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CO-OPERATIVE TESTS OF
ALFALFA
FROM SIBERIA AND EUROPEAN RUSSIA

By N. E. HANSEN

BROOKINGS, SOUTH DAKOTA
JANUARY, 1913
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Co-Operative Tests of Alfalfa From Siberia and European Russia

By N. E. Hansen

This is not a bulletin on the field management of alfalfa. Readers desiring this information are referred to Bulletins Nos. 120 and 133 from the Agronomy Division of this Station. This Bulletin is a report of progress in co-operative work in testing some of the many varieties of alfalfa I found growing wild in my last two trips to Siberia, 1906 and 1908, as Agricultural Explorer sent by Hon. James Wilson, Secretary of Agriculture. The South Dakota legislature, March 3, 1911, made provision for a limited trial of the new hardy alfalfas in every county of the state, by appropriating two thousand dollars for the next biennial period, which makes an average of about twenty dollars per county each year. A few days after this law passed an offer was made through the newspapers of the state to send ten plants free to the first ten applicants in each county—the plants to be set in good garden soil far enough apart each way to permit of thorough cultivation and to encourage the free production of seed. This offer was widely published by courtesy of the newspapers of the state and some eight hundred applications were received. The following is an extract from this article:

"The plan is to test the most promising alfalfas, which are not now handled by seedsmen, in all sorts of soils, especially the new South Russian and Siberian alfalfas which I brought over as Agricultural Explorer for the United States Department of Agriculture in the course of my three trips to Siberia. It is desired to test these plants in a limited way under all sorts of conditions, for example:
1. On ordinary good grain land both for pasture and hay.
2. On rolling, dry, stony upland or “sheep quarters.”
3. On alkali lands.
4. On gumbo soils.
5. On fields subject to overflow and formation of ice crusts, which conditions are found harmful to the old or common alfalfa.
6. On steep mountain slopes and upland pastures in forest reserves and elsewhere in the Black Hills.
7. On extremely sandy soils where trouble is experienced from the wind blowing out the top crust.

These problems occur to me as I write, but there are, no doubt, others to be considered. There are many problems connected with alfalfa growing and it would be of great advantage to South Dakota to secure an absolutely hardy foundation for our alfalfa industry both for a hay crop on good farm land, and also to make alfalfa common as a wild pasture plant on all the rough lands now practically worthless for cultivation. Even rough land would be worth one hundred dollars per acre if it would grow alfalfa.

The past season we raised alfalfa plants by sowing seed in rows with a garden drill and cultivating with a wheel hoe, much the same as for carrots or beets. The plants made a strong growth and were dug up late in the fall and are now heeled in outdoors with manure over the earth. They will be desirable for transplanting three to four feet apart each way in good garden soil and should be given thorough cultivation. This will encourage the free production of seed. Transplanting alfalfa plants is nothing new as it has long been practiced in parts of India and South America.

It will interest our German farmers that in Siberia I met some German colonists who called this wild alfalfa, “Siberische Steinklee,” and esteemed it highly for pastures and hay. “Steinklee” meaning stone clover, refers
probably to the stony places where it will grow, but "lucerne" or "alfalfa" is really the word to use instead of "klee."

A few plants can be spared for other states, especially North Dakota, Minnesota and Montana, but only after the South Dakota demand is met. It may be of interest to know how far north they will grow. My own personal opinion is that these alfalfas, I brought over, will ultimately make alfalfa culture possible clear up to the Arctic Circle on this continent.

From the very beginning I have stated that where no trouble is ever experienced with winter-killing of the common alfalfa, "Let well enough alone."

**VALUE OF CO-OPERATIVE EXPERIMENTS**

The writer is a firm believer in the value of co-operative tests of any new plant, by the farmers themselves who are to make use of the plants on a large scale. A problem of so vast importance should not be reserved for any one man or for several men to solve. A better way is to ask the farmers to try a few plants, and then make up an opinion from their reports, giving my opinion only as a preliminary guide. This is working out as I expected. Much new experience has been obtained as a guide to future work; the large list of new varieties has been sifted down to the best few; and the ingenuity of many practical farmers has contributed to a more rapid solution of the main problem. Upwards of fifteen hundred farmers are cooperating in this work by testing ten or more plants or a packet of one hundred seeds. One year-old plants were sent out for spring planting in 1910, 1911 and 1912. Packets of one hundred seeds each were sent out spring of 1912. The amount sent each one has necessarily been small since some of the best alfalfas were started from a single spoonful of seed, and the total stock of these original plants on the grounds of the horticultural department of the South Dakota Experiment Station consists of a few hundred plants on a small fraction of an acre. But alfal-
fa experimenters the world over appear to recognize that this forms part of the original imported stock of plants from my last two trips to Siberia—1906 and 1908, and so applications have been received from many states and from many foreign countries. The seed from these few plants has been carefully saved and sown here and there in the gardens of this department in places made vacant by the clearing work incident to our fruit-breeding experiments. This crowded condition led naturally to the transplanting method, and from transplanting has developed some interesting and unexpected results.

INTRODUCTORY

The many small lots of alfalfa found growing wild in Siberia, Southern Russia and Mongolia by the writer, as Agricultural Explorer in 1908, were distributed over a wide area for preliminary trial. The portion assigned to the writer was given good garden care, the plants at first being sown in flats and in the greenhouse and transplanted so as to be given abundant room in garden and opportunity for developing the maximum amount of seed. The first transplanting was done in the spring of 1907. As soon as the supply of seed increased sufficiently, the seed was sown in drills and cultivated with a wheel hoe and the plants dug with the Feigly tree digger, which cuts the roots under one side at a time. We found that transplanting dormant plants was usually much better than transplanting from flats.

In reading the following reports it should be remembered that the disastrous and wide-spread drought of 1910 and 1911 throughout many of the western states, proved a very severe test. Two worse seasons could scarcely have been selected for sending out plants. In parts of the west the drought was continued in 1912. It was also necessary to learn by experience the details of handling plants, including the nursery management, the packing in the tree cellars for winter storage, and how best to pack the plants for shipping by mail or express. The experiments have un-
expectedly led to investigations of transplanting alfalfa not only for seed raising purposes but for the economical production of forage on dry land. In the spring of 1912 I determined to hasten the work by using a Bemis tobacco planter adapted to the purpose. I had not read or heard of anyone using any machine for this purpose before. At my request in the fall of 1912 a heavier Bemis machine was constructed by the manufacturers, the Madison Plow Company, Madison, Wisconsin, especially designed to set alfalfa plants on sod in thin light sandy loams found in parts of the west, where the soil blows as soon as turned. If possible such land should be transformed into alfalfa pastures without plowing. I hereby claim priority in transplanting alfalfa with a horse-power machine.

**Transplanting Alfalfa**

Plate No. 9 shows my new method of handling alfalfa by transplanting the one year roots instead of sowing seed, as demonstrated at Ipswich, South Dakota, May 2nd, 1912, where alfalfa plants were set at the rate of 100 per minute, or 6,000 per hour, on the farm of Hon. J. W. Parmley. Demonstrations of this machine planting were first made at Brookings, then at Redfield, Big Stone, Eureka, McIntosh, Lemmon and Onida. Plants were set with plow, spade and hoe at Faith, Frederick, Philip, Blunt, Sansarc, Hilland, Hayes, and other points. It was a strenuous three weeks' alfalfa campaign, mainly in the northern and northwestern parts of the state. Many more points would have been visited but for lack of time and the fact that the cut worms, blister beetles, grasshoppers and drouth of last year cut short the available supply of plants. The other places on the list must wait until we raise some more plants. The counties visited include Brookings, Spink, Grant, McPherson, Corson, Perkins, Sully, Meade, Brown, Stanley and Hughes.

In the fall of 1912 the new machine was tested at Whitewood, Sansarc, Cottonwood and Philip. In this
transplanting, I have combined an old Oriental method with an American machine. I took one of the standard transplanting machines, the Bemis, used for tobacco, cabbage tomatoes, cauliflower, sweet potatoes and many other plants; using a nine-inch shoe slightly widened at the back to allow more space for the alfalfa roots. This was done by a local blacksmith. As to who first transplanted alfalfa would indeed be difficult to determine. It is reported for India, France, England, and South America. Since alfalfa is a very long lived plant under proper conditions, transplanting would come naturally in intensive agriculture. Personally I have used the method since the spring of 1907, with the new alfalfas I brought from Russia and Siberia. Being trained a horticulturist, I knew it would be the best way to make the most out of a small quantity of seed. During the past year I thought if this method could be done cheap enough it would be an improvement on the present methods. At present this is given simply as an item of agricultural news. I neither recommend nor advise the method until the value has been determined by actual demonstration. Some of the reasons which occur to me at this time are:

1. The present method of using twenty pounds of seed per acre means 106 seeds per square foot. Instead of that, every plant should have several square feet, the exact number no one knows as yet. The distance will probably depend upon the soil, elevation and moisture conditions. Even 5 pounds per acre means 26 seeds per square foot which is still too thick if it germinates evenly.

2. Alfalfa plants should be given full opportunity for maximum development. When set in the garden 2x4 feet we get plants with over 500 shoots to the crown and bearing as high as 3 ounces of seed per plant the third year on plants transplanted the first year from seed. This means 1,022 pounds of seed per acre. The variety was the one secured in Russia which I have named the Cossack. From present prospects they will yield much more the present season.
3. The parasitic vine known as dodder is a very serious menace to the alfalfa industry in many states in the west. It is extremely difficult to separate it and when in the field will soon ruin it. In Europe such fields are put out of commission by the government. But plants in hills could easily be kept clean. Pure seed laws will shut out dodder-infested seeds in this country more and more.

4. The present methods of over-crowding the plants give an inadequate supply of moisture. Such plants are much dwarfed and cannot form the long tap-root necessary to endure drought.

5. My experience is that by raising alfalfa plants in well inoculated soil, every plant is abundantly provided in the course of the first season with nodules containing the nitrogen-gathering bacteria so essential to the growth of the plant. This reason alone would be a very strong one in favor of this new method, since there is much complaint due to lack of inoculation in many soils, and the farmer can see the nitrogen-gathering bacteria nodules with his own eyes.

6. My belief is that the present methods of diskig are extremely injurious, that we should not mutilate alfalfa plants by diskig and harrowing. This is in distinct contradiction to the present recommended practice; but examination of many plants that have been split through the heart with the disk or harrow, shows they heal with difficulty, and many are black-hearted or diseased, giving free access to bacteria. An alfalfa plant should be good for at least four centuries; but this means that the heart of the plant must be held sacred. A field set out in plants can be cultivated one way like fodder corn, and then laid by for the season. By giving each plant just the right amount of space in the beginning this useless mutilating of the plant is avoided. At Ipswich I found twenty-five plants to the square foot; at Huron, in a garden, I found thirteen plants on two and one-half square inches—all of them about as big as a darning needle.

7. Alfalfa plants in this spring's demonstrations
were set 2 feet apart in the rows, with rows 3 feet, 8 inches apart so that the common corn cultivator can be used. My opinion is that they should be given cultivation one way just like fodder corn but perhaps check row machines will be devised to make feasible cross cultivation in early spring and after each cutting.

8. Alfalfa is a very poor fighter the first year as the main strength goes below the ground, hence it is often choked out by weeds, which make more top than root. But by setting out a good sized alfalfa plant, often as big as your middle finger, they can hold their own better against the weeds.

9. The plants should be raised the first year in good garden soil that is well inoculated. They may be transplanted in the autumn of the first year but the bulk of them should be kept in outdoor cellars, such as used for storing potatoes or trees, or they may be heeled-in close together in furrows made with a plow. In 1910 at this station on a piece of good garden soil 60x165 feet, fifty thousand Orenburg plants were raised, which is about 220,000 plants per acre. Probably much more could be done if no cut cut worms, etc., appear. These were raised in drills, much like carrots and beets. For the purpose of raising the most seed, perhaps single plants in hills 2x4 feet may be better than sown close together in rows. At this rate, if set 2x4 feet, or 5,445 plants per acre, one acre would raise enough plants to set forty acres. Of course the best method for the maximum seed production will develop with further experience. After seed of these new varieties becomes abundant, every farmer can follow his own method for raising seed.

10. The plants are dug with a Feigly tree-digger, manufactured by Mr. Feigly, at Skiatook, Oklahoma, cutting under the roots on one side at a time, which is better than the plow as the plants are easier to find. The roots are shortened by using a meat cleaver on a block of wood,
being careful to avoid bending the roots. It is better to shorten the roots than to bend them, so that the new roots when they form will go straight down. When set the roots are covered entirely with earth, thus preventing evaporation until established. The meat cleaver should be kept very sharp.

11. Finally: this is all from the standpoint of raising seed, but I believe it will work out from the forage standpoint also. If transplanting proves to be a good thing, no doubt men of mechanical genius will soon invent machines with mechanical feeds and using four horses instead of two, so as to do the work cheaper. But even at this present preliminary stage I believe that the method will very greatly hasten the spread of the hardy Russian and Siberian alfalfas throughout the prairie northwest. On my alfalfa planting tour I found in almost every place men from Wisconsin and other states who had worked on these tobacco transplanter and knew that they were a commercial success in transplanting almost anything in the plant line. We found that one barrel of water is sufficient for 5,000 plants.

Such considerations as these have led me irresistibly to the idea that if we combined the transplanting method of the Orient with some American machine, we can do better than we are doing at present, at least from the seed standpoint, and further experience will soon show its value from the hay standpoint. This problem of giving alfalfa plants the right distance for each locality, soil and variety, will have to be worked out by experimenting in a small way.

EFFECT OF TRANSPLANTING ON THE ROOT SYSTEM OF ALFALFA

The general effect of transplanting any plant is to break up the tap-root and increase the number of lateral roots, hence it is a common practice for florists, market gardeners and nurserymen to transplant various plants to get the benefit of this increase in root development. This is done especially with such plants as celery, tomatoes, as-
ters, evergreens, plum, apple and pear seedlings, etc. It was determined to see if the same general principle held good in transplanting alfalfas.

Plates No. 2, 3, 4, 5, 6, 7, show the general aspect of average one year plants of various varieties. In our alfalfa nursery experiments the past six seasons it has been necessary at times to transplant some of the plants more than once. It was evident that the root system was greatly improved by a large increase in the number of laterals.

Plate No. 12 shows the effects of transplanting one year old Chernio alfalfa roots on the Glenheim Farm of Chas. C. Haas of Whitewood, S. Dak., in the northern Black Hills. In this cut, No.1 is Chernio alfalfa of the average size, received in the spring of 1912. No. 2 shows the increase in root and growth during the first season, 1912, even though the season was dry until July. No. 3 is a root from common alfalfa eleven years old, a few feet distant in an adjoining field. This field had never been cultivated —had been disked the first four years. This plant was about a foot distant from any other plant in the field, with the exception of No. 4, which was a plant near by and had been injured by having the crown split by disking or dragging.

In Plate No. 14, No. 5 shows three common alfalfa roots on one square foot, from an eleven-year-old field. No. 6 shows one of the yellow-flowered alfalfas, the Orenburg, set in the spring of 1912 and dug in November, 1912. These plants were all dug under my supervision on the farm of Chas. C. Haas of Whitewood, S. D.

100 Plants Orenburg Alfalfa, Sent Spring of 1912
Chas. C. Haas, Whitewood, Lawrence County, S. D.
December 9th, 1912.

"The plants arrived in a very dry condition, having been some two weeks on the way. I at once placed them in a pail of water and left them over night and then set them out that following morning. As the ground was
moist no water was given them at this time nor at any time since. They were set in a row, some of them four feet apart, some three feet and others two and one-half feet apart in the row. All plants were set in the ground so the crown was at least two inches below the surface, some more than three inches.

"Of the 105 plants received and set out all are alive today and have made a fine growth both in top growth and root growth. The average crown will average about 6 inches across and the root below the crown will measure about three to three and a half in circumference. Since the tap-root growth system has been broken the tendency to send out side feeders is wonderful. More than a dozen feeders the size of a lead pencil are noted and their length may be many feet each. These feeders tend to grow outward and downward and tend to cover all the ground between the rows thoroughly.

The first crop growth grew to an average height of about two feet, the second growth was about of the same height and somewhat more spreading than the first and on August 17th gave a prospect of about 150 pounds of seed per an average taken from two plants, actual count of pods, when on that afternoon a severe hail storm destroyed everything.

The row was well cultivated and at no time was there present any weed growth while through the month of June there was very little moisture in the ground. July 4th brought a very heavy rainfall (about 4 inches) and there has been plenty of moisture since.

The plants are going into the winter in good condition but are unprotected by top growth, or by surrounding protection of any other nature.

The test to withstand the winter will be a severe one.

Although there has been considerable snowfall it did not lay long and the ground has been bare practically all the time and in all probability will be all winter."
PLATE I. Collection of alfalfas in the Horticultural Department of the South Dakota Experiment Station. This shows the great variation in habit. The one in the lower right hand corner is a low trailing variety of *Medicago falcata*, while immediately back of it is an erect form.

POSSIBILITIES OF TRANSPLANTING

One ton of alfalfa seed contains about 464,000,000 seeds, sufficient if all grew to set 85,000 acres with plants 2x4 feet for seed-raising purposes.
PLATE 2. One season’s growth from seed, 1910, of Cossack alfalfa.
PLATE 3. One season's growth from seed, 1910, of Cherno alfalfa.
PLATE 4. One season's growth from seed in 1910 of *Medicago falcata* from Samara and Saratov, from the Volga river region of eastern Russia.
PLATE 5. One season's growth from seed in 1910 of Omsk and Semipalatinsk Alfalfa.
PLATE 6. One season's growth from seed in 1912, of select Turkestan, No. 191, of my 1906 trip, S. P. I 20711.
PLATE 7. One season's growth from seed, 1912, of Samara alfalfa.
PLATE 8. One season's growth, from seed, 1912, of Samara alfalfa where grown rather thinly in rows.
PLATE 9. Transplanting alfalfa plants at rate of 100 plants per minute at Ipswich, South Dakota, May 2, 1912, with Bemis transplanter.
PLATE 10. Effect of overcrowding and maiming alfalfa plants.
PLATE 11. Effect of overcrowding and maiming alfalfa plants.
PLATE 12. Whitewood, South Dakota. Comparative growth of transplanted and field grown alfalfa. No. 1—Cherno alfalfa 1 year old from seed, of the size set spring 1912. No. 2—Cherno alfalfa transplanted, showing 1 season's growth, 1912. No. 3—An old plant of common alfalfa from an eleven year old field. No. 4—Common alfalfa maimed by diskimg.
ONE POUND, NOT 840 POUNDS OF SEED

If alfalfa transplanting proves feasible and profitable it will affect the alfalfa seed industry. Because one pound of seed, if all grew, would set 42 acres with plants 2x4 feet. While the present method of seeding 20 pounds per acre, requires 840 pounds of seed for the same area.

PLATE 13. Sansarc, South Dakota, Cherno alfalfa 65 days after transplanting on dry upland gumbo with less than two and one-half inches of rain since transplanting.
PLATE 14. Whitewood, South Dakota. No. 5—Common alfalfa from an eleven year old field, started from seed. No 6—Growth of Orenburg alfalfa, transplanted one season.
PLATE 15. Field tests of the yellow-flowered Siberian alfalfa, Medicago falcata, showing patch eaten to the ground by sheep.

PLATE 16. Showing a field of the yellow-flowered Siberian alfalfa, Medicago falcata; one-half Obb, one-half Semipalatinsk; eaten to the ground by two heifers.
PLATE 17. Propagation of Breeding Selected Alfalfa Plants at the South Dakota Experiment Station. This illustrates how easily a stock of any select plant may be quickly increased by cuttings in sand in greenhouse. The cuttings were taken October 24th, 1912, from plants in the field that had previously endured severe frosts; photographed when potted, December 21, 1912.

EFFECT OF OVER-CROWDING ALFALFA PLANTS

The short life of alfalfa on dry upland, which is reported from so many states, may be due to two causes:

1. From lack of hardiness, caused by having come from a region which is largely frostless—the common alfalfa being a native of the warm region from India through Persia to the shores of the Mediterranean Sea.

