1-1906

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Bulletin 94 January, 1906

SOUTH DAKOTA

Agricultural College

EXPERIMENT STATION

BROOKINGS, SOUTH DAKOTA

ALFALFA and RED CLOVER

DEPARTMENT OF ANIMAL HUSBANDRY

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ALFALFA AND RED CLOVER

James W. Wilson H. G. Skinner

INTRODUCTION

This bulletin presents the results obtained during the past three years with alfalfa and clover at this Station and the Forage Testing Station at Highmore; also a few letters containing practical experience in growing these legumes in different parts of the state. This latter feature is included to show that these plants are at home in nearly all sections of the state east of the Missouri river, as well as in the agricultural districts of the Black Hills.

Probably no other feature is of greater importance to our agricultural development than the introduction of leguminous crops. They are valuable wherever grown. They not only produce a large yield of hay, but have no equal as improvers of the soil, by storing up nitrogen in their roots for the use of succeeding crops. Nitrogen is an element required by all plants for their development. The greatest question confronting the American farmer in some localities today is, what is the cheapest source of nitrogen. Farmers in the older states find commercial fertilizers one of their principal problems. Stringent laws have been enacted to control the preparation and sale of commercial fertilizers.

Experience teaches that the fertility of the soil can be retained, and in many cases improved, by a careful system of rotation of crops; or, in other words, the preceding crop makes plant food available for the next crop. This is ac-

complished by growing grains and grasses that will not only improve the mechanical condition but the fertility of the soil as well. Such plants are not soil-robbers, but soil-restorers, having a large root-system extending down as far as needed to water. Some believe that alfalfa and clover are adapted to a wet soil, but this is not the case. All seeds require moisture, heat and air for germination; when the soil is too wet and cold the air is excluded, and as a result most of the seed fails to germinate. This condition should be avoided in all cases. When these crops are properly made into hay they are rich in "protein," or flesh-forming food, and when fed in conjunction with our highly carbonaceous grains, such as corn and barley, furnish a better balanced ration for live stock than when fed native prairie hay. This is a factor in nutrition which must be recognized, sooner or later, by all feeders for economical gains.

It is true that protein can be purchased in the form of by-products, but usually at a prohibitive price, owing to distance from market. We do not insist that these crops are suitable to every locality in the state, but on account of their great value for feeding consider them worthy of a trial.

ALFALFA

Experience shows that a good stand of alfalfa can be secured if ordinary care be exercised in preparing the seed bed. It is not a plant that does well when sowed on the native prairie sod after disking. On the College farm during the spring of 1904 a small area of native sod was disked five times; part was sowed to alfalfa and part to clover. The next spring only a few scattering plants of alfalfa could be found, while a fair stand of clover was secured. As to the variety of alfalfa to sow, good results have been obtained with both the Turkestan and the American varieties. Neither have winter-killed during the time, and the yield per acre in each case has been good. A field sowed to Turkestan alfalfa in 1899 at Highmore Forage Testing Station still produces good yields. The quantity of seed to sow per acre depends largely on the way it is sowed, requiring more if broadcast than when drilled. We suggest twenty pounds when drilled and twenty-five pounds when sown broadcast. The time to sow depends upon the condition of soil. The soil must be warm and in good condition of tilth. Contrary to what is sometimes supposed, alfalfa does not require a wet soil, but one that is well drained, with a loose subsoil. These conditions have been found to be well suited for growing alfalfa. The plants will stand cutting several times during the first year. This method should be resorted to when sown on a field badly infested with weeds, in order to secure a stand of alfalfa.

In 1902 a field, rented by the College farm, which had been cropped for several years and become foul with mustard, was sowed to alfalfa. It was cut three times during the growing season, and the result was that in 1903 there was practically

no mustard to be seen, but a first class stand of alfalfa was obtained. Experiments are now under way in disking alfalfa fields to thicken the stand.

