. I do not show that there is danger of abortion in feeding flax straw to pregnant cows. Possibly, perhaps, if we had allowed these cows to go to a flax straw pile and permitted them to gorge themselves we would have had some trouble but the practice followed was not to give them an over-feed of the straw at first as they were not accustomed to it.

During the two years there were 18 head of cows under observation. From Table No. II, during the second year of the experiment, the average length of the period of gestation for the 3 cows that received alfalfa hay was 278 days, and for the 7 head that received part or all of flax straw as their roughage ration it was 282 days. Winters in "Animal Breeding," 1930 edition, gives the period of gestation for cows from 270 to 295 days. The records for all these cows are then normal.

There were 24 calves dropped during the two year's work, and only one we considered undersize. This was a first calf from cow No. 26 in the lot receiving flax straw. This heifer had been in the experiment but 13 days

before calving, hence we do not attribute its weight to the feeding of flax straw as she was normal in every respect. In the same lot No. 32 carried her calf 88 days, and it was one of the largest calves born. Cow No. 26 weighed but 846 pounds when she went into the experiment, while cow No. 32 weighed 1018 pounds and about 1072 when she calved. In this connection might state that all cows gained while on their different rations.

The following table shows the period of gestation for the 10 cows in the second year of the experiment. Ten of the original cows were bred to the Hereford herd bull and the period of gestation for each was as follows:

TABLE NO. II
Period of Gestation for Cows, Second Year's Test

| No. of Cow | Lot I Ground Corn and Alfalfa hay | Lot II Ground corn and Flax straw | Lot III Ground corn and One-half Alfalfa and all Flax straw they wanted | Lot III Ground Corn and One-fourth Alfalfa and all Flax straw they wanted |
|------------|---|---|---|---|
| 33 | 277 days | | | |
| 34 | 277 days | | | |
| 23 | 280 days | | | |
| * 32 | | 259 days | | |
| 26 | | 277 days | | |
| * 50 | | Calved Jan. 3, '31 | | |
| 17 | | | 282 days | |
| 24 | | | 293 days | |
| 19 | | | 280 days | |
| 37 | | | | 283 days |
| 22 | | | | 278 days |
| 38 | | | | 287 days |

* Bought to make number.

On March 6, cows were tested for T. B. Number 32 showed some evidence of being affected and was sold. Up to this time she had carried her calf 259 days.

On July 5, 1930, 53 days after cows and calves were turned on pasture, No. 50 in Lot II died from wooden tongue and heat. She had been suckling her calf for 172 days but was not receiving flax straw as roughage for this period.

The Steers

As before stated these yearling steers were in the same lots with the cows and continued on their rations for 92 and 123 days, respectively. During these periods the steers did well and no bad results were experienced. At the close of each trial the steers in Lot II, or the ones that were receiving flax straw as the sole roughage ration, were killed in the College abattoir. The object in killing these steers was to ascertain the condition of the contents of the stomachs. Dr. J. B. Taylor, Station Veterinarian and diagnostician, made a thorough post-mortem examination of all the animals. The food contents of the rumen was in a semi-solid condition and contained enough water to facilitate proper digestion and passage of the

food. There were no obstructions or balls found in any part of the digestive tract. The mucous membranes presented a normal appearance and were free of any inflammatory condition.

The data in Table III are interesting. The steers of Lot 1, each year, received only alfalfa hay as a roughage and no flax straw while the other three lots received flax straw, as stated above.

TABLE NO. III
Flax Straw for Yearling Steers

| | First Year | | | | Second Year | | | |
|-------------------------|------------|--------|---------|--------|-------------|--------|---------|--------|
| | Lot I | Lot II | Lot III | Lot IV | Lot I | Lot II | Lot III | Lot IV |
| Number days fed | 92 | 92 | 92 | 92 | 123 | 123 | 123 | 123 |
| Av. weight at beginning | 592 | 652 | 657 | 678 | 587 | 614 | 618 | 665 |
| Av. weight at close | 748 | 781 | 800 | 766 | 740 | 825 | 826 | 834 |
| Av. gain per head | 156 | 129 | 143 | 87 | 153 | 211 | 208 | 169 |
| Av. gain per head daily | 1.69 | 1.40 | 1.55 | .95 | 1.24 | 1.71 | 1.68 | 1.37 |

From results reported in the above table the average gain for the 18 steers in Lots II, III and IV where flax straw was fed, was 157 pounds. The average gain for the 6 steers that received no flax straw but alfalfa hay as the sole roughage for the same periods, was 155 pounds.

Because of the nature of this experiment, it is impossible to credit either the cows or the yearling steers with quantities of grain or roughage for 100 pounds of gain. Results, however, indicate that flax straw both for pregnant cows and yearling steers has a high feeding value.