2. By over-crowding so that the roots have no opportunity for maximum development and the plants become weak and short-lived.

Plates No. 10 and 11 show the effect of over-crowding alfalfa plants. These were dug at Ipswich and Huron, S. D., early in May, 1912.

1. Three alfalfa plants in one cluster on edge of field.
2. 13 alfalfa plants in two and a half square inches.
3. One plant alone out in field one foot from edge.
4. All alone 10 inches from any other, on edge of field.
5. Two in one cluster in field near edge.

The effect of maiming alfalfa plants by having the crowns split by disking or harrowing is shown in the same cut, as follows:
6. Maimed by disking; root black-hearted from crown downward.
8. Two-thirds of crown removed by disking; healed but badly injured.

My present opinion in the matter is that the alfalfa troubles come from over-crowding and maiming, as well as from lack of hardiness, and that there would be much less trouble from hardiness if we could work out some method for preventing injury from disking. All the good disking and harrowing appear to do is that in this manner surplus plants are weakened and killed so that the room they occupy is taken by the other plants to their advantage.

In recent years alfalfa growers in the west have recognized this over-crowding by reducing the amount of seed sown from 20 pounds to 5 pounds more or less of seed per acre, and by sowing in rows of 36 to 44 inches apart to permit of cultivation. The objection to this method, as I see it, is that the seed that comes up will be too thick in the row so that the plants are over-crowded. Market gardeners would not crowd the onions, carrots or beets by seeding too closely with a drill, as they have learned by experience that plants must have room to develop to marketable size. Those who are working with transplanting machines, and who have also thinned vegetables in the row, will agree that it is an easier job to set the plants with a horse-power machine than it is to thin out plants in the row.

Finally, all the above must be tested by many field experiments in many places before any definite conclusions can be drawn. The men who invent our farm machinery will be quick to aid in the matter by power machines and 4-horse machines if the demand proves sufficient.

In the milder parts of the west the transplanting I believe should be done in the fall, as the plants would have all winter to get settled and would be ready to start at the first signs of spring. They would also get the benefit of the winter rains and occasional snows. As to whether fall
transplanting should be practiced in the prairie northwest is another question. I made a preliminary test of the matter in November, 1912, by transplanting at Sansarc, Philip and Cottonwood, in Stanley county; and Whitewood, in Lawrence county.

In the mild parts of the west it will no doubt be found that relieving common alfalfa from over-crowding and maiming will solve the problem, but as we go north the question of planting varieties superior in power of resistance to cold will be needed in addition.

For the purpose of raising good strong plump seed the plants should be given abundant room for maximum development. My present opinion is that this will be found feasible for field culture also, at least on dry uplands—and especially when machines with mechanical feeds are invented for the purpose.

ALFALFA ON DRY UPLANDS

From many western states inquiries have been received for an alfalfa that will do well on dry land. A fair sample of these letters are the following:

Geo. W. Triplow of Weiser, Idaho, writes:—"Here in Idaho we have large areas of dry lands well adapted to the growth of such plants as may be grown without irrigation. The alfalfas grown here at present do not yield satisfactory crops upon the high and dry plateaus. Any variety which will thrive under a non-irrigation system would be a very important variety to add to the local field crops."

Russell Wiseman of Amarillo, Texas, writes under date of June 12, 1911:—"Here in the Pan Handle of Texas the blue flowered alfalfa is not perfectly hardy. Our altitude is 3660 feet. rainfall about 22 inches. We have some extremely dry weather in the summer. For some reason alfalfa usually dies out slowly on the plains. On creek bottoms and sub-irrigated land it is all right."

A correspondent from Carnegie, Oklahoma, writes:—"Will you kindly give me full information relative to your new hardy alfalfa plants? Ordinarily alfalfa does well here on the creek bottoms but in dry years does not
thrive on the uplands and I would like very much to get a plant that will thrive on the uplands."

The following extracts are from an article by Miller and Davis, in the Gazette, Faith, Meade County, South Dakota, August 16, 1912:

"We first commenced raising alfalfa in 1900 on the 7D ranch seven miles north of Faith. It was difficult for us to get enough wild hay for our cattle and we realized that we must raise some kind of a fodder crop to make the business a success. * * * *

"All of our seeding on low bottoms along Flint Rock creek have been very successful when given half a chance. * * * * We have seeded considerable upon what we call our high land, this is a bench land back off from the lower creek bottoms and is underlaid with hard pan at a depth of from 18 to 20 inches from the surface. On this land it was good for about three years, making one and sometimes two cuttings a year and then died out."

**DIFFICULTY OF GETTING A STAND ON DRY UPLAND**

The following experience from Montana, Colorado and Kansas indicates that there are many thousands of acres of land in the milder regions of the west which would be suited to alfalfa but for the difficulty of obtaining a stand from the seeding methods now common:

W. O. Sturgeon, North East, Pa., writes under date of September 19, 1912:—"I have taken much interest in your investigations and writings on the Alfalfa plant as a rotation crop, to be used on the wheat farms of your state. I have some land that has been farmed to wheat and corn too much. Recently, I saw, you have a process of transplanting alfalfa plants, instead of sowing the seed. I am greatly interested in knowing more about this and if it is done after the plants are of some size—or removing old fields of plants on to new grounds. We have had difficulty in getting stands because of the extreme tenderness of the little plants—hurt by dashing rains and drouth before the tap-root gets deep into the subsoil. My farm is in
northwestern Kansas, probably 300 miles south of the south line of South Dakota."

Mack Depew, Belt, Montana, writes under the date of November 17, 1912:—"Alfalfa seems to be a success wherever tried except on the dry land. I have known three and four seedings on the same land and then no stand on land that grew fine wheat and fair oats."

A correspondent from Pueblo, Colorado, asks the following question:—"I am somewhat interested in farming in Colorado and would like to get a variety of alfalfa that would not require as much water as the alfalfa we are now raising on our farms. If you have any variety that you think would grow in Colorado without as much water as our present variety requires I will appreciate it if you will point out how I can get seed for a trial. The Eastern part of Colorado is quite like the western part of your state, although not so cold in the winter time. We have thousands upon thousands of acres without water that ought to be brought into cultivation in some way. It may be that you have some other forage that might grow on our plains without irrigation. I will be pleased to hear from you upon the subject."

The following is an editorial in the Kansas Farmer of Topeka, Kansas, June 8, 1912, on "The Uplands of the Western Counties:" "Thousands of acres of alfalfa are growing on the comparatively low, flat spots of the uplands of the western counties, and this year's first cutting will yield three-fourths to a ton of fine quality hay. These spots will make another cutting if it rains. If a second cutting is not grown, the value of the first cutting will exceed the average gross income per acre of wheat the last twenty-five years—so alfalfa is not a poor crop. Farmers say there are still thousands of acres of undeveloped alfalfa land and that the reason it is not seeded is because of the difficulty attendant upon securing a stand, three or four trials often being necessary. The crop is worth the effort in every county of Kansas. Keep trying."
HEAVY SEED PRODUCTION FROM TRANSPLANTED ALFALFA

The following reports show the possibilities of raising seed from alfalfa plants given plenty of room in garden:

Ole I. Berg, Berg, McKenzie County, North Dakota, reports on alfalfa plants sent him in the spring of 1911:

February 14th, 1912.

"I am more than pleased with the alfalfa seed which I saved from 98 plants—had nearly 22 ounces of seed. Some of these plants were certainly beauties to look at and I found 500 shoots from one root or crown of the Cherno alfalfa. The yield was as follows:

Cherno alfalfa, 25 plants, all lived, saved seed—9 ounces, best I have seen.

Cossack alfalfa, 25 plants, all lived but one, seed saved, 6 1-8 ounces; excellent.

Semipalatinsk alfalfa, 25 plants, all lived but one, seed saved, 4 1-3 ounces; very good grows rank.

Omsk Siberia 1908 alfalfa, 25 plants, all lived, seed saved, 2 1-8 ounces; fair, creeping growth, velvety fine plants.

Alfalfa plants were planted in one row four feet apart and well cultivated.

February 21, 1912.

"In your favor of the 19th inst. you ask if you understood me aright when I reported 500 shoots from one crown (one plant) of the "Cherno." You understood me correctly and I can furnish sworn affidavit to the authenticity of the statement. They were all green and healthy when cut. It must be remembered that these plants were not clipped during growing season, until the latter part of September when each plant was tied up separately and cut off about four inches from the ground, then hung up in granary attic to dry. Pods were hand-picked off this winter, put in muslin sacks to dry, then put into canvas or sacks when seed was rubbed and pounded out. Then it was put through a fine sieve (without wind), then through
fanning mill with ample wind to blow out all rubbish, leaving good clean seed ready to go into the Planet Junior in the spring. So the 22 ounces of seed which I reported are clean seed.”

December 9, 1912.

“The plants had a good chance by being kept free from weeds and grass. They were watered when first set out but not since. In 1911 they seeded. We had a very dry summer. I saved seed for two acres in rows 36 inches apart. All showed up a good stand last summer. The season of 1912 was wet. I kept them clipped so they did not go to seed. All crops are good. I reported on this alfalfa last winter and said then about all I can say now. With me they are doing fine and think enough of them to save every seed and every plant that I possibly can save. Expect good seed crop next year.” Ole I. Berg.

Max Petzold of Haynes, No. Dak., writes under date of December 17th, 1913.

“In the spring of 1912 you sent me 25 Orenburg and 25 Cherno alfalfa plants, and 100 seeds of the Cossack.

The Cherno I planted on good upland in my garden in rows three feet apart and in the rows two feet apart. They all lived and did very well. Last June the ground was covered and the stalks grew from three to four feet long, with leaves coming out on every branch. The blossoms were yellow, with some dark green shine to it, except one plant pure white. They are very heavy seeders. Raised quite a lot of seed but could not thresh it yet, seems to stick in the shell very well, and still some seed dropped out and started growing—made four to six leaves. I never watered any of them, it appeared to me they did not need it.

The Orenburg I planted on very rich ground on lower land in the garden, 3x2 feet apart. They have not done quite as well as the Cherno, and for a while I thought the most of them were dead, but they all lived and grew in a creeping habit. The blossoms are somewhat like the Cherno, only a little more yellow, with black greenish shine.
The seed pod is different from the Cherno or other alfalfas, it is straighter but a very heavy seeder and easy to shell out. Have quite a lot of seed saved but not planted yet.

The Cossack I seeded in my garden on upland, they started to come up. I have 95 plants out of 100 seeds. They grow 3 feet high, upright. They were sown very thick—not over one inch space between them. I will transplant them next spring. Quite a number of plants raised seed this year, which I saved.”

After threshing, Mr. Petzold reports, “The 25 Orenburg gave me one-half pound of clean seed; the 24 Cherno gave me one-half pound clean seed. One plant of the Cherno was white flowered, and I saved the seed extra from it, have one large tablespoonful large clean seed. The Cossack which I seeded last spring yielded two large tablespoonfuls of good, large seed, so in all the seed weighs one and one-fourth pounds, on a well balanced platform scale. The seed is all very plump.”

Albert Holton of Miles City, Montana, reports under date of January 13, 1913, on 25 Orenburg, 25 Cherno alfalfa plants sent spring 1912.

“I have threshed and cleaned the seed from the blue-flowered alfalfa, (Cherno) and from the 25 plants, received one and one-half quarts. The plants received no artificial moisture at all. Were not planted until about two weeks after they came. Then brought them overland from Miles City to Cohagen (67 miles). The Orenburg I have not cleaned yet. I planted both kinds in one row. Would you advise me to separate them or let them mix? I am in doubt how to handle them next year. Expect to sow the seeds in rows with a garden drill. Will this be all right? Would like some seeds of these kinds if you can furnish it. Let me hear from you.”

In round numbers, this yield means 26000 seeds per plant the first year from one year old Cherno plants. For the present seeds of each variety should be kept separate, although no harm will result from a practical standpoint
since the Orenburg is probably hardier than Cherno and the resulting Sand Lucern will be vigorous and productive.

**HAY YIELDS FROM TRANSPLANTED ALFALFA**

Herbert A. Hardy, Timber Lake, Dewey County, S. D., reports on 10 Semipalatinsk alfalfa plants, one of the yellow-flowered Siberian varieties sent spring of 1911 by Prof. N. E. Hansen, State College, Brookings:—“The plants were put in on sod broken about April, 1911, but of course it was well cut to pieces. About one and one-quarter ounces of seed gathered 1911. In 1912 the plants were cut for hay about the middle of July and yielded about nine and one-half pounds of cured hay. The season of 1911 was extremely dry—nothing except potatoes made a crop. Fall of 1911 quite wet and during the whole winter of 1911 and 1912 the ground was covered with a heavy coat of snow. 1912 a reasonable amount of moisture.

Note: At .95 pounds cured hay per plant, a field set in hills at 2x4 feet, or 5445 plants per acre, would yield 2.58 tons.

W. H. Patmore, McNeely, Tripp County, South Dakota reports on 10 plants of the same alfalfa planted at the same time: These yellow-flowered plants blossomed the first year and yielded one ounce of seed. In 1912 plants were cut in June; second crop did not mature seed. This spring the crowns of the plants were one foot across. The hay cut from one of the parent plants, weighed five pounds. This was the weight cut green.

Note: Plants like this in hills 2x4 or 5445 plants per acre, would yield over thirteen tons green forage to the acre. It indicates that alfalfa set in rows and cultivated will do better, in dry seasons at least, than by the present method of seeding.

The machine transplanting of alfalfa plants, which can be readily done by an adapted tobacco planter as was shown by our many field trials last spring, was intended mainly for raising seed quickly of new varieties. As to
whether it can be adapted to raising alfalfa for forage on dry upland, can only be proved by further experiments in many places.

BLISTER BEETLES AND INJURIES THE FIRST YEAR

At this station the past three years we have had trouble with the gray and black blister beetles, which are native insects. They appear suddenly and are very fond of the blossoms—appearing to feed equally well on all yellow-flowered alfalfas, as well as on Cossack, Cherno and Turkestan. The past season they were especially destructive as the early crop of blossoms was destroyed, which threw the later blossoming too late in the season when rains interfered with the pollination by various insects. The blister beetles were fought by spraying. These experiments were in charge of Prof. H. C. Severin, who submits the following report:

Brookings, South Dakota, January 15th, 1913.

"During the years 1911 and 1912 the Entomologist at the South Dakota State College carried on some spraying experiments to protect alfalfa plants from the ravages of blister beetles. The following formula protected not only small seedling plants but also large alfalfa plants from which seed was especially desired:

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paris Green</td>
<td>1 lb.</td>
</tr>
<tr>
<td>Freshly slaked lime</td>
<td>2 lbs.</td>
</tr>
<tr>
<td>Whale oil soap</td>
<td>1 lb.</td>
</tr>
<tr>
<td>Water</td>
<td>50 gals.</td>
</tr>
</tbody>
</table>

H. C. SEVERIN,
State Entomologist.

Complaints were received from various parts of the state concerning the ravages of blister beetles and if they should become an annual pest it will more than ever favor the transplanting method since a transplanted plant will recover from their attacks while seed that is just coming up will be a total loss. Plants may be raised the first year in a nursery, one acre perhaps raising enough for forty
acres later, and this small area can be much more easily protected than where the seed has been sown over a large field. The hardships that a transplanted alfalfa plant will endure even the first year, is well illustrated in the following letter from A. J. Mosier, Rapid City, Pennington County, S. D.:

Mr. A. J. Mosier of Rapid City writes under date of December 29, 1911, on 150 alfalfa plants sent spring 1911, consisting of 25 Cherno, 25 Cossack, 50 Omsk and 50 Semipalatinsk. The plants started all right but were eaten to the ground twice during the early part of the season. Then the plants grew, blossomed, and seed began to form when they were cut to the ground again by hail. One hundred feet from the alfalfa there was no hail to speak of. Up came the alfalfa again and blossomed, and seed was forming when the family came to town one day and someone using my corral to catch horses let four get away in my field, pulled out and left them there and of course they could not find a three-acre patch but found my garden patch and ate it as close as the rabbits did. When the frost came it was about eighteen inches high but I did not get a single seed. In the spring I will put poultry netting around the garden spot that will keep the rabbits out and I will see to it that no more horses eat it.”

Under date of November 12, 1912, Mr. Mosier reports as follows: The plants were kept fairly clean of weeds, were watered when first set out but never after that. Seeded some in 1911 but about one-third was destroyed. Seeded very prolific in 1912. I believe I will have eight or ten pounds of seed altogether when cleaned. These plants were set three feet each way, were not cultivated but kept fairly clear of weeds. They all seeded very heavy. The two yellow varieties seed in pods like lima beans with a very slender stem. I picked about two quarts of seed off the high and nearly as much off the low plants, most of the seed fell on the ground and I raked it in. The Cos-
sack and Cherno seed I mixed and have over a peck with hulls on picked by hand. They are certainly hardy and I shall sow all the seed I have next spring.”

**HASTENING GERMINATION OF MEDICAGO FALCATA**

It frequently occurs in the introduction of any new plant to cultivation that difficulties present themselves before the habits of the new plant are understood. The seeds of many plants do not germinate evenly the first year but appear a few at a time during a long period, a large percentage holding over until the following year. These hard seeds, as they are called, found in so many legumes and other plants, are nature’s provision to prevent extermination of species in an unfavorable season. Dr. Nilsson at the Experiment Station, Svalof, Sweden, recognizes this problem of hard seeds in the legume crops in his seed-scratching machine called the Preparator, which is a device for throwing the seeds violently against a hard surface so that the seed is slightly indented or broken to admit more ready absorption of water. In 1906 I saw this machine in use at the Experiment Station at Svalof, Sweden, and brought one to America. In 1911 this machine was tested with favorable results by the Agronomy Department of this Station and the results published in Bulletin No. 133, “Alfalfa as a Field Crop in South Dakota,” February, 1912, by Dr. A. N. Hume and Mr. Samuel Garver. Seed-scratching machines are now in common use by seedsmen in Sweden and other countries of Europe. The seeds are run through the machine just before shipment, as the farmers get a better stand, and hence are better satisfied with the seeds.

A number of correspondents complain of difficulty in getting a good stand in sowing the yellow-flowered Siberian alfalfa seed. We have raised many thousands of these plants from seed kept dry over winter, sometimes in a warm room, sometimes in a cold shed, and have always obtained what appeared to be a fair stand of plants. But deeming
it best to make some definite investigations as to how many plants should be expected from a definite quantity of seed, part of the 1911 crop was devoted to this purpose.

The native alfalfas of Siberia are all exposed to severe freezing before germination, while the common alfalfa being native to a frostless region in southern Asia, does not need freezing.

A little reflection on the peculiarities of the Siberian climate will quickly suggest that the seed may need freezing. A scratching machine may be a substitute for the freezing, but definite tests must be made in the matter.

The immense number of cut worms and grub worms, followed by repeated attacks of the gray blister beetles, threatened for a time to destroy the entire experiment. In digging the plants we found that many plants had been cut off entirely beneath the surface, but that the top piece had made new roots. This shows the strong vitality of alfalfa plants. The blister beetles were fought by spraying with a solution of paris green and fish oil soap. However, the following results for 1912 are worthy of consideration, since the insects seemed to be evenly distributed throughout the entire field.

The results of freezing and seed-scratching experiments, 1912 are as follows:

**Effect of Scratching Method**

**Samara alfalfa—Medicago falcata.**

- 6 ounces seed, not scratched, planted May 25, 1912—yielded 4967 plants.
- 6 ounces seed, scratched twice, prepared by running twice through Dr. Nilsson’s Preparator, planted same time—yielded 12549 plants.

The above test shows a gain of 153.6 per cent by use of the seed scratching machine.