When made for hay it should be cut when about one-tenth of the plants are in bloom. If allowed to remain until in full bloom the per cent of woody fibre in the stalk is increased, and as a result the hay is less palatable and digestible. When cut for seed, the second growth is preferable to the first, because the plants at this time are of a more even growth and have reached a more uniform degree of maturity than with the first growth. During the season of 1905 a nurse crop of two bushels of barley was grown with alfalfa, with good success, probably owing to the unusual amount of rainfall during the growing season, but under ordinary conditions we do not advocate the growing of a nurse crop. H. M. Cottrell, in Bulletin No. 114, Kansas Experiment Station, states: "Under no conditions should the first cutting of alfalfa be allowed to seed, if it is desired to maintain a stand of alfalfa on the land. The alfalfa should be cut when the greater proportion of the seeds are hard, but not sufficiently ripe to shell. The cut alfalfa should be cured like the hay, with as little handling as possible, and then stacked. Many of our correspondents have an impression that alfalfa should be rotted after being cut. The reverse is actually what is needed. The alfalfa should be well cured and thoroughly dry when put in the stack, or there is damage from heating, and stack-heating seriously injures the vitality of the seed. The straw left after the seed has been threshed from the alfalfa is a fairly good rough feed, although not nearly equal to alfalfa cut at the proper time for hay."

Yields of Alfalfa at the Brookings Station

Turkestan alfalfa sown May 10, 1903.

	Pounds per Acre
First cutting June 29, 1904	3,237
Second cutting August 15, 1904	2,200
Total yield per acre	5,437

Same Field in 1905

	Pounds per Acre
First cutting June 21st	2,800
Second cutting September 7th	2,313
Total per acre	5,113

The second growth in 1905 was left for seed, but as no seed matured, it was cut for hay.

Montana grown seed sowed in May, 1903.

	Pounds per Acre
First cutting July 9, 1904	3,417
Second cutting August 13, 1904	2,316
Total yield per acre	5,733

The Turkestan seed was sown on high ground and the Montana grown seed was sown on low ground. In both cases the third growth was pastured off with sheep, which did not injure the stand in the least. However, we do not advocate pasturing close in the fall.

An experiment in pasturing alfalfa with swine was conducted during the summer of 1905. This test covered a period from July 15th to September 4th, inclusive. The second growth was used with the following results. The object of the test was to determine the relative value of alfalfa, clover and blue grass for pasture. Equal areas of each were measured off and fenced hog-tight. Fifteen shotes of average quality were selected, weighed and divided up into three different lots, care being exercised to get the lots as near same size and weight as possible. They averaged 135 pounds apiece when put in. To each lot was given a small ration of ground barley and separator milk throughout the test. Each lot had all the forage they could eat. The clover was of the medium red variety and second growth.

The following table shows the kind of pasture, number of pigs in lot, weight of lots at beginning of test, number of pounds of grain and milk allowed for each, weight at close,

number of days, total gain for each lot, and gain per head daily.

Kind of Pasture	Number of Pigs	Weight of Lots at Beginning	Number Pounds of Grain	Number Pounds of Milk	Weight at Close	Number of Days	Total Gain of Each Lot	Gain per Head Daily
Clover	5	659	816	735	844	51	185	.72
Blue grass	5	689	816	735	865	51	176	.69
Alfalfa	5	686	816	735	877	51	191	.75

The above table shows that the lot receiving alfalfa pasture made the largest gain. Yet they made but a trifle more gain than did the lot receiving clover pasture. There was a sprinkling of white clover in the blue grass pasture, which undoubtedly assisted in the gain for this lot. But it may be seen that the difference in gains for the different lots places both alfalfa and clover in the lead for a pasture for pigs.

Alfalfa Pasture for Sheep

During the fall of 1905 an experiment was conducted in turning sheep into alfalfa pasture. The object was to ascertain which conditions were most unfavorable for this purpose.

A field of alfalfa adjoining a field of Bromus inermis was divided into five small pastures and fifty head of matured sheep were secured and divided into equal lots for the test.