**Cossack alfalfa—Medicago media.**

- 1 pound seed, not scratched, sown May 25, 1912—yielded 15777 plants.
1 pound seed, scratched once, sown same time—yielded 20262 plants.
Gained 27.7 per cent.
1 pound seed, scratched twice, sown same time—yielded 20806 plants.
Gain, 31.6 per cent.
This also indicates the advantage of using the seed-scratching machine.

Effects of Freezing

Obb Siberia Alfalfa—Medicago falcata. In freezing an ounce of seed was put in a pan of water one inch deep about the middle of February and frozen for about four weeks—then spread out and dried in greenhouse and kept dry until June 1st.

This was not the best method as I believe it should be dried out just previously to planting and sown as early as it is possible to get it into the ground. The young plants stand severe frosts.

1 ounce frozen seed—yielded 790 plants.
1 ounce not frozen but kept in warm room all winter—yielded 627 plants.
This is a gain of 25.8 per cent by soaking and freezing.

This winter we expect to try both freezing and scratching the same lot.

The seed-scratching machines are made in various sizes, including the small one that can be put on an ordinary table. In 1906 Dr. Nilsson informed me that for a few seeds a fair substitute for this mixing the seed with sharp sand in a bag and pounding the bag against a board.

As to freezing seed, it may be that fall planting will be the best way but on a heavy soil seeds of any kind sowed in Autumn may be heaved out by alternate freezing and thawing. Soaking and freezing of seeds is a common nursery practice for many fruits, trees, shrubs and herbaceous perennials.
Shattering the Seeds

Most of the yellow-flowered Siberian alfalfas are inclined to shatter their seeds over a long period. They do not all do this as the species found wild appear to be a collection of elementary species, some of which hold the seed much longer than others. In gathering seed in their native home I found many plants full of seed when the snow was still on the ground. At first thought this shattering of the seed would appear to be a defect, but for the purpose of a wild pasture plant that will hold its own on dry upland, especially on rough land not adapted to cultivation, this may really be an advantage since some of the seeds are sure to fall in moist soil. The best method of handling the yellow-flowered Siberian alfalfas is still under test. But the transplanting method will very greatly reduce the amount of seed needed for any given area.

A North Dakota farmer reports results from 25 Omsk alfalfa plants set spring 1910. In 1911 he had about 200 plants from seed sown the previous year, ready for planting, and in addition about one-third pound of seed, which gives him about an average of 10,000 seeds per plant each year the first two years.

At this station we noticed in 1911 that this seed volunteers so abundantly in cultivated garden soil that the ground is covered with young plants in the fall. The seeds came up as soon as the fall rains began. April 4, 1912, we took up a flat box containing two square feet of this surface soil; this yielded 914 plants. In a wild pasture of course much fewer seeds would find a favorable place for germination. Many of these plants were only one-fourth inch in height but the root was already four inches long. These leaves showed green as soon as the snow went off. The roots of these little plants had many nodules, showing they were well inoculated with the nitrogen-gathering bacteria.

It has been my observation that these plants when growing thickly in a wild pasture hold each other up and are much more erect than when grown singly in hills. Also
that single plants the second year are much more erect than the first year. Certain strains are upright, others more of trailing habit, the latter are more for steep slopes and rough pasture lands.

FEEDING TESTS OF SIBERIAN ALFALFAS

The question of the palatability of these new alfalfas has been raised. This is one that is certainly important, but having seen stock over many thousands of square miles in Siberia, grazing and keeping in good condition on these various alfalfas, I have no fear on this score. The taste of the rich milk, cream and butter made in a large measure from these alfalfas in Siberia, as well as the kumiss made from mare's milk by the Kirghiz Tartars still lingers in my memory.

Mr. H. Rockhill of Conrad, Grundy County, Iowa, writes under date of March 16th, 1912.

"In regard to feeding alfalfa to horses, we tried both Cossack and Samara, I could note no difference in this test, as both kinds were eaten readily."

C. H. Blair & Sons, Tilford, S. D., report under date of November 18, 1912, on 10 Plants Semipalatinsk alfalfa received spring 1911, as follows:

"The season of 1911 was very dry from January 1st, to July 20th, but we saved all of the Semipalatinsk by watering three times after setting them out. The season of 1912 had plenty of moisture up to May 15th. The plants made fine growth, stooled well and covered a space of 10 inches in diameter and a height of four feet, also flowered well. July came in cool and wet. One night early in July when raining, one of the horses gained entrance to the plot where the alfalfa plants grew and ate off all upright stems and trampled the lower branches down so the seeds were injured by the wet weather and failed to mature. Now, as to the stock eating the yellow-flowered alfalfa, this case shows there is no doubt that
the horse that ate off those plants was not a hungry ani-
mal. It came out of a good pasture where it had access
to native grass, alfalfa and timothy."

Professor James W. Wilson reports as follows:

THE PALATABILITY OF MEDICAGO FALCATA
FOR LIVE STOCK

During the early summer of 1912 experiments in
pasturing the yellow flowered alfalfa with cattle and sheep
and an experiment in using the alfalfa as a soiling crop
for swine, were conducted. The object of these exper­
iments was principally to note the palatability of the al­
falfa as a feed. In each case the stock did well. With
the sheep a lot was fenced in so they could have their
choice of other grasses. It was found that they preferred
the alfalfa to alsike clover.

With two lots of hogs of two head each receiving
the same quantity of corn daily, but one receiving alfalfa
and the other Bromus inermis grass as soiling crops, the
alfalfa hogs made twenty-eight pounds more gain in the
forty-one days than did the lot receiving Bromus as a soil­
ing crop.

Hay made of the yellow flowered alfalfa is quite pal­
table for sheep and is now being fed in an experiment to
determine its relative feeding value to common alfalfa.

James W. Wilson,
Professor of Animal Husbandry.
Brookings, South Dakota, January 20, 1913.

NATURAL HYBRID ALFALFAS

In Asia and southern Europe wherever the common
blue-flowered alfalfa and the yellow-flowered alfalfas grow
near together, the pollen is carried from one to the other
by bees and other insects so that hybridization takes
place freely. These hybrid alfalfas are sometimes called
Sand Lucerns. Their number is legion and they consist of all sorts of mixtures in varying proportions of the yellow and blue alfalfas.

Since the Medicago falcata is very widely distributed in Europe and Asia, ranging in Asia from India north to above the Arctic Circle in Northeast Siberia, the plant varies greatly in its ability to resist cold, hence it follows that the hardiness of this hybrid alfalfa must depend largely on the region from which it comes. Coming from the mild region of Southern Europe it could not be expected to be as hardy if it came from drier and more severe climates. Hence while nature has indicated in the Sand Lucernes a method of increasing the vigor of alfalfa by hybridization, we do not know that this combination is the best one that it is possible to make. I now have at the Experiment Station at Brookings a large cosmopolitan collection of alfalfas and hope in the near future to originate still better varieties combining the best points of the alfalfas of the world. Much progress has already been made in this line by the United States Department of Agriculture. The following is quoted from the report of Hon. James Wilson, Secretary of Agriculture, for 1912:

"Siberian Alfalfas (page 121.)

"During the past year marked advance has been made in the work with the hardy and drought-resistant alfalfas introduced from Europe and Asia. The crossing of the yellow-flowered form with the common species has resulted in some very promising hybrids adapted to use both as hay and for grazing in the Great Plains region. The value of the new alfalfa for hybridizing can scarcely be overestimated."

(Page 119)

"The whole alfalfa question in the United States has been put on a new basis by the introduction of the Turkestan, Siberian, Arabian and Peruvian alfalfas and the development of the hardy hybrid strains which grow in the Southwest throughout the winter."
From my trip in 1906 I brought home four of these hybrids, one from north Sweden and three from southern Russia. I have been greatly pleased with their extremely vigorous habit of growth, quick recovery after cutting, many stems and large leaves, the abundant seed production the past four seasons, and the fact that the seeds are tightly retained in the pods instead of shelling as it ripens through a long season. The flowers vary greatly in color from blue to yellow, ranging into green, dark, violet and purple. My impression is that this hybrid condition of the plants should be maintained in order to get the greatest amount of forage per acre, although, of course, we are endeavoring to isolate some of the most striking colors by selection. In 1910 I named two of these three Russian hybrid alfalfas, the Cossack and Cherno, both of them descended from single plants found wild by Prof. V. R. Williams, Imperial Agricultural College at Moscow, in the steppes of Voronesh province of southern Russia, the land of the Don Cossacks. As near as can be judged, they combine the good qualities of both parents.

The original plant of Cossack, S. P. I. 20714, as found wild in the dry steppes, had blue flowers on one branch, yellow on another, and sometimes both colors on the same branch.

The original plant of Cherno, S. P. I. 20716, as found growing wild, was described as a beautiful plant, very hardy, very productive and with black green flowers.

Our experiences at this station, and the experiences of those who have tried the plants elsewhere, show that Cossack and Cherno do not come true to color. At Brookings both are stronger in growth than the Turkestan and appear hardier, although they will probably not grow as far north as the pure yellow-flowered Siberian alfalfas, since their native home is in a black soil region where Indian corn, sugar beets and watermelons are raised. But judging by their behavior at Brookings the Cossack and Cherno will be two of the best hay alfalfas for South Da-
kota. In color of flower they vary very greatly, scarcely any two plants alike, ranging from the deepest violet purple through red purple, old rose, lilac, green, tan, deep yellow, light yellow, even into clear white. One plant of the Cherno alfalfa bearing 25,000 seeds was exhibited at the State Fair at Huron, September, 1911. Later in the season we found this was largely exceeded by other plants. One plant, the Cossack, yielded 31,935 seeds; one plant of the Cherno yielded 37,175. Our champion for the season was one plant of the Cossack alfalfa, which yielded three ounces of seed; this means 11,450 seeds on one plant. This plant has plenty of room in good garden soil, on high dry upland prairie; but even if such plants were set in rows 4 feet apart, and 2 feet apart in the rows, this means 1022 lbs. per acre. The common alfalfa seed runs about 14,500 seeds to the ounce, but the Cossack appears to run a little heavier than this,—about 13,810 seeds to the ounce. Both Cossack and Cherno are distinguished for their vigor of growth, individual cultivated plants running as high as 500 stems to the plant. In fact 500 stems to the plant is becoming our minimum standard in selection work. In both Cossack and Cherno the aftermath is rapid and the seed is held tight in the pods until spring,—although of course it should be harvested at the usual time when ripe. A large number of farmers are testing these varieties in a small way and it is from their reports that I will make up my final opinion: Owing to the great variation in the color of the flowers of these alfalfas, securing the right seed will be a matter of good faith on the part of the grower. I am endeavoring, as rapidly as possible, to originate by selection, varieties from these hardy Russian and Siberian strains that can be easily identified by the purchaser either by uniformity of color in the blossom, by the character of the seed, or other point. Somewhat on the plan of Hereford cattle breeders who put a white face on this breed to distinguish it from all other breeds. The Cherno shows a decided tendency to white flowers and we have made good progress in this
direction. A white-flowered alfalfa, if equally good in other respects,—as to hardiness and vigor, will be desirable as it will distinguish it from all other varieties.

100 Cossack Alfalfa Seed, Sent Spring 1912

Report by Waldemar Larson, Carthage, Miner County, S. D., Nov. 17, 1912:

"The 100 Cassack seeds I got from you this spring seeded this fall very heavily. There was more seed on the plants than I ever saw on any plants before."

10 Plants Cossack Alfalfa, Sent Spring 1911

Report by W. O. Huffman, Gettysburg, S. D., Potter County, November 12th, 1912.

"The 100 Cossack seeds I got from you this spring free from weeds and grass. I watered the plants when I first set them out, none afterwards. They seeded a very little in 1911 but more in 1912. I set the plants in the garden in a row about two feet apart, I poured water in each hole when I set them out as the ground was very dry. I got about a tablespoonful of seed in 1911 but this year I got about a pint. The plants came through the winter in good shape. I did not protect them any but there was snow over them all winter. We have had two very dry seasons here, practically no wheat the past two seasons and other crops very poor. The hot wind this summer did not seem to affect the plants any except they did not grow as fast as at other times. The plants are all alive except one or two that the gophers worked on before I found it out. Some of them spread out two feet or more."

10 Plants Cossack Alfalfa, Sent Spring 1911

Report by W. E. Scanlon, Gettysburg, Potter County, S. D., November 11th, 1912.

"Plants have been kept free from weeds, hoed several times during the growing season. They were not watered when first set out nor at any time since. Have
13 rows 14 ft. long, very very thick in row from seed that I gathered in 1911. Intend transplanting them in the spring of 1913. No seed in 1912, foggy weather blighted them."

10 Plants Cherno Alfalfa, Sent Spring 1911

Report by G. H. Bonney, Forestburg, Sanborn County, S. D., November 7th, 1912.

"The first year plants were kept from weeds and grass. Were watered only when set out. Got about one half teacup full of seed with hulls on and they seeded in 1912. I got 13 plants of you and nine of them lived. Four of the plants were of an upright growth and five of them ran along on the ground like a vine. I did not cut the third time last year and now I have quite an area covered with the young plants. They seem to be absolutely hardy as the ground was perfectly bare all last winter and they lived O. K. I would like to test some of the yellow-flowered alfalfa."

10 Plants Cossack Alfalfa, Sent Spring 1911

Report by W. E. Berkey, Jr., Ashton, Spink County, S. D., November 17th, 1912.

"This letter may be a little late but the reason that I didn't answer it sooner was because I was just digging up my plants to reset them this fall.

"When I received those Cossack Alfalfa plants from you in the spring of 1911 I set them out at once. I took a shovel and dug holes about four feet apart, poured in about one-half gallon of water to the hole, put in the inoculated dirt and the plant.

The plants were kept clean all summer and produced between two and three tablespoonful of seed. The biggest and the two smallest plants didn't produce any seed. They had no water after being set out. The way I got the seed shelled was to pick off the bolls by hand and then run them through an old coffee mill which shelled them
all out. Last spring I planted this seed in the garden. I made a small furrow after a rain and planted part of the seed, but it got so windy that I had to stop and didn’t get the rest planted until about two weeks later after another rain kept them clean all summer.

I have just finished digging and replanting them and have 4900 set out and between 400-500 small ones that didn’t come up until late that I am going to set in the garden in the spring where I can take care of them. Where I set the plants was in the corn and potato field this year. I plowed it about seven inches deep and harrowed it three times. Then marked it cross and lengthwise three feet eight inches. Planted where the two rows crossed by sticking a shovel down and putting the plant behind it. I had almost enough plants to plant an acre and a half. This year my ten plants made a good growth and had a lot of blossoms but the black potato bettles got on them and ate off quite a few of the blossoms before I found out they were there. I sprayed the plants with paris green and the beetles left. I have the seed gathered but have not gotten it shelled. I think there will be about as much as there was last year.

In 1911 our crops were rather poor. Some of our wheat we never cut and our best yield was seven bushels per acre. This year our crops were fair, wheat averaged eleven bushels and corn is going better than thirty bushels per acre.

If there is anything further that you would like to have me write more about let me know and I will do what I can.

10 Plants Cherno Alfalfa, Sent Spring 1911

Report by Samuel Scott, Custer, Custer County, S. D., November 14th, 1912.

"Kept free from weeds, watered when first set out and twice afterwards. Seeded some in 1911 and abundantly in 1912. Got 556 plants, first class, would have had 1200 but for fleas. One of the 1912 plants extended 5 feet 8
inches on one side and 6 feet one inches the other side, making a diameter of nearly 12 feet. The crown of the plant where it came out of the ground was 18 inches one way and 15 inches the other way.”

10 Plants Cherno Alfalfa Sent Spring 1911

Report by R. G. Kottke of Timber Lake, Dewey County South Dakota. December 3, 1912.

“I set the Cherno alfalfa out and two plants did not grow. At first I watered them about ten to fifteen days. After that they didn’t get any more water until August, 1911, but the alfalfa grew just the same to about 15 to 18 inches high. This summer I cut it off twice. After that I let it grow and go to seed. I got about one pound seed from eight plants of Cherno alfalfa. It is the best alfalfa for hay I ever saw. It does well in South Dakota. I wish I had about a peck of that seed.”

10 Plants Cossack Alfalfa, Sent Spring 1911

Report by L. Henry Wellrodt, Chamberlain, Brule County, S. D., Dec. 9th, 1912:

“I have given the plants a good chance by keeping them free from weeds and grass. The plants were never watered. In 1911 they seeded but developed more pods than seed. They seeded in 1912 but again there were many empty pods. The plants were planted 2 x 3 feet in 1911 and now the crown have increased so that the alfalfa covers the ground with a rank growth. I planted them in old garden soil. They had no particular care except an occasional hoeing. The past two seasons here were marked by long droughts in May and June followed by an excess of rainfall for the summer and fall months. Small grain was practically a failure during these years.”

10 Plants Cossack Alfalfa, Sent Spring 1911

Report by Harry Brown, Waverly, Codington County, S. D., November 29th, 1912:
"The plants have been kept entirely free from weeds and grass the first year and nearly so the second year. The plants were watered three or four times when set out. The plants produced flowers and seed pods both years but they were eaten by a black winged insect. The season of 1911 was very dry many fields of small grain being left uncut. In spite of the dry weather the alfalfa plants made a hardy vigorous growth on ordinary upland soil. In the spring of 1912 the alfalfa plants started early and were soon up eighteen inches to two feet high. They were not injured or killed by the extremely cold weather the winter of 1911 and 1912. The plants have proved their ability to withstand dry seasons as well as cold winters."

65 Plants Cherno Alfalfa, Sent Spring 1911

Report by G. A. Tracy, Watertown, Codington county, South Dakota.

November 20th, 1912.

"Your letter was duly received asking me to make a report of 65 Cherno alfalfa plants which you sent me in the spring of 1911. The plants arrived in a good condition, also a package of inoculated earth. I mixed the latter with three times as much rich dry dirt and put the plants in a pail of water. Then as I set them out would take a plant and roll it in the dry dirt until the roots were well coated, and then set them out in rows three feet apart, the hills two feet apart in the row. The plants had started a growth of from two to four inches when received. These tops dried up and died down to the roots, but soon sprouted up again. I gave them a little water as I set them out and six days later I watered them again—no more water all summer. I kept them free from weeds and grass. Only two plants out of the sixty-five failed to grow. They made a fine growth up to about July the first, but the long gray bug got in and ate the leaves nearly all off. I gave them a dose of paris green water and the next day not a bug was to be seen. I then cut off the tops, after which they made a fine growth and seeded very heavily, but it was so
late a part of the seed did not ripen. I saved the seed and planted it and will have several thousand plants to put out next spring. The spring and summer of 1911 was very dry so that many pieces of small grain was not worth cutting. The corn and hay crops were very light also. In 1912 we had plenty of rain all summer. Crops of all kinds were very heavy. *Alfalfa made a rank growth—so heavy it could not stand up, no bugs to injure it and it blossomed all right, but very little seed grew, not enough to pay for gathering. I think the ground it is growing on is a little too rich for the best results for seed growing. It is in the garden where the land was heavily manured. It seems to grow seeds best in dry seasons. There are apparently three or four different varieties as the blossoms are light blue, dark blue, yellow and nearly black, all good. I am well pleased with it and think it will be worth millions to South Dakota as soon as we can get to raising seed enough to supply the demand. I expect to set out what plans I have with a spade. I will put the spade down full length and then push the handle forward and put two plants behind the spade so they will average eight or ten inches apart in the row and the rows eighteen inches apart. A man and a boy can put in a good many plants in a day. I shall cut the tap-root off so it can be set without bending the root. Alfalfa, the first year from seed, will grow a tap root straight down ten to eighteen inches, which makes it a very strong drought resisting plant.

"The plants had a good chance by being kept free from weeds and grass. They were watered when set out and six days afterwards but have not been watered since. In 1911 the plants seeded very heavily. In 1912 they did not seed to amount to anything. They grew so large they all laid down about the time they blossomed. The ground was too rich and there was too much rain. They would do better in a dry season."
10 Plants Cherno Alfalfa, Sent Spring 1911

Report by Simon A. Stumley, Grand Valley, Corson County, South Dakota.

November 18th, 1912.

"The plants had a good chance by being kept free from weeds and grass. They were watered when set out but not since. In 1911 they were covered with seed late in the fall but did not get ripe. They seeded in 1912 but not so much as in 1911. We received the plants which were in fine shape at the time. I planted them the next day after keeping them in a mud bath over night. I dug a hole 18 inches deep, 14 inches in diameter, filled full of water and let it soak in. The ground was as dry as ashes. I held each plant up while I sifted fine dirt around the roots. After filling with dirt I soaked the ground with water and that was all the water the plants had until the first rain in the fall which we got the first Friday in August. I cut the plants in July and after the cutting they did better than before. Some animals pulled two of the plants up so there were only eight left to experiment with. They all came up this spring but the rabbits ate two so now I have only six. However, they are all right. My experience with the plants proves to me that a dry hot year like last will produce seed, while a wet summer like this summer will produce hay. Last winter was a hard winter with lots of snow. The plants were in an exposed place but came out all right. I saved some seed which I shall plant next year.

10 Plants Cherno Alfalfa, Sent Spring 1911

Report by M. O. Johnson, Pierpont, Day county, S. D.

November 10th, 1912.

"Plants were kept free from weeds, and were watered when first set out only. Seeded quite heavily in 1911 and also in 1912. The season of 1911 was very dry, small grain almost complete failure, corn good. Season of 1912 rainfall low with nearly normal yield of small grains. Corn not so good, mostly soft due I think, to weak seed and cold summer."
10 Plants Chernò Alfalfa, Sent Spring 1911


"Plants were kept free from weeds. Were not watered when set out or any time since. Seeded in 1911 and also in 1912. 1911 was a very poor year for any crop here. We harvested a crop of corn only. 1912 was a fair year probably about our average. These plants made a quick hardy growth with no care except to hoe around them occasionally."

10 Plants Chernò Alfalfa, Sent Spring 1911

Report by Wm. Sheeler, Webster, Day County, S. D. November 4th, 1912.

"At the time of planting the 10 plants of Chernò alfalfa there was a strong wind blowing from the south. Soil on top, one-fourth inch deep was dry, below that it was slightly moist. I watered the plants at time of planting. Plants were received in good condition. August 30th, 1911, I cut alfalfa for seed, got three pounds in weight when green. When dry I shelled out the seed and got about 2000 seeds. Sowed the 2000 seeds May 10th, 1912, and got about 1000 plants from said seed. The said plants look good at this time. The reason I think, that I didn't get seed from the 10 plants this year is I let it grow for seed the first crop. The 10 plants are large and thrifty."

10 Plants Chernò Alfalfa, Sent Spring 1911

Report by E. C. Thompson, Lily, Day County, S. D. November 5th, 1912.

"In regard to the alfalfa plants which you sent me in spring of 1911 I have had very good success with them. As soon as I received them I planted them in rich garden soil and planted them by digging a hole of a good size, then I set the plants in and watered them as soon as I had set them, then covered the roots with dirt. I kept them clean from weeds and well cultivated and in July some were 18
to 24 inches high. I got about 6 ounces of seed from them. This seed I planted this year and now I have a great number of young plants. This year the plants were in blossom when some insect destroyed the blossoms so they did not seed, but the plants seem to be as healthy as ever. All are growing which I received in the spring of 1911."

10 Plants Cherno Alfalfa, Sent Spring 1911

Report by Alex. Cattnach, Timber Lake, Dewey County, S. D.

November 8th, 1912.

The plants have had a good chance by being kept free from weeds and grass. They were watered a few times when first set out. There was a small amount of seed in 1911. In 1912 the plants seeded and I picked the pods off and as I have not shelled it out I cannot say how much there is but it weighs one and one-half pounds. I planted them as soon as received on land just broken a few days before (prairie sod) and as the ground was very dry I watered them once a week for three or four weeks and then I tried to keep a dust mulch around them. The season of 1911 was very dry here and crops of all kinds were a failure but the alfalfa lived and seeded a small amount. In the spring of 1912 it came up green and looked good but a few days later I noticed one plant standing still while the others grew fast. It soon died and I pulled it up and the roots broke a few inches below the crown and seemed rotten. During the summer of 1912 I spaded around the plants (all the ground) 10 inches deep and they did fine. I believe it will do very well for hay as it stands up straight. This season, 1912, we have had more rainfall and the crops did fairly well. During the year it has not shown any sign of drying up and we had some very dry hot weather. Every other crop suffered considerable for rain. I also planted the seed off these plants in spring of 1912, transplanted them during the summer and they seem to be doing all right. This is a new business to me but I hope the report is all you could wish for."
10 Plants Cherno Alfalfa, Sent Spring 1911

Report by Axel O. E. Nord, Milbank, Grant County, S. D.

November 13th, 1912.

"Plants have been kept free from weeds and were watered when first set out. They seeded the first year but did not seed the second year as they were kept down too long by insects. The plants grew and were thrifty bearing a good crop of seed in 1911. They started out well this spring and about the 18th of June they were cut near the ground. They came up again, a foot in two weeks. The latter part of June they were infested by a black beetle which took most of the foliage and worked along the roots and around the stem. We sprayed with paris green. The spraying demolished the insects but afterwards seven of the plants died. We do not know whether the insects killed the plants or whether the paris green solution was too strong.

As far as hardiness goes, I think the plants did well. Concerning the other crops, they were very poor in 1911, ten bushels per acre being the best yield of wheat. In 1912 the crops were good, some wheat yielding 32 bushels per acre and oats 100 bushels. Oats, barley and rye yielding in proportion to the wheat. Corn was good in 1911 but many failed to supply themselves with good seed and the result is an enormous amount of immature corn this year. Corn from good seed yielded about 60 bushels per acre."

10 Plants Cherno Alfalfa, Sent Spring 1911

Report by Omer Mills, Wall, Pennington County, S. D.

November 19th, 1912.

"At the request of my son, Omer Mills, who is in the service of the government in "The Hills" at present, I will try to comply with your request. Of the plants received 7 lived. They made a wonderful growth last season notwithstanding we had no moisture during the growing months. A few seeds were secured from them last year,
from which we have eight or nine plants this year. This season we had but little rain to speak of until July. The old plants began growing very early, first crop cut in June, near two feet high. Second crop grew very rapidly and was left to seed, but on account of so much rain in July, no seed formed but instead a partial second crop of bloom came on from which a small quantity of late seed was secured. I think the germination of this seed doubtful. We have the purple and yellow flowered plants. The yellow is a creeper and has made no seed so far. One of the purple made an immense growth from two to three feet high before it went down and then from four to five feet. The plants produce an immense amount of forage. Plants were kept free from weeds and watered when first planted. Got a very few seeds in 1911. Seeded in 1912. Good attention has been given them all the time. We are very enthusiastic over them and expect to make a great success of them. Think they should be planted in hills somewhat closer than corn.”

10 Plants Cherno Alfalfa, Sent Spring 1911

Report by John B. Wittmayer, Eureka, McPherson county, S. D.

November 15th, 1912.

Ten Cherno alfalfa, sent spring 1911. “Kept free from weeds. Were not watered when first set out or at any time since. Did not see any in 1911 but did in 1912. The alfalfa grew nice from the start, it grew about two feet tall the first year. This year it was three feet high. The season of 1911 was dry, wheat went three bushels to the acre. This year, 1912, wheat went 13 bushels to the acre. I have the alfalfa plants in the garden. I think Cherno alfalfa will not winter kill here. I will try more of it from the seed I got.”
10 Plants Cherno Alfalfa, Sent Spring 1911

Report by W. D. Dillon, Quinn, Pennington County, S. D.

November 10th, 1912.

"The plants have had a good chance by being kept free from weeds or grass. They were not watered when first set out or at any time since. They did not seed the first year, 1911, but they did seed in 1912. The last two seasons, 1910 and 1911 were exceedingly dry here and I had only one plant that stood the two dry seasons but that is an extraordinary fine plant and the second cutting seeded very heavy this year. I am taking special care of the seed and aim to get a start of it."

10 Plants Cherno Alfalfa, Sent Spring 1911

Report by J. H. Johnson, Fort Pierre, Stanley County, S. D.

November 6th, 1912.

"Eight of the plants were set in gumbo and shale on a high hill in grass sod and were watered frequently. They seeded nicely in 1911 and also in 1912 they seeded very good again. They have spread and produced a fine crop of hay in 1912. We sent you a sample of one plant in May, 1912. The other two plants were set in the middle of the garden and were plowed under once in 1911 and once in 1912 and are still alive. We regard this alfalfa as a wonderful plant."
PLATE 18. Sansarc, South Dakota, Semipalatinsk alfalfa, growth of one year old plants after 14 months drouth of less than 5 inches of rainfall on dry upland gumbo.
PLATE 19. Sansarc, South Dakota. Semipalatinsk alfalfa, growth of one year old plants after 14 months drought of less than 5 inches of rainfall on dry upland gumbo.
PLATE 20. Sapsarc, South Dakota, Semipalatinsk alfalfa, growth of one year old plants after 14 months of drought of less than 5 inches of rainfall on dry upland gumbo.
PLATE 21. Semipalatinsk alfalfa at South Dakota Experiment Station, June 20, 1912. These were one year plants set spring of the preceding year, 1911.
SEMIPALATINSK ALFALFA

The yellow-flowered alfalfa, *Medicago falcata*, extends over a vast area including most of the continents of Europe and Asia. A species ranging over such a vast area naturally differs widely in its ability to endure climatic extremes, and also in its characteristics as a plant. The most vigorous form of this species, as far as I have observed, is that found in the dry steppes of the Semipalatinsk region (Akmolinsk province) western Siberia. In 1908 I gathered seed on the Irtish river, about ten miles north of Semipalatinsk, (S. P. I. 24455), from plants of erect habit, with stems of which some were five feet eight inches long. Flowers bright yellow. This is *Medicago falcata* from a region with very cold winters and dry, hot summers. In 1909 some more seed was gathered for me in the Semipalatinsk Region.

The following extracts are from the Annual Report of Hon. James Wilson, Secretary of Agriculture, for 1912:

*Siberian Alfalfas—*

“Our dry-land problems will be measurably solved through alfalfas from Siberia and nonsaccharine sorghums from Africa.” (Page 10.)

“During the past year an agricultural explorer was sent through the steppe regions of western Siberia, south of Omsk, to make a detailed study of the behavior of the yellow-flowered, hardy alfalfa on the cattle ranches there, and he made contracts with the peasants for all the possible seed for special experimental tests of this plant in the Northwest.” (page 120.)

10 Plants Semipalatinsk Alfalfa, Sent Spring 1911

Report by E. A. Billings, Geddes, Charles Mix County, S. D.

November 16th, 1912.

“The plants had a good chance by being kept free from weeds and grass. They were watered when set out. In
1911 they did not mature but in 1912 they seeded. I set them out on rather dry land on a side hill on heavy soil and the land has been well cultivated. Last year was dry with us and I got very little and very poorly filled seed which failed to grow. This summer has also been dry but the plants made a fine growth and I have some seed not threshed but carefully stored away in my barn and I think the seed will germinate. The plants grew and were very thrifty and spread about eight feet on the ground but were not more than two feet high."

10 Plants Semipalatinsk Alfalfa, Sent Spring 1911

Report by J. N. Johnson, Wagner, Charles Mix County, S. D.

November 15th, 1912.

"Plants were kept free from weeds and grass. Were not watered when first set out or at any time since. Don't know if they would have seeded in 1911 or not as the pigs got to them. In 1912 one plant had some seed others had practically none. These plants are stooling wonderfully. Crops here have been good this year but last year was very dry and crops short."

10 Plants Semipalatinsk Alfalfa, Sent Spring 1911


"In regard to the Semipalatinsk alfalfa I planted the plants you sent me in the garden. All grew but one, grew very stalky and vigorous, but had very little seed. This year I cut it July 1st, it grew large and stalky. Second crop grew large but did not blossom and consequently had no seed. The season has been good for all crops, plenty of moisture.

Grass crops were also good, especially clover and alfalfa. The first cut of alfalfa was good but the second crop
did not do well besides had very little seed and was hardly any seed threshed."

10 Plants Semipalatinsk Alfalfa, Sent Spring 1911

Report by Rev. F. A. Hassold, Morristown, Corson County, S. D.

November 27th, 1912.

“The plants had a good chance by being kept free from weeds and grass. They were watered a very little at first as the ground was extremely dry. They were not watered afterwards. The plants did not seed any the first year, 1911. In 1912 the plants seeded, that is the two that survived. The plants had seemingly been delayed in the mails. It was very dry at the time and during a year of drought. Only two of the plants grew after being planted. These were on newly plowed prairie that had however, been thoroughly prepared by digging and pulverizing the soil. The plants were watered a little at first as the surface soil and the plants seemed dry and needing it more than would ordinarily be required. The two plants grew well and strong but neither bloomed or produced seed. A few buds came out late in the season. The plants wintered well being covered with the deep snow during the winter. In the spring 17 shoots sprang up from the one and 12 from the other plant. One was over six feet across as it lay and some 22 inches in height. The other not quite so large. Both bloomed freely and seed formed. The season was a wet one and crops were good generally except where injured by a hot wind in June. The plants were not injured. Some seed shelled out but some were gathered. The previous year there were no crops owing to drought and neither bees or butterflies. This year there were both. The plants were not cut as it was desired to secure all seed possible. The plants were kept in the garden but no care, other than to keep them free from weeds, was given. When the other plants dried up and died these plants withstood the drought. This year when during a dry spell common alfalfa (Turkestan from Nebraska) wilted and turned yel-
low, these plants grew and were healthy looking. I also had Cossack, Orenburg, and Cherno. Seed of the first and plants of the latter two. All did well this year and produced seed. The Cossack seed produced strong plants and seed was very plentiful but the seed was not fully ripe when the wet weather followed by the frosts made it seem unwise to delay further in gathering it. So a lesser amount of good seed was secured than might have been had.”

10 Plants Semipalatinsk Alfalfa, Sent Spring 1911

Report by Anton O. Hagen, Roslyn, Day County, S. D.

November 19th, 1912.

“The plants have had a good chance by being kept free from weeds and grass. The plants were watered when set out and a few times afterward. They did not seed any in 1911. In 1912 they seeded some but not very much. It may be that I have made a mistake for I have never clipped them. One of the plants didn’t show life when I set it out, but the remaining nine have made a wonderful and vigorous growth, especially last season.”

10 Plants Semipalatinsk, Sent Spring 1911

Report by Wm. N. Ferguson, Isabel, Dewey County, S. D.

November 17th, 1912.

Ten plants Semipalatinsk alfalfa, sent spring of 1911. "I take pleasure in saying the plants you sent me in spring of 1911 did fine this year obtained about 2 ounces of seed. Plants have stood the drouth as well as the winter, all living. From 15 to 40 sprouts grew from each plant this year. I grew 500 bushels of potatoes in same kind of soil in which alfalfa was planted. Plants were kept free from weeds, were watered at the time they were set out, but did not seed in 1911.”
10 Plants Semipalatinsk Alfalfa, Sent Spring 1911

Report by H. A. Biddle, St. Lawrence, Hand County, South Dakota.

November 16th, 1912.

"The plants had a good chance by being kept free from weeds and grass. They were watered. The first year, 1911, there was no seed. We watered them several times during the season which was terribly dry and hot. They barely lived and three or four died. They did not blossom during 1911. This year they got no care except keeping the weeds out and they grew to be wonderful plants and were not cut but left to seed but began blossoming during a spell of hot dry weather and did not seed to do any good. Some bugs that looked like the Colorado potato bug seemed to eat the blossoms. In regard to other crops in 1911 everything was a complete failure except potatoes which came on after late rains. This year crops are fair as an average though conditions vary on account of strictly local showers and rains."

10 Plants Semipalatinsk Alfalfa, Sent Spring 1911

Report by Fred R. Posey, Bates, Hand County, S. D.

November 19th, 1912.

"I gave them thorough cultivation. They were not watered when first set out or at any time since. Seeded very little in 1911. In 1912 I cut them off as if for hay except one. This one seeded a very little, the rest none. As a rule alfalfa seeded very poorly this year. My plants from you all lived and branched wonderfully well."

10 Plants Semipalatinsk Alfalfa, Sent Spring 1911

Report by J. A. Batchelder, Ralph, Harding County, S. D.

December 18th, 1912.

"The 10 alfalfa plants were set out May 4th, 1911, ground very dry spaded the ground about 16 inches deep and puddled well when setting. The season was very dry,
yet the plants all lived and made a growth of twelve to sixteen inches. Did not water after setting but kept the ground well stirred by hand hoeing. In the fall a flock of sheep ate them close to the ground, hence, no seed season of 1911. Spring of 1912 I re-set the plants in a sandy loam. Made splendid growth, some stalks four to five feet long, blossomed and seeded freely but as I went away August 15th I did not secure any seed. The past season was dry and cool excepting the first week in July when we had some fine showers.”

10 Plants Semipalatinsk Alfalfa, Sent Spring 1911

Report by Edward Olson, Camp Crook, Harding County, S. D.

November 21st, 1912.

“Plants were kept free from weeds. Did not seed year of 1911 but did in 1912. They grew about 2 feet 6 inches tall. In 1911 there were no crops here of any kind to speak of except what was irrigated. This year, 1912, we had a fine crop. The rabbits ate the plants down the first year so they were not given a chance to bear any seed. The plants were watered a little when first set out but not since.”

10 Plants Semipalatinsk Alfalfa, Sent Spring 1911

Report by Jacobs & Vander Boom, Govert, Harding County, S. D.

November 7th, 1912.

“We set them out on our ranch here and watered them only at the time we set them out giving the plants no water whatever during the entire rest of the season. Last year was very dry here, there being hardly any rainfall whatever and no crops were raised at all. With all the adverse conditions seven of the alfalfa plants lived and attained a height of a little over one foot by the middle of the summer at this time. Although we had the plants protected by woven wire the rabbits managed to get at them and cropped them close to the ground but they
came on again and by fall were several inches high. The ground froze up dry last winter and we gave the plants no protection at all in the way of mulch but all seven of the plants wintered through, and in good shape and did fine this summer, attaining a height of over two feet. This year we have had plenty of rainfall except during the month of June which was pretty dry.”

10 Plants Semipalatinsk Alfalfa, Sent Spring 1911

Report by Edward Northdurft, Harrold, Hughes ty, S. D.

November 9th, 1912.

10 plants Semipalatinsk alfalfa, sent spring of 1911. “The plants we kept clean from weeds and grass. Plants were not watered when first set out or at any time since. Seeded very light in 1911 and in 1912 they flowered freely but did not seed very heavy. The seasons have been very dry here and other crops have been a failure. The alfalfa plants, did real well. They had from 25 to 35 shoots each and grew about 30 inches long. It was tall enough about the 25th day of May to cut for hay. I cut some of it about the 24th of August, 1912. It grew up again about two inches. Some I cut later. It did not start again and some I left without cutting, will leave it that way until spring. I sowed some of the seed last spring none of it grew and I sowed some this fall, it has sprouted some.”

10 Plants Semipalatinsk Alfalfa, Sent Spring 1911


“The plants had an excellent chance by being kept free from weeds and grass and were watered when first set out. They did not seed in 1911. In 1912 one had a few seeds. Two of the plants bloomed in 1911 but I could find no seeds. Plants all bloomed in 1912 but one had a few seeds. I think the cause of not seeding in 1912 was the very rank
growth of the plants. The most thrifty one had 53 strong stems and measured six feet across laying almost flat on the ground."

10 Plants Semipalatinsk Alfalfa, Sent Spring 1911

Report by Chas. C. Haas, Whitewood, Lawrence County, S. D.

December 9th, 1912.

"Reporting on the Semipalatinsk I wish to say that I was so unfortunate as to get but one (1) of the ten plants sent me started owing to the exceptional drought of 1911.

"Upon setting them out all of the plants were watered for a number of days but as the weather continued so dry and hot they did not seem to start as they should have done.