Pasture No. 1 contained alfalfa alone and sheep were kept in it from the beginning. Pasture No. 2 contained alfalfa; sheep were put in a dry yard at night and turned in each morning when the dew was on. Pasture No. 3 was the same as No. 1 and 2; sheep were put in dry yard at night and turned in each morning when the dew was off. Pasture Nos. 4 and 5 contained part alfalfa and part Bromus inermis. Sheep were put in No. 4 and allowed the run of pasture day and night, while those in No. 5 were put in dry yard at night

and turned in each morning when dew was off. In all of these tests no unusual results were experienced. One of the fifty head died during the test, but after a close examination the cause could not be attributed to injurious effects from eating alfalfa.

Reports are received from time to time where alfalfa has killed sheep from bloating; however, this test indicates that danger from this cause is not great. There is always danger of loss when a change is made from one feed to another, and great care should be exercised not to allow the animals to gorge themselves.

In an experiment in feeding common dairy cows alfalfa during the winter of 1902 and 1903 it was found that it required about one-sixth more Bromus inermis hay than it did alfalfa hay to produce a pound of butter-fat. During this period the cows were receiving practically the same quantity of grain, but made a gain in weight of ten pounds per head more than the lot receiving Bromus inermis, which indicates the value of this feed as a flesh-producer.

The following letters show that alfalfa and clover are being grown in nearly every section of the state east of the Missouri river, also in the Black Hills district.

Yields at Forage Testing Station at Highmore

Plot B5 was sown to Turkestan alfalfa in 1899, and is the only one any record can be given of for a number of years.

Turkestan alfalfa sown in 1899. Plot B5. One-fourth acre.

	Pounds per Acre
First cutting in 1903, June 27th	2,080
Second cutting in 1903, August 9th	980
Total yield per acre	3,060

In 1904 the latter part of the season was so very dry that

no second crop was cut. The yield of first crop was at the rate of 1,672 pounds per acre. In 1905 the same field:

	Pounds per Acre
First cutting June 23d	2,148
Second cutting August 7th	1,412
Total yield	3,560

It may here be stated that the second cutting met with serious loss, before the weight was taken, by storm and rain. From the above facts it may be seen that this variety of alfalfa has thrived for seven years in what is considered to be one of the driest sections in the state.

In 1905 five one-tenth acre plots of alfalfa from various foreign sources were sown on very high land. These plots were cut once during the season, on July 22d. About one-fifth of the hay thus obtained was pigeon grass and the remaining four-fifths alfalfa. The average yield from these five one-tenth acre plots for this cutting was at the rate of 1,750 pounds per acre.

The season of 1905 was of course an unusually wet one for this part of the state. In ordinary seasons no such yield could be obtained the first year of sowing.

Reports From Correspondents

Mr. Byron Andrews of Erwin writes: "About twelve years ago a small patch of medium red clover was noticed growing on the banks of a grade on the road two and one-half miles south of Erwin. No one knows its origin, but it attracted considerable attention among the farmers, many of whom maintained that no new thing would do well in this country. They did not want anything to 'do well' but wheat, and oats enough to winter the necessary horses. This patch continued to 'do well,' however, and still thrives and spreads.

"About five years ago, having wheated the rich black soil of eastern Kingsbury into the verge of ruin, the farmers began to sow some clover, and to date it has done well. In the townships of Hartland and Baker, with which I am

most familiar, there are probably four to five hundred acres in timothy and clover mixed and in pure clover. The medium red is generally grown, although there is some alsike, which appears to do well.

"I know of no alfalfa in this vicinity except a five acre experimental field sowed on one of my farms four miles south of Erwin this season. I secured my seed from a seedsman in Wisconsin at $14.50 per hundred pounds. It tested 97 per cent germination. I prepared a good seed bed and sowed broadcast at the rate of twenty pounds to the acre, with a nurse crop of one-half bushel of barley. I procured five sacks of soil from an old alfalfa field on the College farm at Brookings, which was thoroughly infested with the nitrogen nodule. and sowed it broadcast at the rate of one sack to the acre. But I left a strip four rods wide across one end of the field.