"This single plant made good progress during the year of 1912. I was thankful that it survived the year of 1911 which is about all that I can say for it for that year, but this year it did credit to itself.

"The first crop was clipped June 9th, and stood about two and a half feet high and had a spread of three feet The second crop was making seed August 17th rather indifferently but had made good foliage growth. Stood about three feet high and had a spread of four and a half feet, while the crown measures 18 inches across. Has a great tendency to stool or creep.

"It withstood the dry weather of May and June wonderfully and gives promise of being a good variety for pasture if it will grow in the sod as well as hoped for.

"The foliage is rather thin and spindly, the leaves are narrow but rather plentiful. Did not promise very much in the way of seed this year but the seeding of alfalfa was rather indifferent this year as a whole although indications were that it was going to do better than it had during the first part of the second bloom than during the latter part of this bloom, but the hail storm of the 17th of August destroyed everything.
“I am watching this variety with interest since it gives promise of great things.”

10 Plants Semipalatinsk Alfalfa, Sent Spring 1911

Report by Charles C. Haas, Whitewood, Lawrence County, S. D. December 30th, 1912.

“In reporting on the Semipalatinsk I forgot to note the severity of the winter of 1911-12 during which time the plant withstood a temperature of 44 below zero during a spell in which the thermometer did not rise above 10 below zero for a week, and for three weeks not above zero. Most of this time the plant was not covered with snow. The thermometer was a reliable one and here on the ranch. This is a severe test even tho it was during January, for a yearling seedling to go thru. Last winter we had a week of 10 below with the low mark at 36 during the first part of January, (1912).

“I expect to see the experiment go thru in fine shape this winter and if it prove O. K. it will work a revolution in alfalfa planting. As “Necessity is the Mother of invention”, I have met the occasion, etc., and have invented alfalfa planters galore, and there will be no dearth of machines to transplant alfalfa plants with and within the reach of the pocketbooks of all. One little simple affair, a one-horse affair that will be put on the market around $12 and another that can be sold for about $25, a two-horse machine that works along the lines of the machine you had here and can be adapted to other uses on the farm.”

10 Plants Semipalatinsk Alfalfa, Sent Spring 1911

Report by S. Halvardsgaard, Cavite, Lyman County, S. D.

November 5th, 1912.

“The plants have had a good chance and have been well taken care of but one of them died. I got some seed in 1911 but hardly any. I think some little insect had cut a hole near to the middle. I planted them but they did not
sprout. They did not seed much in 1912. It was so extremely dry through this season that we could not expect any. The remaining nine plants stooled out so they were like one. I planted them about three feet apart.”

*Note*—The insect was probably chalcis; to prevent injury fumigate seed with formaldehyde in tight vessel; this is the experience of Henry L. Jeffries, of Sansarc, S. D. Carbon bisulphide is a standard remedy for bean weevil and other seed-eating insects.

**10 Plants Semipalatinsk Alfalfa Sent Spring 1911**

Report by James J. Terco, Hilmo, Lyman County, S. D.

November 14th, 1912.

“The plants have been given a chance by being kept free from weeds and grass. They never were watered. They seeded the first year a little. Some of them seeded in 1912, about three out of the lot. It did better than any alfalfa that I have. Small grain was a total failure in this district. Our rainfall was very little.”

**10 Plants Semipalatinsk Alfalfa, Sent Spring 1911**

Report by Fred Meidinger, Long Lake, McPherson County, S. D.

November 16th, 1912.

“The plants have always been taken good care of except this fall I let the weeds grow up a little as I was too busy with other farm work. I made a thick mud with water and earth and dipped the roots into it and after planting I watered them using about three gallons to each plant, after about a month I watered three or four plants once more and since then no more. I got about a teaspoonful of seed from three plants and the rest did not seed and those that seeded were those that I watered. They were in blossom all summer but did not seed until late in the fall so did not get ripe and if some did I did not gather it. Considering the dry season we had in 1911 the alfalfa did better than anything I ever saw. It grew about
two feet high the first year and I often wish I had ten acres instead of ten plants. In 1912 it was green before the snow was all gone, and by July it was three feet high and great big bushes, some of them four feet across. You want to know how the seasons were with me. Well, for 1911 I can say that we have not had as dry a season for a long time. Most of the grain was very poor. I only got five bushels of wheat to the acre and some of it was not worth anything. 1912 was better. We had all the rain we needed in the spring, but from June on it was very dry. Our nicest grain on the fall plowed land did not return the seed. Spring plowed and last year's breaking was good and went as high as fifteen bushels to the acre. Next year I intend to cut at least part of the plants as soon as they start to bloom just to see how many cuttings could be made in one season. I am pretty sure that two cuttings can be made.

10 Plants Semipalatinsk Alfalfa, Sent Spring 1911


"The plants have had a good chance by being kept free from weeds and grass. They were watered a little when first set out. They did not seed the first year in 1911 nor did they seed in 1912. The first season the plants did not impress me very favorably. They were not a good color and looked as if they were not at home in my deep, rich soil. I did not mulch the alfalfa. But in the spring of 1912 before the frost was even out of the ground they began to grow even before the pieplant started and on June the first there were branches 44 inches long and spread out on the ground, all but one plant that grew erect and did not have as large a growth. We had a hail storm on July 5th and that cut them badly but they came on again and bloomed very full but I could not see any seed and I rooted some from the cuttings in May. I am very much elated over this alfalfa and have sent sample of it to many whom I knew would be interested. One
plant set near where some bushes and rubbish had been burned did far the best thus showing that it would do fine on burned over land like in Minnesota. I only regret that we cannot have more and sooner. The very sight of a green plant so early in the spring so long before the other grass does one good. And what wouldn't a good patch be worth to brood sows and pigs so early when bran and shorts are $35 a ton like they were this spring and hay could not be had at any price. In regard to the other crops the hail did a great amount of damage. The 169 and Velvet Chaff wheats did the best. Corn was nearly all injured by early frost except some corn mostly of D. November 9th, 1912.

10 Plants Semipalatinsk Alfalfa, Sent Spring 1911

Report by M. J. Staven, Britton, Marshall County, S. D.

"The plants have had a good chance by being kept free from weeds and grass. They were watered when first set out but not later. The plants seed the first year but did not hold the seed very long. They seeded in 1912 also and there was an abundance of seed, but shelled as soon as they were ripe. The first year, 1911, was very dry but the plants grew in spite of it. This year we had plenty of moisture and they did fine. I think this kind of alfalfa would make splendid pasture. It started very early in the spring and had grown two or three inches tall by the time the native grasses had started. Last winter the ground where the plants were was covered with deep snow all winter. The ten plants you sent me are all living. This year they grew to a height of about three feet."

10 Plants Semipalatinsk Alfalfa, Sent Spring 1911

Report by H. A. Michel, Red Owl, Meade County, S. D.

November 19th, 1912.

"The plants came up in fine condition and I planted them as best I could and I watered them several times
each week. They were eaten down three times by the Fourth of July by rabbits and were almost in bloom each time. Although it did not rain from the time I planted them until September everything was dried up except my plants and the rabbits would come a great distance to get a good feed on this imported alfalfa. After the Fourth of July I fenced the plants in and they did very good but didn’t bloom or go to seed. Three died. This year several more died but four are living fine and never bloomed for the weeds were a little too much for them. This year we had a very dry spell in June until the first of July. After that we had plenty of rain and all the crops did fine. The potato crop was very big and everybody got from 100 to 400 bushels per acre. Corn was also a good crop. Common alfalfa that is irrigated surely does fine but otherwise is no good, but I think we could get a fair sized patch of Semipalatinsk alfalfa. It is the only drought resistant for this country.

10 Plants Semipalatinsk Alfalfa, Sent Spring 1911

Report by Jens Peterson, Faith, Meade County, S. D. November 16th, 1912.

"The plants had a good chance by being kept free from weeds and grass. I watered them a few times when I first set them out. They did not seed any the first year, 1911. Range cattle broke in and ate them off and killed six. The plants did not seed in 1912 either. A stray cow got them when they were in bloom and since the rabbits have kept them well clipped. In 1911 when I was harvesting, range cattle pulled six of the plants. One of those however lived until spring of 1912 and then died. The four that are still living seem quite hardy. During the winter they were covered with snow until quite late in the spring. We had no rain during the season of 1911 and there was not moisture enough in the ground to start corn. We had some snow the winter of 1911 and 1912 a dry, late spring. We had just enough rain in 1912 to keep the crops from dying. Flax yielded from one-half to four bushels to the
I acre. Small grain was almost a total failure. Some fields of corn had nothing but stalks. Mine is yielding from five to fifteen bushels to the acre. Potatoes were fair, about 75 bushels to the acre.”

10 Plants Semipalatinsk Alfalfa, Sent Spring 1911


Ten Semipalatinsk alfalfa, sent 1911. “To begin with the plants were watered when set out but not since. 1911 was exceedingly dry, did not cut plants back. Gathered about a pint of seed unshelled. This year, 1912, started in fine shape, cut back once, did not seed at all. This spring when I cut the alfalfa they had stooped to nearly 100 stalks to the hill. At least three or four of the hills were cultivated good last year not much this year. The plants were set out in a little draw of newly spaded ground in an old buck brush patch. Snow stood on them last winter to a depth of about three feet. This spring they were under solid ice for quite a while, no water stands on the plants as there is a good drain. I sowed the seed this spring in the edge of a patch that was sowed to the purple alfalfa but as the yellow alfalfa did not blossom don’t know how it did grow. Last year there was practically nothing raised in this part of the country. This has been a fairly good year.”

10 Plants Semipalatinsk Alfalfa, Sent Spring 1911

Report by Myron Burns, Carthage, Miner County, S. D. November 7th, 1912.

“I have kept the plants free from weeds and grass. I watered them when set out and about once a month during 1911 as it was awfully dry here. The plants did not seed any the first year, 1911, but were just loaded in 1912. The plants were about as big as a bushel basket.”
10 Plants Semipalatinsk Alfalfa, Sent Spring 1911

Report by J. Wayland Allen, Farmingdale, Pennington County, S. D. November 16th, 1912.

10 plants of Semipalatinsk alfalfa, sent spring of 1911. "Kept free from weeds. Were watered when first set out and some afterwards. Grew some two feet high, quite stalky. Spread out like a shrub, nearly two feet across from one side to the other. Blossomed full but no seeds or very few. Only one lived. Have kept one from weeds. Rabbits ate off the plant in 1911."

13 Plants Semipalatinsk Alfalfa, Sent Spring 1911

Report by Elbert Lee, Scenic, Pennington County, S. D. November 29th, 1912.

"I set them in rich garden soil near a slough on land that had been plowed for three years and was thoroughly rotted. I dug holes 18 or 20 inches deep and put a pail of water in each after filling with loose dirt. In these I set the plants and they have had no water except rains since. Ten of them grew well in 1911 and would have produced quite a little seed had not the rabbits eaten off most of the blossoms. The season of 1911 was very dry and very little grew but I had ordinary purple alfalfa only a few rods away, but the rabbits preferred the Semipalatinsk. This season the tops of three of the plants were as large as a bushel basket. The others were more reclining and did not get very large. We saved probably two cupsful of seed and we did not get near all of it. There has never been a weed near the plants and their chance has been the best. I am very well satisfied that they will do well here. We are on a table 300 feet above the Cheyenne river on rich dark loam about 30 inches deep. As the bottom of the soil is a sort of hard pan through which water passes. Below this is 42 feet of light sand in the bottom of which is our water supply of nice soft water. I intend to sow what seed I have on bottom land where I can irrigate by the dry draw principle in drills 3 feet 8 inches apart. I
sowed some purple alfalfa by the above method this year and it did finely. It was 12 or 14 inches high when I cut it in September. It was kept perfectly clean all summer. I believe the plants have roots enough to care for themselves. I shall cultivate during 1913. There are 9 or 10 of the Semipalatinsk alfalfa plants alive but only three are of value as hay plants. The others may be of value as forage.

10 Plants Semipalatinsk Alfalfa, Sent Spring 1911


"Plants were kept free from weeds. They did well and all lived over winter except one which was in poor shape when set out and our rainfall was less than two inches until August 1st, 1911. This year (1912) I clipped them June 5th and some branches measured over two feet long. Plants were watered when first set out and once after that. The season this year has been quite fair. Crops made about two-thirds yield. Had plenty moisture except during June which was dry and hot."

10 Plants Semipalatinsk Alfalfa, Sent Spring 1911


"Plants were kept free from weeds and grass. Were not watered when first set out or at any time since. Did not seed in 1911, but made a fine growth. Did not seed but a very little in 1912, but made an immense growth. They had from 15 to 30 stalks. I weighed the growth of one root when green and it weighed four and one-half pounds."

10 Plants Semipalatinsk Alfalfa, Sent Spring 1911


10 Semipalatinsk alfalfa, sent 1911. "Kept free from
weeds and cultivated frequently. Plants were not watered when first set out or at any time since. Did not seed in either 1911 or 1912. Plants made good growth first year but made no seed. I did not cut them.

This year, 1912, I cut first crop when first blooms appeared. Made very heavy crop. Some plants over four feet high. Some stood up well, some spread or sprawled out. Second growth 12 to 18 inches but no seed. Both seasons very dry, wheat made one and one-half bushels in 1911; 11 bushels in 1912.”

10 Plants Semipalatinsk Alfalfa, Sent Spring 1911


“The plants had a good chance by being kept free from weeds and grass. I watered them. The plants seeded the first year. They also seeded in 1912. We got about 1500 seed the first year, 1911, and we planted them this year, 1912, but the seed did not come up good so we got only a few plants and we got a few seeds this year, but the plants grew and did well. They grew about three feet high and bloomed well but we did not get many seeds. I believe that this alfalfa will be a great plant where planted on dry soil. It seems to stand the dry weather good for it did better last year than this, we had a lot of rain this year. As for the year of 1911, we didn’t raise very much for it was very dry out here, but this year we have had lots of rain and we have had a large crop of everything. Corn, potatoes, beets, cabbage and in fact everything did splendidly.”

10 Plants Semipalatinsk Alfalfa, Sent Spring 1911

Report by W. M. Gilchrist, Weta, Stanley County, S. D. November 15, 1912.

“The plants had a good chance by being kept free from weeds and grass. They were watered when set out. They did not seed the first year, 1911, but did in 1912.
The season of 1911 was very dry. All the plants lived but made small growth. There was no seed. Other crops were almost an entire failure. In 1912 the plants made a good growth and I have gathered a nice bunch of seed. One of the low down spreading plants measured seven feet across. Small grain this year was about one-fourth of a crop, corn a little better, hay short. I expect to plant all the seed from these plants next spring.”

10 Plants Semipalatinsk Alfalfa, Sent Spring 1911

Report by Lillie Oldaker, Phillip, Stanley County, S. D. December 24, 1912.

“I planted them in good garden soil, a deep plowed sandy loam. Five of them lived but the rabbits kept them cut off the first year. Fenced them with chicken wire this year and they grew splendidly. Tried to save all the seed but have not shelled it yet. The cut-worms kept all vegetation cut until late in season of 1912. I kept the ground fine on the surface. The season of 1911 was dry, we raised no crops except potatoes. 1912, hard beating rains in spring that made the fields like bricks. A light rain July 4th and a flood about September 1st, no rains since, a few fields of corn raised and potatoes good.”

10 Plants Semipalatinsk Alfalfa, Sent Spring 1911


“The plants had a good chance by being kept free from weeds and grass. They were watered when first set out but not since. They did not seed any the first year as I cut them down. In 1912 they seeded 70,000 seed from nine plants. There has been no crops raised in the vicinity since I set plants out in 1911, not even fodder or oat hay. In 1912 the corn fodder was very light but there was no grain of any kind. The past two years has been the driest in this vicinity of any two in succession in twenty-two years to my personal knowledge. Some plants would
have made a good feed for a cow in July, 1912, on less than four inches of rainfall. Early in the season I dug cut worms from around the plants, having taken twenty-five from a single plant in a day. The worms damaged the plants considerably. These plants have been directly the cause of keeping several people from moving away this year. I have given several people seed to start with. They have also put new life in old ranchmen, there being no native hay raised close by for several years. The stock eat it very readily. Even the largest branches after being ripened on the root so no green tint was visible very late in the fall. Four or five thousand plants being sufficient for an acre here it will not take long to get several hundred acres from a few plants. 70,000 plants would be sufficient for fourteen acres, and one acre seeding at the rate these did would transplant 7,000 acres if it all grew well. We in the semi-arid belt in western South Dakota have great faith in the ultimate outcome of the yellow-flowered varieties brought from Siberia by you regardless of the opinion of a few unpractical men who have to write for a living instead of being fitted to raise and put to use a forage crop.”

10 Plants Semipalatinsk Alfalfa, Sent Spring 1911

Report by Mrs. Vern Soper, Rosseau, Stanley County, S. D. November 11th, 1912.

“The plants have had a good chance by being kept free from weeds. They were watered when set out but not since. Two died at first. They did not seed any the first year in 1911, but they did seed in 1912. A horse ate off all but one after they had blossomed. The one that was not eaten off was not the most thrifty one, but 286 seeds were gathered from it. The past two seasons have been very unfavorable for other crops. These plants came through the winters fine, also resisted the drought of the past two summers in good shape. None of the runners on the plants exceeded two feet. Most of them were about one foot long.
10 Plants Semipalatinsk Alfalfa, Sent Spring 1911


"Plants were kept free from weeds and were watered when first set out and during year of 1911 but not in 1912. They did not seed in 1911 or 1912. I lost four plants by a worm resembling the wire worm. That left me six plants. I watered them during the summer of 1911 and they grew very large but did not bloom. Last spring the 30th of May, I cut three of the plants, they were about 18 inches high, and just beginning to bloom. They grew up again about 15 inches and had just began to bloom when the frost came. The other three plants I let grow all season. They bloomed very profusely but made no seed at all, not even one pod. I cut those three just before frost and the largest stem at ground measured fully one-half inch in diameter and spread 30 inches across at about 15 inches above ground and were at least 30 inches high at center of plant. I did not water at all this season.

10 Plants Semipalatinsk Alfalfa, Sent Spring 1911

Report by Wm. Floyd, Okoboji, Sully County, S. D. December 11th, 1912.

"In reply to yours of October 30th regarding the 10 plants Semipalatinsk alfalfa will say, the year of 1911 was very dry. I set them out near my house where I could see them every day. I watered them only when they actually needed it to keep them alive. I kept the weeds out and raked the ground over once or twice a week. As a result, the first year they grew about 10 inches but did not bloom. The year 1912 I treated them the same way with the result that they grew to twenty inches or two feet in height and spread out thick. They blossomed and seemed to stay in blossom until frost and did not have any seed. Both years have been very dry in western Sully county. No crops either year."
10 Plants Semipalatinsk Alfalfa, Sent Spring 1911


"kept free from weeds and grass. Were watered when first set out and a few times afterwards. Plants did not seed any the first year 1911, but they did in 1912. In 1911 we did not raise anything except a little garden truck. In 1912 we raised a half crop. The alfalfa plants all grew in 1911 but only four lived through the winter. They did fine this year and yielded a lot of seed. I set them out in new land, plowed about 10 inches deep."

10 Plants Semipalatinsk Alfalfa, Sent Spring 1911


"The plants have had a good chance by being kept free from weeds and grass. They were watered when first set out, but not since then. There were no seed in 1911 and only a very little in 1912. The past year plants made a good growth and some of the stems measure about six feet."

10 Plants Semipalatinsk Alfalfa, Sent Spring 1911


"The plants had a good chance the season of 1911 by being kept free from weeds and grass. I watered them. Most of them seeded the first year, 1911. I do not know if they seeded in 1912 or not. The plants did fine last year and nearly all seeded with very little watering. Small grain burnt out in June. I leased the place last winter and have been away since early spring and understand small grain dried up again in June but have not heard how the alfalfa came out, but I will gladly make report as soon as I find out. Many thanks for the plants as I was much interested."
COMBINED REPORTS ON SEVERAL VARIETIES

Plants of the following four varieties of Medicago falcata have been sent out for trial. My present opinion is that the Omsk and Obb Siberia should go further north. The Samara is quite erect and blossoms several weeks earlier than the Semipalatinsk. The Orenburg plants were sent out in the spring of 1912 only. The following descriptions are for convenient reference.

ORENBURG ALFALFA

This is my No. 261 of my third tour to Siberia, 1908. This is Medicago falcata, grown from seed gathered for me from plants growing wild in the dry steppe region at Orenburg, Orenburg province, on the extreme eastern border of European Russia. Summer heat of 98 degrees above, and winter cold at 33 degrees below zero Fahrenheit, are not uncommon. The annual rainfall at Orenburg is a little less than 16 inches; in this region the yield of hay from this wild yellow-flowered alfalfa is reported at 300 Russian "pood" per dessiatine, which equals two tons per acre, and the yield of seed 26 pood per dessiatine, or 348 pounds per acre.

We find there is a small proportion of blue-flowered plants in this lot, both the blue and yellow-flowered alfalfas being found in this region, but they can easily be separated; the blue-flowered would then naturally be of the Turkestan alfalfa group.

SAMARA ALFALFA

This is my No. 201 of the 1906 trip (S. P. I. 20721); of tall erect growth with beautiful yellow flowers M. falcata. From the dry steppes of Samara province in the Volga river region of eastern Russia. This may range further south than the Omsk and Obb Siberia strains, but should be found drought-resistant and sufficiently hardy for South Dakota.
Omsk 1908 Siberia Alfalfa

This was grown from seed gathered from wild plants near Omsk, Akmolinsk province, western Siberia (S. P. I. 24453) in my 1908 trip to Siberia, hence is really the same as my No. 199 of my 1906 trip (S. P. I. 20719) Medicago falcata, gathered in the same place. The plants hold their own perfectly with other native plants in the compact prairie or steppe sod. Omsk is in latitude fifty-five degrees. A plant of vigorous habit with bright yellow flowers. The plant varies somewhat in erectness of habit so that there is room for improvement by selection.

Obb Siberia Alfalfa

This is Medicago falcata gathered in my 1908 trip (S. P. I. 24452) on the open steppes near Obb on the Obb or Obi river of the Tomsk province, central Siberia. In hardiness and general characteristics it is much like the Omsk Siberia strain.

Select Turkestan Alfalfa

This is Medicago sativa Turkestanica, No. 191 of my 1906 trip (S. P. I. 20711), originally developed from seed of a single plant found at Tashkend, the capital of Russian Turkestan. This plant is remarkable for its erect and vigorous growth. At Moscow it was found very hardy and productive, a beautiful plant, where the French lucern, by which is meant the ordinary cultivated alfalfa of southern Europe winter-killed. This variety will be appreciated wherever the Turkestan alfalfa is found fully hardy.

50 Plants Omsk and 25 Cherno Alfalfa Sent Spring 1911

Report by E. I. Underwood, Willow Lake, Clark County, S.D., November 13th, 1912.

Omsk and Cherno alfalfa, sent 1911. "Plants were well cultivated and hoed and watered at the time they
were set out but not since. Seeded some in 1911 but not very heavy as the gray blister bettles kept the plants eaten down. As soon as received I set plants 4 feet apart each way. Five of the Omsk died and also three of the Cherno. The season was extremely dry but cultivation kept them growing. They would have done fine had the beetles let them alone. In the fall I cut the stems off with the seeds leaving the plants bare of protection all winter. As the snow did not drift around them and the winter very cold the test was very severe, but there are today 17 Cherno and 43 Omsk. Last spring's seeding of the Cherno made a good stand, sowed in drills but I could never find any Omsk started. There seems to be such a difference in the Omsk in leaf and the way it spreads out.

**75 Plants Cherno and 50 Plants Orenburg Alfalfa, Sent Spring 1911**

Report by Charles Uckert, Clear Lake, Deuel County, S. D., December 7th, 1912.

"The plants have had a good chance by being kept free from weeds and grass. They were watered. They did not seed the first year and very little the second. My alfalfa plants I got in 1911 are all living but on account of drouth in 1911 I didn't get any seed and the plants I got in 1912 are all living and doing well but had no seed. The first crop I cut June 20th. It was about 18 inches high. Maybe I made a mistake. The second crop was about 15 inches long. It blossomed all right but had no seed. Toward the last it dried up. My other crops were good in 1912. The wheat average was 20 bu. per acre, barley 30 bu. per acre, oats 85 bu. per acre, flax 12 bu. per acre, the corn was fair. Number of acres of land 840."

Note—Transplanted plants should not ordinarily be cut the first season as the roots have not had a chance to get established. With new varieties they may be permitted to seed the first year. But further experience may demonstrate it is better not to let them seed the first year but to clip the tops just sufficient to prevent seeding. This
will permit the roots to become better established and prepare for a heavy crop the second year. It will be remembered that strawberry growers act on this general principle and prefer to remove the blossoms the first year as far as practicable.

10 Plants Semipalatinsk and 10 Plants Cherno Alfalfa, Sent Spring 1911

Report by Rudolph Jager, Timber Lake, Dewey County, S. D., November 5th, 1912.

"The plants which you sent me were cultivated frequently. I set them out in watered soil and dry weather last year compelled me to water them once or twice after. The first year they seeded slightly on most of the sprouts. In 1912 from the Cherno Alfalfa I gathered about one pint of seed and from the Semipalatinsk about two tablespoonfuls seed. I will sow this seed next spring in rows far enough apart to cultivate as I believe I can raise enough seed this way to supply all my present needs."

100 Seeds Obb and 100 Seeds Cossack Alfalfa, Sent Spring 1912

Report by H. G. Conger, Harding, Harding County, December 30, 1912.

"In regard to the alfalfa seed sent me in the spring of 1912 I have 114 of the Cossack plants 2x4 feet. The most of them grew with vigor. Several put out branches between three and four feet in length. The only trouble I see is that it has a tendency to lay down, but perhaps that will be overcome in another year. I gathered a little over two ounces of seed from same. Two or three of the plants became pale and weakly during the latter part of the season. Of the yellow pasture alfalfa I have fifty-two plants. They all grew well but nothing like the Cossack. Am anxious to see what the winter does to them."
10 Plants Cherno, 10 Semipalatinsk Alfalfa, Sent Spring 1911

Report by Hon. J. H. Mettler, Menno, Hutchinson County, South Dakota, November 14th, 1912:

Cherno and Semipalatinsk, sent 1911. "Kept free from weeds, watered only when set out. Good crop 1912, grew 4 ft."

10 Plants Omsk and 10 Plants Semipalatinsk Alfalfa
Sent Spring of 1911

Report by John Wolzmuth, Spearfish, Lawrence County, S. D., November 4th, 1912:

"The plants have had a good chance by being kept free from weeds and grass. They were watered. They seeded in 1911 but not in 1912. The seed from 1911 crops was planted in 1912 distant from any other alfalfa but the flowers were principally blue this year although the flowers on plants sent were yellow. I attribute it to the work of bees. No alfalfa seeded this year in this section."

Note.—This indicates that the Siberian alfalfas cross freely with the common alfalfa.

50 Plants Cherno, 50 Plants Omsk and 50 Plants Samara Alfalfas, Sent Spring of 1910

Report by Messrs. Hubert & Fisher F. Dillard, Lovell, Meade County, S. D., December 7th, 1912:

"The plants have been kept perfectly clean and were set two feet by four feet and hoed frequently. They were watered when first set out and occasionally afterwards until the first of July. Yes, I have over a half a bushel of pods, leaves and small stems just as I stripped it from the plants, that is of the Cherno and Orenburg did much better. We had practically no rain here until the 3rd of July, none at all since very early in the spring but on the 3rd and 4th of July both patches were under water for
two or three hours each day after which they took a new
growth and covered the ground before fall until hoeing was
a thing of the past for 1912 for lack of bare ground to hoe.
The Cherno are about the largest alfalfa plants I ever saw,
some reaching 2 1-2 feet each way from the hill and as
high."

SO Plants each of Obb, Samara and Cherno Alfalfa
Sent Spring 1910

Report by Martin A. Haines, Sturgis, Meade County,
S. D., November 26th, 1912:

"The plants have had a good chance by being kept
free from weeds and grass the first year. They were
never watered. The yellow plants seeded the first year.
In 1912 they did not seed. They laid in Sturgis six weeks
before I got them. They all leafed out well. I mulched
them. There was not a green leaf here when they came
up. The rabbits dug down and ate them off below the
crown. Four of them lived but have not done well. The
plants were all dead when I saw them except thirty-four
yellow blossomed plants and a yellow and purple plant.
The seasons have been the driest I have ever seen. I be­
lieve that the yellow blossomed plant is a winner in this
district."

150 Plants Orenburg, 50 Plants Cherno Alfalfa
Sent Spring 1912

Report by L. A. Coates, New Underwood, Pennington
County, S. D., now at Harlem, Mont., but to return to
New Underwood.

Dec. 10th, 1912.

"Yours of Oct. 1st found me away from home, hence
the delay in answering. I received the alfalfa plants of
Cherno and Orenburg varieties and through neglect of ex­
agent to notify me, they were at the local office ten days and
I was doubtful as to their condition but set them out at
once, the soil being in good condition, and in very short
time all had started and very soon after commenced cultivating and continued to through the season until the last of August. The season being very dry in my locality, old established fields produced nothing, and the season of 1911 was a total failure in all crops as well as the native wild grass, all hay and grain being shipped in. The spring of 1912 started very encouraging with good stands of small grain, but the months of May and June were deficient in rainfall and the abnormal rains of July came too late to do much good to the small grain. Corn that was well cared for made a fair yield, hail storms doing considerable damage all through the summer months, no hay put up except in valleys and irrigated lands.

"Of the Cossack seed I planted 50 plants, result, the rabbits ate them back and gave them no chance.

"I cultivated the plants thoroughly and kept them free from weeds and grass. I never watered them, and every one is alive and made a wonderful growth. I set the Cherno four feet in a row and now some of the plants overlap. They seeded in 1912 very heavily and there was a great difference in individual plants. The Cherno, notwithstanding the dry year, made an unexpected growth when old established fields of common alfalfa, (Medicago sativa) were practically a failure. Orenburg received the same care but did not grow or seed as heavily as the Cherno."

**10 Plants Orenburg and 10 Cherno Alfalfa, Sent Spring 1912**

Report by J. M. Walters, Gettysburg, Potter County, S. D., December 18th, 1912:

Plants have had a good chance by being kept free from weeds and grass. They were not watered when first set out or at any time since. I got about an ounce of seed from two plants of the Cherno, the rest all blossomed out but owing to a black beetle they did not seed."
50 Plants Semipalatinsk, 15 Plants Cherno Alfalfa, Sent Spring 1912

Report by M. J. De Wolf, Letcher, Sanborn County, S. D., December 14th, 1912:

“They have not set any seed to speak of, and less this year than last. The hay yield this season has just been immense, stalks 3 1-2 to 4 feet high and quite erect.

“The plants received in 1912 had a good chance by being kept free from weeds and grass, were hoed and cultivated the same as my garden. Were not watered when first set out or at any time afterwards. Plants seeded the first year of 1912 and I secured quite a little seed which has not yet been threshed out. I tied it in bundles and stored it for winter threshing.”

75 Plants Omsk and 75 Cherno Alfalfa, Sent Spring 1911

Report by John A. Frohman, Cottonwood, Stanley County, S. D., Nov. 9th, 1912:

“The plants did not have a good chance by being kept free from weeds and grass. They were never watered. I do not remember of any seed in 1911 but there was some in 1912. The 1911 crop was a complete failure of everything in this immediate neighborhood except alfalfa. The Cherno seeded heavily because it was thoroughly cultivated. I let the Omsk take care of itself after planting as I wanted to see if it could hold its own with the native grasses and weeds. I repeated the experiment this year. Evidently it would have seeded but the rabbits ate it off in preference to the native grasses. I have had the same trouble with the Cherno. Rabbits seem to prefer the Cherno to the Dry land alfalfa which was growing near it. The fiber in the Cherno is less woody than in the Dry land alfalfa. Where the crops were properly put in in 1912 they were from fair to good. The Omsk will evidently do as well if not better than the native grasses for pasture. I found to my loss that all alfalfa plants that did not have the crown even with or below the surface died.”
10 Plants Omsk and 10 Plants Cherno Alfalfa,
Sent Spring of 1911

Report by Louis J. Gusler, Winner, Tripp County, S. D., November 11th, 1912:

"The plants have had a good chance by being kept free from weeds and grass. They were not watered when first set out or at any time since. They seeded the first year in 1911 and they also seeded in 1912. They are cultivated in garden row and are very profuse in flower, especially the Omsk one plant of which has a sprawling growth and lies flat to the ground. The Cherno is very rank. 1911 was extremely dry in early part of season but later there was plenty of rain. The small grain all dried up but the corn was good. In 1912 we had plenty of rain the entire season and all the crops were good."

30 Plants Semipalatinsk Alfalfa and 10 Cherno,
Sent Spring of 1911.

Report by George W. Ryan, Java, Walworth County, S. D., November 24th, 1912:

"The plants have had a good chance by being kept free from weeds and grass. They have not been watered at all. Most of the ten plants had seed the first year, 1911. There was no seed in 1912. I cut the alfalfa off three times in 1912. Cutting prevented seeding. I could have cut it four or five times. I set out the alfalfa plants in the garden at Java. All lived except a few which the hens scratched out. I did not water them. The winter killed a few plants. I thought perhaps they died because I did not cut them. They grew vigorously. This year I cut them. The largest stalks were about two feet in length when I cut them this year. I did not give these plants the attention I hope to next year. 1911 and 1912 were both very dry years here. Drought did not seem to injure these alfalfa plants."
100 Plants Omsk and 100 Plants Semipalatinsk Alfalfa, 
Sent Spring of 1911

Report by Anaconda Copper Mining Co., Warehouse, 
Anaconda, Deer Lodge County, Montana, Nov. 29, 1912:

"I cultivated the plants twice each year to keep them 
clean. They were watered. They did not seed either year, 
1911 or 1912. I lost only one plant. We had good rain­
fall this year. The plants grew as high as four feet, fine 
stemmed and very full leaf. They bloomed wonderfully, 
most beautiful but no seed. The season was rather cold. 
It far excels our blue variety as a forage, but I cannot 
get any seed. Please tell me what to do. . .Our elevation is 
5,450 feet.

Note:—1912 was a poor seed year over a wide area, 
owing chiefly it appears, first to blister beetles, and later to 
late rains in blossoming time.

50 Plants Orenburg Alfalfa, and 100 Seeds Cossack, 
Sent Spring 1912

Report by M. Markley, Kimball, Nebraska, December 28, 1912.

"Plants have been given a good chance by being kept 
free from weeds or grass. Were watered with a hand 
sprinkler every day or two for about the first month dur­
ing which time it was quite dry. The plants seeded in 
1912—got about 1-8 pint of seed of Orenburg.

"I planted Orenburg plants and seeds of Cossack about 
middle of May, 1912. Out of the whole I planted three 
rows, one row of Orenburg with plants about 2 1-2 feet 
apart in the row, then two rows of Cossack seed mostly 9 
inches apart in the row, the rows three feet apart—first 
the row of Orenburg and then the two rows too close to­
gether. They should have been 3 1-2 or 4 feet apart. Also 
I realize now that by planting the two varieties so closely 
together that they will probably mix some, but I believe 
this will be of mutual advantage to each variety for my 
own use for this location, though I could not warrant the
seed to be perfectly pure to others. Of Orenburg variety I got 53 plants to grow. Of the Cossack seed I had started about 150 plants but three nasty little hail storms cut that number down to about 130 plants. Both varieties grew fine, the Orenburg variety, however, too recumbent to mow in the field with a mowing machine. Will it improve in this feature next year? If not in the row would this feature disappear sowed for hay or pasture in the field? This is one of the features of Orenburg which worries me. Cossack grew upright in fine form. Season was unusually wet, cool, and backward for this locality after the middle of June, so it will be difficult to get good seed corn, but the general average of crops will probably be better than ever before known. Orenburg variety flowered profusely but seeded badly, but what few seed pods were formed hung on quite well to the close of the season though I could notice it had more tendency to shell than Cossack. However, most of the blossoms of Orenburg blasted and fell off. Curiously enough there were two plants of Orenburg which seeded quite heavily and the flowers did not drop off. These I suspect are cross-bred with some other variety, as the pods were somewhat different in shape, having about this form. Believing it better to allow these seeds to remain with the rest so as to improve the seeding quality of the whole I gathered all Orenburg together. I got in all about 1/8 of a pint of Orenburg seed. I have an opinion that the blasting of nearly all the Orenburg blossoms was due to too much wet weather. If all the blossoms had seeded it would have been a great crop.

"What surprised me was to find towards the close of the season that Cossack was going to seed heavily. Had the season not been so backward, wet and cold, and had the frost held off a few weeks longer the crop from Cossack, the seed of which was planted after the middle of May, 1912, would have been immense indeed. As it was I got about 7-8 of a pint of seed from it, which I think was excellent for first year. I might have helped Cossack seed
better had I left it stand longer for later I found that from 18 to 20 above zero did not hurt it at all. Another fine thing about Cossack is that after I cut the seed it started to grow again, and kept nice and green until we had zero weather. Orenburg did not start much again this fall after being cut for seed. I am wondering whether Cossack has proved a success anywhere at this elevation; nearly 5000 feet. Could you tell me? I want to transfer all this seed eastward about 75 miles where the elevation is about 3800 feet. Do you think Cossack would be successful there with a rainfall of about 16 inches?"

**10 Plants Cossack, 10 Chemo, 50 Semipalatinsk Alfalfa, Sent Spring 1911**

Report by Supt. Angus Mackay, Experimental Farm, Indian Head, Sask., Canada. December 17th, 1912.

"The plants were cultivated and no weeds allowed to grow in them. They were not watered when first set out or at any time since. They did not seed any in 1911, but did in 1912. The plants were received in good order and planted with other test plots of alfalfa and red and alsike clovers. They made a good growth the first year, and this year attained a very strong growth. Medicago falcata was very heavy. All sorts were struck with rust and very little seed formed. The season was not favorable for alfalfa, but good for grain, roots and other farm produce the past year. During 1911 we had good crops of alfalfa but what was left for seed was badly rusted and not threshed. Grain was frozen all over the Province. Heavy rains late in both years was favorable for the second cutting of alfalfa, but the first growth when left for seed was cause of rust.

**200 Plants Semipalatinsk Alfalfa, 200 Omsk 1908 Siberia Alfalfa, Sent Spring 1911**

Report by F. Maclure Sclanders, Saskatoon City, Saskatchewan, Canada, January 1st, 1913:

"You may remember that I purchased a number of
one-year-old Siberian Alfalfa plants from you last spring, and it may interest you to know that, notwithstanding the exceedingly unusual and entirely unfavorable weather conditions under which we labored, the results have been most encouraging. In every case plants showed quite a remarkable growth; although owing to the wet cold weather seed was not ripened in many instances. Nevertheless, I have now seen enough of your alfalfas to recognize them as a veritable God-send to this country, and in my opinion they constitute a discovery in a class by itself.”

F. Maclure Scianders, Saskatoon City, Sask., Canada, writes under date of February 2nd, 1912:

“I sincerely hope that you may have lots of Siberian Alfalfa plants or seeds available for me this spring, and I shall be glad to hear how you are situated. You will be pleased to learn that the plants of pasture varieties secured from you in the spring of 1911 have all done exceedingly well, although in quite a number of cases the seed did not mature owing to very unpromising weather conditions. Nevertheless, the fact remains, that this Siberian Alfalfa has successfully withstood several very heavy cold snaps when the snowfall was too slight to afford it any material protection; in fact, I feel that our experience has fully justified your claims; and with your permission and co-operation we intend to continue our efforts.”


Report by Otto Kankel, Fertile, Polk County, Minn. December 5th, 1912.