"The barley and alfalfa were cut September 9th with a binder, and it was found that much of the alfalfa was ripe, as seed was observed on bed of binder.

"The alfalfa came on again and grew to a height of eight to twelve inches before October 9th, when all vegetation was killed by frost. In conclusion I may say I observed no difference in the growth of the plant where I sowed the soil to inoculate and the strip on which I did not sow the inoculated soil."

Mr. Isaac Lincoln of Aberdeen writes: "My experiments with alfalfa and clover were a failure, but I am convinced it was my own fault. I sowed some Kansas alfalfa seed, it winter-killed, and I plowed it up. I intend another year to sow some Minnesota or South Dakota seed if I can get it; if not, will get some Montana seed."

Mr. J. M. Dunmire of Scotland, Bon Homme county, writes: "I have been raising clover since 1901 with the best of success. Have cut crops of hay and crop of seed each year. Hay yielded one and one-half to two tons to the acre first growth. The second growth yielded two to two and one-half bushels of seed to the acre. I threshed seed for three years with a common threshing machine, reversing concave teeth and run with high power; however, I have a clover huller now and am having better success than I ever had in Iowa. I have

never inoculated the soil. I have always disked ground before sowing seed and usually sow with barley or speltz and disk again and harrow well. Many of my neighbors are raising clover successfully and find it a very profitable crop. I have been raising alfalfa successfully for the last five years. I cut first growth for hay and second for seed. This year has been too wet for alfalfa seed. I have cut three crops for hay and the fourth crop is making quite a good growth for pasture.

"As to winter-killing, I have not had any winter-killed since I have been farming in South Dakota. I have clover that has been sowed five years and still is a good stand. I never pasture close in the fall. I always sow one bushel of clover and one of timothy, mixed, to eight acres. I sowed thirty acres of prairie sod last spring to clover. I disked the sod, sowed the seed and then harrowed well. I then hauled manure and spread over it and I have a perfect stand."

Dr. F. A. Spafford, Flandreau, states: "I have had experience in growing both the common and the Turkestan varieties of alfalfa, and I consider the Turkestan variety away ahead of the other. First crop did not seed in 1905. I consider it one of the most valuable crops for this country. It does well on both hill and valley. I have never tried inoculating seed or soil."

Mr. George E. McEathron, Huron, writes: "I consider alfalfa and clover culture practicable in this locality. I do not think it necessary to inoculate soil for these crops in South Dakota. After the first year I cut my alfalfa fields three times and secured an average yield of five tons to the acre. I have never allowed seed to mature, always cutting for hay. No trouble from winter-killing has been noticed."

Mr. N. S. Tubbs, Custer, writes: "I consider alfalfa and clover culture practicable in this locality. I have never had any experience in growing the Turkestan variety of alfalfa, nor have I had experience in inoculating the soil. I cut my alfalfa three times during the season and receive a yield of about two tons the first cutting and one and one-half tons

the other cuttings. I save the second cutting for seed and thresh with a common thresher, putting in some extra teeth. I received a yield of two bushels of seed to the acre last year. These legumes have not winter-killed since I have been growing them."

Mr. O. S. Jones of Madison writes: "I began raising alfalfa on my place two miles west of Madison five years ago. The soil is a dark loam with some sand in it, lays level and has a sand and gravel subsoil. Water is obtained at a depth of eight to ten feet. I have used both the Turkestan and the common alfalfa, and I consider the latter the better for my land, as it grows ranker, with more leaf and better color than the former. I have had the best success in sowing about the first of May, without a nurse crop. On one four-acre piece seeded three years ago, I pastured 150 to 175 head of hogs and spring pigs for two months this year and also cut between fifteen and sixteen tons of hay in two cuttings.

"I sowed twelve acres this year in two six-acre fields, that has been pastured, continually, with 175 head of hogs and pigs and ten head of young cattle since early in July, and a great deal of it matured seed.