“About two years ago I got some plants from Prof. N. E. Hansen, six different kinds, and planted them; they grew about six feet tall, the blue and yellow variegated flowers straight up. After exhibiting at the Fertile Fair I sent it to Minneapolis fair in 1912. I sent some to Minneapolis fair this year early July, 1912. It was six feet up at that time. It seeded the first year and I took the seed and
distributed amongst the farmers. It seeded well this year. Seeded from last year, and in the spring it was nine inches early in July. The second growth came on after going nine inches and that is two feet high now after the snow came. Fine seed crop this year on the old plants. This spring planting also seeded quite a few seeds. The pure yellow flowers had finer leaves and better for hay. They were pretty close to four feet, and they make better hay on account of finer leaves and not so hard a stem. They seeded well the first year, most of which were distributed amongst the neighbors. A fine crop of seed this year, better than 1911. The farmers have got both kinds and said it was the finest they had ever had and all came back for more seed because it grew so nicely. Didn’t cover them at all last year and gave no protection whatever and they proved perfectly hardy. Wind was broken somewhat by the pine trees but the farmers have planted the seed in the open prairie and they did just as well. The farmers are coming from some distance for this seed. It was dry last year and it rained last fall. Dry summer 1911. This year it was dry also, but rains came too late both years to help. It has proved resistant to drought.

HANDLING SMALL LOTS OF ALFALFA SEED

Frequent inquiries are received as to the best methods of handling small lots of seed of these various hardy alfalfas. In a small way the seed may be rubbed out by hand or against a sieve and the seed cleaned by letting it fall on a sheet spread out where there is a current of air, not too strong, out doors. Two rubbing boards with several parallel grooves made with a chisel have also been found satisfactory. Two correspondents report success by running the seed through an old coffee mill. This winter a small hand power alfalfa and clover seed huller was brought on the market by The Birdsell Manufacturing Company of South Bend, Indiana. We find this serves the purpose very well. This same firm also offer to sell sep-
arate the special rasps used in their large sized alfalfa hullers; these rasps can readily be fastened on opposite boards running parallel in a frame. We find that for cleaning small lots of alfalfa seed a good hand machine is the Clipper Seed, Grain and Bean Cleaner, manufactured by A. T. Ferrell & Company, Saginaw, Michigan.

HISTORY OF INTRODUCTION OF TURKESTAN, SIBERIAN AND RUSSIAN ALFALFA

The History of the Introduction of these new alfalfas was given in Bulletin No. 150 of the Bureau of Plant Industry, issued May 27th, 1909, entitled "The Wild Alfalfas and Clovers of Siberia, with a Perspective View of the Alfalfas of the World," by N. E. Hansen. A copy of this Bulletin may be obtained by sending money order or cash, ten cents, to the Superintendent of Documents, Government Printing Office, Washington, D. C.

For the convenience of the reader the following paragraphs are reprinted from Bulletin No. 150:

INTRODUCTION

On February 10, 1909, the writer returned to Washington from an eight months' tour to Siberia and Turkestan as Agricultural Explorer for the United States Department of Agriculture. This concluded his third tour to Siberia in search of a hardy alfalfa for the Prairie Northwest. These three expeditions were preceded by a visit to European Russia in 1894.

It had been his plan to say very little concerning the new plants obtained until they had been further tested, preferring that the seeds should tell their own story as to their value for this continent. However, the flood of correspondence indicates such great interest in this subject that it appears desirable at this time to present a preliminary report.
THE PREPARATION FOR THE WORK

Upon entering the Cabinet in 1897, Secretary Wilson mapped out a comprehensive system of foreign explorations by which the number of economic plants now in cultivation in various parts of the United States was to be largely augmented by additions from other countries having similar conditions of soil and climate.

The writer had the honor to be appointed the first agricultural explorer. Three years previously, in the course of a four months' trip through eight countries of Europe, he had spent three weeks in European Russia studying the horticulture and agriculture of that empire. The trip served to direct his thoughts into unusual channels, especially in the line of breeding hardy fruits. This breeding work has occupied his attention ever since, and after raising seedlings by the hundreds of thousands some remarkable hybrids have been originated.

This line of breeding has led the writer to study the habitat and original distribution of many economic plants and to do considerable work in exploring our western wilds, where an occasional rattlesnake would add zest to the quest. The wise counsel of his teacher, Prof. J. L. Budd, and his observations from a trip through Russia gathering fruits in 1882 have been remembered with great profit. Since September, 1895, in the writer's work at the agricultural college experient station of South Dakota, this question has continually presented itself: Why are some plants hardy and other plants tender as regards winter cold and summer heat? There must be some definite law underlying this great difference in hardiness.

THE FIRST JOURNEY TO SIBERIA

The writer's first journey to Siberia was a ten months' tour from June, 1897, to March, 1898, through eastern European Russia, Turkestan, western China, and Siberia. As a result of this journey Turkestan alfalfa was imported into the United States for the first time. The exportation
of Turkestan alfalfa, both to North and South America, has since assumed large proportions, as it has been found in certain localities to be more resistant to cold and drought than the ordinary alfalfa now in cultivation, which was brought by the Spaniards from North Africa to South America, perhaps three centuries ago, and later to California.

The trip of 1897 included an overland journey by wagon and sleigh of over two thousand miles from Tashkend, Turkestan, to Omsk, Siberia, via Kuldja, western China. Five carloads of various seeds and plants were obtained in the course of the ten months' tour.

The endeavor of 1897, as developed in the progress of the investigation, was to find the northernmost plants of *Medicago sativa*, the common alfalfa now cultivated. As nearly as could be determined, the northern limit was near Kopal, in southwestern Siberia. The severity of the winter made further work by the writer impossible. At one time he was one thousand miles from the nearest railroad. The hardships and perils of that journey are a matter of record.

At that time the writer had become to believe strongly that the botanical name of any species of plant was not enough for the purposes of agriculture; that a species extending over a wide geographical range differed widely in degrees of hardness especially in regard to cold; and that for the northern regions of the United States we must find the form that had been developed by nature in similar regions in the Old World. Hence the endeavor to get the most northern type of alfalfa in Asia for trial under similar conditions in North America, where no alfalfa is native.

**THE SECOND JOURNEY TO SIBERIA**

Circumstances made it impossible for agricultural explorations to be resumed in Siberia for some time. The Spanish-American war, the Russian-Japanese war, and the Russian revolution all made further work impracticable.
In July, 1906, the second journey began and this turned out to be a six months' trip around the world by way of England, Denmark, Lapland in northern Norway and Sweden, Finland, Siberia, Manchuria, and Japan. Some three hundred lots of various seeds and plants were obtained on this journey.

The writer learned that he was very nearly correct in his former estimate as to the northern limit of the common alfalfa in Asia, but that extending far north of this limit across Siberia were three wild species with yellow flowers instead of blue and that these were good forage plants in the driest and most severe regions of southern Siberia. The early settlers of Siberia learned the value of these species, as they put up wild hay for the stock and observed that the cattle, sheep, and horses on the ranges were fond of these plants. These three species were *Medicago falcata*, extending approximately over the western two-thirds of Siberia; *Medicago platycarpa*, found in a much more limited range in central and south-central Siberia, especially along the edge of timber and of timber clearings; and *Medicago ruthenica*, found in the remaining eastern portion of Siberia, Mongolia, and Manchuria. Associated with these were some wild clovers which appeared equally desirable to obtain, especially for short rotations.

The lateness of the season when these species were found made it impossible to obtain the seed of more than one of the three, *Medicago falcata*. The intense interest manifested in this discovery upon returning to the United States showed the urgent need of hardier alfalfas and clovers than we now have for the prairie regions of the Northwest.

**THE THIRD JOURNEY TO SIBERIA**

The third journey, of eight months, was for the purpose of gathering more seed of new forage plants, especially alfalfas and clovers, in Siberia. As the route homeward was through the Caucasus, the Mediterranean region, and North Africa, the writer was able to make a study of some
other alfalfas, so that the present report might be termed a perspective view of the alfalfas of the world, or a study of alfalfa on four continents, especially the wild alfalfas of Siberia and the cultivated alfalfas native to Turkestan and the Mediterranean region. It is the story in brief outline of a persistent and determined effort to find out what nature has done toward making the alfalfa family adapted to regions of extreme cold, heat and drought.

This third tour to Siberia was very greatly hampered by unfavorable weather; it was the wettest and most backward season known for many years and the seeds were not ripe at the usual time. The widespread epidemic of Asiatic cholera in Russia and Siberia, in the midst of which the writer had to labor, did not facilitate the work. Some 300 lots of seeds and plants were obtained, however. On this journey a study was made of how people manage to live in some of the principal deserts of the world, including the Gobi Desert of Mongolia, the Salt Steppes of southern and southwestern Siberia, the Hunger Steppe of Turkestan, and the Sahara Desert of North Africa. An effort to extend this knowledge has been made by studying the work of numerous Russian explorers in Siberia and central Asia, so as to get a wider grasp of the subject. The remarkable fact developed that one alfalfa and one clover grow nearly, if not quite, at the northern limit of cold. This point is Verkhoyansk, in latitude 68 degrees north, with a recorded minimum temperature of -67.8 degrees C (—90.04 degrees F.). Yakutsk is in 62 degree north latitude, nearly due north of Lake Baikal, with a recorded minimum temperature of —64.4 degrees C. (—83.92 degrees F.). The northeastern limit of *Medicago falcata* and of *Trifolium lupinaster* is somewhere between Verkhoyansk and Yakutsk. Specimens of both plants have been collected on the Aldan river north of Yakutsk. In this region the subsoil remains permanently frozen.

In this extreme northern section of Siberia throughout an immense area are found the remains of the huge mastodons which at one time roamed over the plains. Their
ivory tusks are still found in large quantities and are utilized, although usually much weathered after so many centuries of exposure.

It is of great interest to note that nature has furnished two legumes for this extreme north region. The mastodons of a former age have been succeeded by the hardy breeds of cattle and reindeer kept by native tribes and exiles. The time available, as well as his own preference, made the writer gather seeds in latitudes farther south, from 50 degrees to 55 degrees north, where with hot and dry summers there is much less snow at the time of the lowest temperatures, the mercury in the thermometers sometimes freezing with no snow on the ground.

In studies as to the sources of the seed the important fact should be borne in mind that the mere latitude and longitude do not tell the main story, but that isothermal lines and the amount of precipitation are the main factors in indicating climatic extremes. These have been the main guides in choosing the localities in which to gather seeds.

A FORECAST

The writer has often been urged to make positive statements as to what the alfalfas and clovers brought from Siberia will do under field culture in the various regions of the United States. Inasmuch as he is not a prophet nor the son of a prophet he has steadily refused to do this. To the farmers of the Northwest who have lost millions in all these years by the winterkilling of the common alfalfa and clover imported from the far milder regions of the Old World, he must give the admonition to be patient until the Department of Agriculture can definitely determine the value of these and other new introductions for the various regions of the Northwest.

The great difficulty of gathering seed in quantity in the wilderness makes it impracticable to send out the seeds to private planters, nor would it be desirable to do so until their real value has been determined. From a study of
the climatic and soil conditions under which the seeds were gathered in Siberia, there are excellent reasons for believing that they will be found valuable in the colder and drier regions of the Northwest. They are not intended for regions where no trouble has been experienced in winterkilling of alfalfas and clovers under ordinary conditions. For such regions the writer would say "Let well enough alone." His own belief is that these new plants will extend the present alfalfa and clover limits as far north on the American continent as anyone will wish to farm.

These alfalfas and clovers may be used in two ways: (1) As a cultivated crop for hay and pasture, and (2) to introduce as wild plants into the native ranges of the Prairie Northwest, where they will probably be able to hold their own with any plants now found there. As regards food value the peasants of Siberia have long ago determined that these alfalfas are suitable for all kinds of stock. Medicago falcata, especially, is no doubt an important factor in making the rich cream and butter for which Siberia is becoming noted.

THREE SIBERIAN ALFALFAS

There are upward of 50 species of Medicago distributed through middle and southern Europe, especially in the Mediterranean region, western Asia, and North Africa. The group includes the useful snail clovers. Some are objectionable owing to their spiny pods, which cause trouble by getting into the wool of sheep.

The genus is well represented in the Caucasus, where there are at least 21 native species, along with 54 species of Trifolium, and there is abundant room for further explorations, especially in the mountain regions, for new species.

MEDICAGO FALCATA

Geographical distribution.—Medicago falcata L., the name "falcata" referring to the falcate or sickle-shaped pods, is distributed over a very wide area of Europe and Asia, but in the milder regions of its habitat it has been overshadowed by the common lucern, which has been under
cultivation for a much longer period. It extends through a large part of western Europe, central and southern Russia, the Crimea, the Caucasus, and through approximately the western two-thirds of Siberia, at least as far as 64 degrees north latitude, through North China, the Trans-Caspian regions, including Turkestan and Persia, and through Afghanistan, western India, and Asia Minor. The extraordinary wide distribution of this plant makes it necessary to be extremely careful in choosing the source of seeds.

Sir J. D. Hooker, in his "Flora of British India," states that the plant is found in Kashmir, Ladak, Kunawar, etc., and at an altitude of 5,000 to 13,000 feet in Afghanistan.

Moorcroft, in his article on the fruit trees of Kashmir, July 8, 1823, gives interesting notes on the cultivation of this yellow lucern in northwestern India. In a letter written in 1822 Moorcroft says that "the yellow lucern is a spontaneous production of this, is of a constitution more hardy than that of Europe, requires no other culture than that necessary for sowing it, and lasts for a long series of years."

This yellow-flowered lucern is considered by some authors to be the ancestor of the common alfalfa, but if so it must have been derived from the form of the species as found wild in its far south range, where civilization flourished in the earliest times. The Chinese have cultivated Medicago sativa from very early times, and have Medicago falcata in cultivation in North China south of the Trans-Baikal region. However, this is far south of the region in which the writer secured seed in 1906 and 1908.

Medicago falcata in European Russia.—The agricultural experiment station at Besentsug, some 30 miles east of Samara in the Volga River region of eastern European Russia, is in the midst of a vast steppe region which has suffered from severe summer droughts and winter colds, often with but little snow. Recurring failures of crops have caused widespread distress at times among the peasants. This station has been recently established to help
solve the dry-land agricultural problems for this region. *Medicago falcata* is found native here, and attention has been turned to it very recently as a valuable native plant adapted to cultivation. The trials at this station show that *Medicago sativa*, the French lucern as it is called in Europe, winterkills frequently and does not endure pasturing, while the native alfalfa, *Medicago falcata*, is of course perfectly hardy and endures pasturing for ten years at least. Under culture the plant is of upright habit except the first season, when it is somewhat reclining. It is a long-lived plant with a strong root system. The roots have been traced to a length of 10 feet and were still vigorous. Chemical analyses show that the protein content of the first cutting is superior by nearly 2 per cent to that of the common alfalfa, but in later cuttings the reverse is the case. Hence, it would seem best to cut early. Stock are very fond of this wild alfalfa.

The small experimental plots of the native form of *Medicago falcata* in southern European Russia in the Poltava and Khark of provinces showed a strong upright growth, as strong as ordinary alfalfa (*Medicago sativa*). However, *Medicago falcata* is not cultivated to any extent in this region because the ordinary alfalfa has the start of it as a cultivated plant and the seed is plentiful and cheap.

At Moscow and other regions of western Russia where the climate is moister, clovers are more profitable in their shorter rotations than alfalfas.

Klingen, the Russian agronomist, found as many as one hundred branches from one plant of *Medicago falcata*. Where not pastured the plant is of strong, upright growth, standing fully waist high in the steppes, but where pastured closely it creeps and only the ends are erect. In general, Klingen finds that *Medicago falcata* stands pasturing, while *Medicago sativa* does not.

*Medicago falcata* is considered an excellent plant for bees, the flowers containing an abundance of nectar.

In his 1906 expedition the writer secured seed of *Medicago falcata* from Kharkof Province, southeastern Russia,
S. P. I. No. 20717; from Omsk, Siberia, S. P. I. Nos. 20718 and 20719; from Irkutsk, eastern Siberia (from a load of wild hay), S. P. I. No. 20720; Samara Province in the Volga river region, S. P. I. Nos. 20721 and 20726; Saratov Province, central Volga River region, S. P. I. No. 20722; Don Province of the lower Volga river region, southeastern Russia, S. P. I. No. 20725; and Tomsk, Siberia, S. P. I. No. 20724.

Siberian field notes on Medicago falcata made in 1906 and 1908.—In 1906 and 1908 the writer found Medicago falcata to be a long-lived perennial with yellow flowers and with such a strong upright growth that it could be easily cut with a mower. Seed of this plant was gathered in many localities in 1906 from various parts of the Volga River region of eastern and southeastern Russia and in 1908 from a good many places ranging from the western boundary of Siberia to the Chinese border in the Trans-Baikal region, a distance of about 4,000 miles, but especially in the provinces of Tomsk, Akmolinsk, and Irkutsk. The choice of localities was decided by their similarity to the region of the Prairie Northwest, in which the alfalfas were designed to be tested. This species is especially abundant in the provinces of Tomsk and Akmolinsk, western Siberia. In 1908, traveling by wagon from Biisk to Semipalatinsk, in the vast plain lying just north of the Altai mountains which separates it from Mongolia, the writer learned in the course of a drive of 400 miles that Medicago falcata is one of the dominant and characteristic plants of the steppe pastures and open range, holding its own with all the other vegetation. An abundance of hay is put up by the peasants and the plant is highly esteemed in the wild pastures and ranges.

Wherever the range is not greatly overcrowded, especially with sheep, Medicago falcata is a fine upright plant three to three and one-half feet in height. The abundant bright yellow flowers are decidedly ornamental. Stock eat this plant greedily and bees work on it industriously. It has a very strong root system. At three feet the taproot
of one plant was still as large as a lead pencil.

The land here is divided into fenced tracts. Each village has one tract, usually greatly more than sufficient for its needs, but the population is rapidly increasing by immigration from European Russia.

Medicago falcata is a common plant in the wild hay offered for sale in the hay markets of the small towns along the line of the Siberian railroad. The common name given it by the peasants is “scholtoe veseel,” the first word meaning yellow, but “veseel” is sometimes applied to a vetch and to a clover in other regions of Russia.

In August, 1908, the writer found wild plants of Medicago falcata 5 feet 8 inches in length near Semipalatinsk. This was on the banks of the Irtish river in sandy soil mixed with some clay. In the open steppe three to four feet was a common height.

Medicago falcata is a very common wild plant all through this region. The peasants have so much land that they have not begun the cultivation of any alfalfas or clovers and will not need to with the present scarcity of population and as long as Medicago falcata is so abundant.

The personal observation of the writer was that horses, cattle and sheep are extremely fond of the plant, and that it endures considerable pasturing. It was also learned that it is green very early in the spring, endures very severe summer droughts, stands dry upland soils underlaid with hardpan, and is considered resistant to alkali in the salt steppes of the south part of the Tomsk Province.

In 1906 the writer found this plant quite abundant on the eastern coast region of Lake Baikal in eastern Siberia, and a quantity of the seed was saved from hay brought in by the Buriats, a Mongolian tribe, from north of Irkutsk. The proximity of this great lake gives a greater rainfall here than out on the steppes, so that this form of the species may prove desirable in moist, cold regions such as Maine and northern Michigan. Lake Baikal may be termed approximately the eastern limit of the plant, although it was found in abundance at Werchne Udinsk, about 100 miles
east of the lake. The extreme eastern point where it has been found is at Charonte, a few miles into Chinese territory, where an arm of the Gobi Desert extends across the Siberian railroad.

**Medicago platycarpa**

*Medicago platycarpa* Ledebour is a strong-growing perennial alfalfa with yellow flowers and large flat pods, found mainly in central Siberia. Its distribution is principally along the edges of timbers and in open places in the native timber. Its native environment indicates that it should be tested in some sheltered regions, such as the timber sections of northern Minnesota and Wisconsin and westward into the Rocky Mountains. It is found in southeastern Siberia from the Province of Tobolsk west to Irkutsk and south into Mongolia, its main distribution, however, being in the southern part of the Province of Tomsk. In this province seed was gathered in 1908 at Chylin, east of the Obi River.