"I could have cut these pieces in August with profit had I so desired, and then had plenty of growth to have kept the stock in pasture, changing pastures each week."

Mr. N. O. P. Synoground, Groton, writes: "I consider alfalfa and clover culture practicable in this locality. I also consider the Turkestan variety superior to the home-grown varieties. Cut the field twice the first year and received four tons per acre. I have never cut any for seed. These crops have not winter-killed here."

Mr. J. M. Erion, Mitchell, writes: "I consider alfalfa and clover culture entirely practicable in this locality if properly seeded. The Turkestan variety has not proved to be superior to other varieties. The soil does not need to be inoculated, although I have had no experience in this line.

"I cut alfalfa three times and red clover twice, the latter once for hay and once for seed. Alfalfa has yielded five tons

per acre, and red clover in 1904 three tons of hay at first cutting. In 1904 clover yielded one and one-half bushels of seed to the acre second cutting. Thresh with a clover attachment to a common separator. Red clover killed out a trifle by removing second growth for seed, but was thicker the second year than the first, from shattered seed."

Mr. P. W. Peterson of Vermillion writes: "I certainly do consider clover and alfalfa culture practicable in this locality. This spring (1905) I sowed ten acres of alfalfa without inoculation and got a splendid stand. I cut one very good crop for hay in July and a light crop in October. Tenants on my farm sowed ten acres at the same time and inoculated their land; received a good stand, but not so good a growth as I did, and they only cut their field once. I know of alfalfa fields that have been cut three times each year for the past ten years. The first cutting yielded about two tons to the acre."

Mr. A. E. Chamberlain of Howard writes: "I certainly do consider clover and alfalfa culture practicable in my locality. I do not consider it necessary to inoculate the soil for their culture. Clover has wintered perfectly in my section."

CLOVER

Several experiments in growing clover on the College farm have been conducted during the past three years. While the yields were not so large as those with alfalfa, it was considered a profitable crop. It was found to be of great value to sow on native prairie grass and Bromus inermis grass after they had been thoroughly disked.

Method of Sowing

As soon as frost was out of the ground in spring the fields were disked four times in order to secure a good seed bed. The seed was then sowed at the rate of ten to twelve pounds to the acre, and harrowed in. Perfect stands were secured in each case. The medium red variety was used, because it does not grow so rank as the mammoth varieties, and is therefore better for hay. The seed was obtained from a

PLATE I—A SUCCESSFUL EXPERIMENT IN DISKING CLOVER IN ON SOD-BOUND BROMUS

Showing where Clover was sowed on Bromus sod

Showing where no Clover was sowed

grower in the southern part of the state and was of a high germination quality. No trouble has been experienced from killing out in the winter, but care has been taken not to pasture it close in the fall.

The following yield from a field one year old shows the increase in the quantity of hay over the sod-bound field of Bromus inermis:

Field A—Where Clover Was Sowed

First cutting July 23, 1904, yield 3,484 pounds per acre; second cutting September 5th, yield 2,000 pounds per acre; total yield, 5,484 pounds per acre.

Field B—Bromus Inermis

First cutting July 23, 1904, yield 3,294 pounds per acre. Second growth too short to cut.

Same field in 1905:

First cutting July 17th, yield 3,966 pounds per acre; second cutting August 30th, yield 3,889 pounds per acre; total yield 7,855 pounds per acre.

In 1904 another field of Bromus inermis was disked and sowed to clover, with the following results:

Field C—Where Clover Was Sown

First cutting July 18, 1905, yield 5,131 pounds per acre; second cutting September 9th, yield 4,227 pounds per acre; total yield per acre, 9,358 pounds.

Field D—Bromus Inermis

Cut July 24, 1905, yield 2,360 pounds per acre. Second growth too short to cut.

With the exception of Field D, all were treated the same, disked and manured.

The poorest yield of hay was obtained from Field D, where no manure was applied, while the best yield was obtained from Field C, where clover was sown and manured.

The above cut shows fields making largest and smallest yields.