**Medicago ruthenica**

*Medicago ruthenica* Ledebour is a yellow-flowered wild perennial alfalfa extending approximately from the eastern shore of Lake Baikal to the Pacific ocean; in Siberia extending southward into Manchuria, Mongolia, Korea, and northern China. Its northern limit, from the specimens collected so far, appear to be the central part of the Amur River and its tributaries. Seed was gathered the past season at Charonte, in an arm of the Gobi Desert, a few miles east of the Chinese border in the Mongolian portion of Manchuria. Manchuria proper begins in the Chingan Mountains, farther east. Here this plant was abundant and growing in nearly pure sand. In general it is found scattered in dry, stony soils. *Medicago ruthenica* is closely related to *Medicago falcata*, but the seed pods are flat and oval or tapering slightly at both ends, much like those of *M. platycarpa*, but smaller.

As a fodder plant this species is greatly relished by the cattle, horses, sheep, and camels kept by the native nomad Mongolians in the region where the seed was
gained. Its distribution in a general way may be said to be north of that of the common alfalfa (*Medicago sativa*).

The botanical descriptions indicate, as far as length of stem is concerned, that the three Siberian alfalfas, *Medicago falcata*, *M. platycarpa*, and *M. ruthenica*, are the same length of stem, being given as 75 to 100 centimeters. The stems of *M. platycarpa* and *M. ruthenica* are smooth; those of *M. falcata* are somewhat hairy. The flowers of all three are yellow. The pods of *M. platycarpa* and *M. falcata* contain many seeds; those of *M. ruthenica* not usually more than four seeds. The seed pods of *M. falcata* are sickle-shaped, while those of the other two are flat and somewhat oval.

**FOUR OTHER ALFALFAS**

*MEDICAGO SATIVA*

The common alfalfa, or lucern, is a native of the temperate regions of western Asia. According to Watt, the botanical evidence favors the inference that the original habitat of this plant extended from the northwest frontier of India to the shores of the Mediterranean. Watt further says that many writers regard *Medicago sativa* L., *M. falcata* L., and *M. media* Persoon as forming but one species. Other writers hold them to be varieties of one species, and still others believe that all three are distinct. Stebler and Schroter very justly maintain that to the agriculturist all three are very distinct. The ancient Indian literature is too vague to separate these alfalfas fully, so Watt describes all Indian notes without specific botanical distinction as to the species to which they allude. Stebler and Schroter state that lucern is indigenous to Asia, Anatolia, the southern Caucasus, Persia, Afghanistan, Baluchistan, and Kashmir. To this list should be added Bokhara and other parts of Turkestan, the vast region just north of Persia and Afghanistan. However, this plant has been cultivated in China since a very early date and further investigations may modify our notions somewhat as to its oriental distribution.
According to De Candolle the Romans brought lucern from Media four hundred and seventy years before the Christian era; hence the generic name, *Medicago*. The plant is mentioned by early Roman writers.

It is difficult to determine whether lucern is really indigenous to North Africa, but it is certain that it has been cultivated from a very early date and found its way to Spain centuries ago, perhaps at the time of the Moorish invasion and was afterwards brought by the Spaniards to South America, and later to California. Some of it probably came over direct from Europe to America. In the light of the new theory of mutation we must regard this species as a collection of elementary species differing widely in character, some of which have been isolated under cultivation, but in none of them do we find the plant we desire for regions with extremely severe winter cold, especially with no snow on the ground.

The researches of Russian botanists show that *Medicago sativa* grows spontaneously in northern Korea, southern Manchuria and Mongolia, northern China, and all of Turkestan. Further research may serve to give more credit to the Chinese in developing *Medicago sativa* than we do now. One claim is that alfalfa followed the ancient southern caravan tracks westward many centuries ago. Certain it is that the plant was cultivated in Turkestan from very ancient times.

The writer returned home from Siberia and Turkestan in January, 1909, via Trans-Caucasia, the Black Sea, and the Mediterranean Sea. He took occasion to visit the Sahara Desert in northern Africa to study the alfalfa as cultivated by the Arabs. In asking an Arab at Biskra if the alfalfa he grew was not secured by him from the French, it was amusing to note his eagerness to insist that on the contrary the French had obtained it from the Arabs. Alfalfa is one of the favorite plants of the oases, where it has been grown from time immemorial.

The point to which particular attention is directed is that so far no pure strain of *Medicago sativa* has appeared
which is sufficiently hardy for the northern tier of states in the Prairie Northwest—that is, none that has not suffered at times from winterkilling. In other words, we have been endeavoring to cultivate common alfalfa far north of its ancient limits, and the process is fairly successful in regions of abundant snowfall, as the snow serves as a perfect winter protection. But there is a large area in the prairie Northwest where the most severe cold comes occasionally with no snow on the ground. An example of this was in February, 1899, when millions of dollars' worth of common alfalfa was lost from our northern boundary south to Kansas.

The writer's ideal is an alfalfa that will never winter-kill under the most severe conditions that can be found in the Prairie Northwest.

Medicago sativa turkestanica.—Probably the hardiest form of Medicago sativa is the one introduced from Turkestan in 1898. This proved more resistant to drought and cold than the ordinary alfalfa in cultivation in the United States.

In his second trip to Turkestan in 1908, after a lapse of eleven years, the writer was interested in learning of the remarkable growth of the export of Turkestan alfalfa seed. On good authority he learned that 200,000 poods† go out of the khanate of Khiva alone, and perhaps upwards of 100,000 poods from the remaining sections of Turkestan. This may be explained by the multitude of camels in Turkestan which eat the old dry stems after the plants have been left standing for seed. The larger part of this seed goes to South America, where the area to which the plant is adapted is larger than that in the United States.

A danger now confronts the industry, owing to the fact that the seed passes through the hands of so many middlemen and a certain amount of seed is shipped from southern Persia by the Caspian Sea which also goes into the market under the same name. Efforts are being made to

†A Russian pood equals 32 pounds.
correct this, as seed of the far southern region can scarcely be expected to be as cold resistant as the more northern types.

The name "turkestanica" is not a botanical name, but one given by Russian agronomists to distinguish the alfalfa found in Russian Turkestan and central Asia. S. P. I No. 20711, from Prof. V. R. Williams, at Moscow, was originally from a single plant found at Tashkend, the capital of Russian Turkestan. At Moscow, Professor Williams has found this strain very hardy, very productive, and a beautiful plant, while the French lucern, by which is meant the ordinary cultivated alfalfa of Europe and North Africa, is winterkilled.

**MEDICAGO MEDIA**

*Sand lucern.*—Lucern is only another name for alfalfa and is the one most commonly used in Europe. Sand lucern (*Medicago media* Persoon) is usually regarded as a natural hybrid of *Medicago falcata* and *M. sativa*. The flowers of sand lucern vary from pale yellow to green and violet. It appears that where the two species overlap in Europe and Asia natural hybrids occur, although not abundantly, and the hybrid ranges farther north than *Medicago sativa*. This hybrid origin makes our work with the ordinary sand lucern uncertain, as we do not know the exact origin of the two parents. Some of the strains of common alfalfa now in cultivation appear to be pure types of this species, and whether they are not really hybrid mixtures with *Medicago falcata* remains to be determined. This problem is now in the process of investigation by the Department of Agriculture.

In the light of the previous discussion of the varying hardiness of a species of a plant extending over a wide area it is reasonable to suppose that the native sand lucern of northern Sweden, western Siberia, and the Volga River region of eastern Russia would not be of the same degree of hardiness as the native sand lucern of Hungary and other parts of southern Europe. A very interesting field for further work is opened up for plant breeders by the
importation of these new types of wild and cultivated alfalfas from various places in Europe and Asia.

It would be of great interest to make the cross referred to artificially in order to see whether nature's work can be reproduced. Experiments should also be made in crossing strains of definitely known origin of these two species of alfalfa to determine the best combination. In other words nature has pointed the way by giving us a good hybrid alfalfa, but it may not be the best one that it is possible to make.

_Sand lucern in Russia._—In 1897 the writer learned of the existence of sand lucern in Russia in his tour of the Volga River region. It is native in this region of eastern Russia. It is found at least as far north as Perm Province and is called “sand lucern” by the peasants.

In 1907 seed descended from a single plant grown in Voronezh Province of the lower Volga River region was obtained. This spontaneous or natural hybrid will sometimes have yellow flowers on one branch and blue flowers on another, or both on one branch. As already stated, sand lucern is considered to be a natural hybrid of _Medicago sativa_ and _Medicago falcata_ (S. P. I. No. 20714). S. P. I. No. 20715 is from the same region, but bears yellow flowers and is in fact almost _Medicago falcata_ in its characteristics. S. P. I. No. 20716, from the same region, is a plant of vigorous growth, very hardy and productive, with black-green flowers. These three lots of seed were selected by Professor Williams of the Agricultural College at Moscow.

In 1906 the writer secured seed of sand lucern from north Sweden, 60 degrees north latitude (S. P. I. No. 20571). The plant appears to be in cultivation more in Hungary than elsewhere in Europe.

Herbarium specimens from lower Austria at the Imperial Botanic Garden in St. Petersburg were marked as growing spontaneously among the parent species, _Medicago sativa_ and _M. falcata_, and there were also specimens from the rocks on the eastern shore of the Caspian Sea.
MEDICAGO GLUTINOSA

*Medicago glutinosa* Bieberstein is a native of the Caucasus Mountains and Trans-Caucasia generally, especially of Armenia, where it is found up to a height of 7,500 feet. It is the only one of the 21 species of *Medicago* native of Caucasus which the writer thought worthy of introduction. His intention was to secure seed when returning through the Caucasus from Turkestan, but it was too late in the season and there was too much snow in the mountains to make this feasible. When it is obtained it should be from the very dry upland region surrounding Mount Arart in Armenia, the mountain mentioned in the eighth chapter of Genesis.

This plant is closely related to the *Medicago falcata* of western Siberia, the main distinction being the minute glutinous hairs found on the seed pods and young shoots.

MEDICAGO ARBOREA

*Medicago arborea* L. is the largest representative of the *Medicago* genus, attaining a height of upwards of 10 feet. It is a native of the Mediterranean region of Europe, Asia, and North African, and is the "cystisus" mentioned by ancient Greek and Roman writers as an excellent forage plant. It is especially common on the islands of the Greek archipelago and in southern Italy. It is cultivated to a limited extent in various portions of its range but as it gets woody too quickly and is less productive, the ordinary lucern is much more in favor. It is a favorite wild plant, as it furnishes rich feed for cattle, sheep, and goats. In old plants the wood is dark and hard like ebony, and its use for saber handles, canes, and beads is recorded.

The writer's personal observations in gathering wild seeds of this plant are confined to Mount Lycabettos at Athens, near Mars Hill, on which the Apostle Paul preached to the Athenians, and to the cliffs near the outskirts of Naples, Italy, where the plants were found growing in the crevices of rocks, where they were inaccessible to any live stock. The plants seemed to flourish in the driest possible crevices in almost perpendicular cliffs where, apparently, no water could get to them.
Medicago arborea appears of value in hot, dry places where few other plants will live, but its greatest value is perhaps to be looked for from the standpoint of breeding. Some of its remarkable vigor of growth could with advantage be imparted to the other Medicago of more northern origin. This species has been tried in a limited way in southern California as an ornamental plant, and north of its main range in Europe is considered only as an ornamental shrub needing winter protection. The large, bright yellow flowers are abundantly produced.

THE FUTURE ALFALFA FOR AMERICA

From a personal study of the alfalfas on four continents as outlined in the foregoing pages, the thought has come very strongly to the writer that no one alfalfa has all the good points needed for our future agriculture. All of them, in the light of the mutation theory, are collections of elementary species varying widely in important characteristics.

This opens a vast field for the plant breeder. The elementary species which are the best for each particular region may be isolated by selection. Parallel with this line of experimentation should be carried on experiments in hybridization.

In the spring of 1908 the writer began this work independently in South Dakota by potting plants of several alfalfas obtained in his former tours to Asia, with a view to hybridization. However, the idea is not wholly new, experiments having been started independently by the Department of Agriculture. Nature has already pointed out the way in the natural hybrid known as Medicago media, or sand lucern. There are many combinations possible, and it is a promising field for the plant breeder, especially since Mendel's law of heredity has given us a quick method of breeding hybrids true to seed. This, however, is a work for the plant breeder and not for the farmer. The Siberian alfalfas, in their present unsettled state, fresh from the wilds of Siberia will, it is hoped, prove useful in solving the alfalfa problem in the Prairie Northwest.
CAN PLANTS BE ACCLIMATIZED TO ENDURE A GREATER DEGREE OF COLD?

Some of the most fundamental problems in agriculture and horticulture in the United States depend upon the right answer to this question. In view of the fact that the writer's opinion on this subject differs materially from those usually held it appears only fair in this connection to define briefly his position, as outlined during the past few years in a number of addresses and bulletins. The discussion may be divided in (1) annual plants, or those enduring but one season, and (2) perennial plants, those living more than one year.

ACCLIMATIZATION OF ANNUAL PLANTS

The history of cultivated annual plants has been quoted as an exception to the law that plants cannot be acclimatized to a greater degree of cold. Indian corn, for example, in its native tropical and semitropical home in South America attains a height of 20 feet, requiring seven months for maturity and has kernels several times the size of ordinary corn. The Indians before Columbus discovered America had already completed the work of carrying the plant northward on the American continent into Canada, but the plant has simply been dwarfed and shortened in its period of maturity. It still needs extreme heat for a part of the growing season, and no variety has been originated which is adapted to the cool nights of northern Europe.

The theory of mutations has thrown a new light on the subject of acclimatizing annual plants. It appears that the ordinary botanical species usually consists of a number of elementary species or distinct mutations. By the critical methods of observation of Doctor Nilsson and his associates at the experiment station at Svalof, Sweden, new varieties of cereals are being produced by isolating mutations. The Swedish Select oat imported by the
United States Department of Agriculture is one of the results of this work.

This work may be described in another way by saying that elementary species are being isolated from systematic species. An ordinary variety of barley, for example, may consist of a number of elementary species or distinct mutations. These, in the course of years, have adjusted themselves in a more or less constant proportion to meet the conditions of a given locality. When the seed is now transported to a new environment the relative proportions of these elementary species are rearranged to meet the new conditions. For example, if a variety of barley is taken northward the extra-early elementary species within the limit of the variety soon outnumber the later maturing mutations, and if taken too far north the late sorts are soon entirely eliminated. Doctor Nilsson believes that a very early variety which will be adapted to far northern conditions may be originated far south, because the early mutations will surely appear whether the variety is raised north or south, and the problem is mainly the isolation of these early mutations when they appear.

ACCLIMATIZATION OF PERENNIAL PLANTS

It is worthy of note that the many failures in farming in the semiarid regions of the West are due to the fact that the plants cultivated are from the milder regions of central Europe, showing that it is unwise to farm in a dry, cold climate with wet, warm climate plants. This is a very fundamental proposition, but the farmers of America have spent hundreds of millions of dollars in a vain effort to acclimatize certain plants.

Let it now be placed on record that his study of horticultural problems in the Prairie Northwest during the past twenty years has taught the writer to have no faith in the possibility of acclimatizing perennial plants to a greater degree of cold than that to which they are accus-
tombed in their original habitat. Why is it that some trees and shrubs live and others die at a temperature of — 40 degrees F. with the ground bare of snow? In the endeavor to answer this question in the study of hundreds of kinds of fruit and ornamental trees and shrubs it appears that those native to a cold climate prove hardy, while those from a milder region are winterkilled. On the other hand, it appears that the original source of the seed makes a great difference. The box elder, red cedar, and many other trees from southern seed prove short lived and tender in the north, while trees of the same species of northern origin were hardy at the north. It appears, then, that for horticultural purposes the botanical name is entirely insufficient; that there is a difference in the species that can not be defined in botanical terms.

The writer does not believe in giving plants winter protection, as that is horticulture on crutches, and hence undesirable. In his first trip to Russia in 1894 he became interested in the results of Russian experiments with seed of evergreens from the northern regions of Russia and western Siberia as compared with seed of the same species from western Europe. In each case the native Russian seed had given plants of superior hardiness. It appeared then that nature was able to acclimatize the same species to widely different regions, but there was no means of determining the length of time which had been taken for this work. This thought came to mind in reading the following in the "Origin of Cultivated Plants," by De Candolle:

"The northern limits of wild species * * * have not changed within historic times, although the seeds are carried frequently and continually to the north of each limit. Periods of more than four or five thousand years or changements of form and duration are needed apparently to produce a modification in a plant which will allow it to support a greater degree of cold."
Combining these two fundamental propositions, it seems possible to take full advantage of the great work done for us by nature in acclimatizing plants and to cultivate farther north the hardiest form of a species instead of the form adapted in the course of thousands of years to a moist climate. We should "hitch our wagon to a star," but should be careful to pick out the star that is going the right way for our purpose.

This fundamental thought, to work with and not against Nature in adapting plants to our prairie conditions, should underlie all efforts in the improvements of plants.

Concisely stated, the writer's belief is that plants cannot be brought to endure any great degree of cold to any noteworthy extent; that hardiness cannot be bred into plants by selection alone. The ability to endure cold is probably a unit characteristic of the species which may be imparted by hybridizing. In fact, in his work in originating many hybrids between hardy and tender fruits at the South Dakota Agricultural Experiment Station, he has obtained hardy plants from the seed of tender varieties by hybridizing with the hardy ones, showing that the hardy male parent can transmit its hardiness even when the female parent is tender.

The only other way in which acclimatization might possibly occur is by some great mutation or sudden change in the species, according to De Vries's theory of mutation. It appears as the result of De Vries's experiments that new varieties of plants and animals may originate as freaks or sports which are capable of reproducing true to seed. The writer has summarized this in the statement that evolution may be likened to a kangaroo rather than a snail; that changes that were formerly thought to demand thousands of years really take place suddenly. Applying this thought to the history of Short-horn cattle, for instance, the "Champion of England," who stamped himself indelibly upon the breed, was really a
mutation and fully prepotent in his ability to transmit his perfect points.

A hardy plant may appear from tender stock, then, as a mutation, but so far, out of many instances, as in the case of the apple, raspberry, grape, alfalfa, and clover, no noteworthy progress has been made in making plants hardier by selection from tender stock. It is like the never-ending work of Sisyphus.

There is much discussion as to acclimatizing alfalfa, but the occasional test winters such as that of 1898-99, in which millions of dollars' worth of alfalfa was destroyed in the West and Northwest, indicate that it is not feasible to get hardy plants by selecting from tender stock. In each and every case it is starting on a work that may take many thousands of years for completion and the test winters may compel us to begin all over again. Nature takes a century of centuries for some experiments; let us leave such work to her. In other words, the writer has believed that those who were attempting to acclimatize the alfalfa brought over from Africa by the Spaniards and which reached California by way of the Spanish settlements in South America were starting on a ten-thousand-year job, and hence on one that they could never finish.

This is applying De Candolle's law to agricultural problems. Hence the overland journey of 2,000 miles in 1897-8 in northern Turkestan, western China, and southern Siberia, in an endeavor to find the hardiest form of the common alfalfa.

To return to Siberia in 1908, after a lapse of eleven years, and to learn that nature had done the work of breeding a hardy alfalfa was indeed a great pleasure. It is hoped that it will help in solving the alfalfa question on the North American continent. It appears as a sensible proposition for the United States, in the task of developing our natural agricultural resources, to take ad-
vantage of the work of nature through countless ages in other regions of the world. National or patriotic sentiment has no reference to plant life. We should be cosmopolitan and get as many kinds of economic plants from as many regions as possible, bring them together here, and let the fittest survive. We shall be satisfied with nothing less than the best of everything for every region. That is the fundamental thought of the agricultural exploration work which has been planned and carried out during the past twelve years by the present Secretary of Agriculture.