ANNUAL REPORT

Mr. Willis E. Johnson, President,
South Dakota State College.

Dear Sir:

As director, I have the honor to make the following report of the South Dakota Agricultural Experiment Station for the fiscal year ending June 30, 1919.

Mr. B. L. Thompson, who had been connected with the College for several years but more recently added to the Station Staff, resigned to accept work in agricultural extension in Ohio. Mr. A. H. Kuhlman of Wisconsin, who has had considerable experience in extension work in that state, was employed to succeed Mr. Thompson.

The Legislature of 1918-1919 made an appropriation to purchase 160 acres of first-class land and as a result this department will be in a better position than ever, when possession is secured, to conduct experiments in the breeding and feeding of livestock.

Blackleg Vaccine

Thru the efforts of the county agricultural agents the distribution of blackleg vaccine has been greatly increased.

EXPERIMENTS

Animal Husbandry

Our efforts were confined to breeding and feeding experiments with cattle, sheep, and swine with the aim to proceed along the lines that will be of the greatest practical value to the people of the state. The results of our experiments are sought after by the people of South Dakota and other states, and we feel that our efforts in these lines are appreciated.

Experiment No. 1

The object of this experiment was to develop, if possible, a breed of sheep better suited to our conditions than any we now have, and also to eliminate the tail.
Excellent progress has been made. By breeding a cross-bred fat rump ram to a cross-bred fat rump ewe, a ram with a short tail that did not require docking was secured. This ram was used last year with the result that quite a percent of the lambs were short tailed. It is the intention to continue this line of work but it will be necessary to keep large flocks to provide numbers to select from. We are also developing a strain with a square rump, and one that will furnish a fur. We further believe that lambs with this blood, the fat rump, have more vitality at birth than lambs of any of the other breeds and also that these lambs will reach 80 pounds sooner than lambs of other breeds from the fact that the ewe will draw on her stored body fat to supply milk for her young. This can be proven when we have more room. We believe sheep with this blood will live longer during a deep snow than ordinary sheep because of stored fat in their bodies.

Experiment No. 2

This experiment was conducted to determine the relative feeding value, for cattle, of four different kinds of corn when made into silage, as follows: Flint, early maturing white dent, sweet corn, and late maturing yellow dent. The silos were filled, the cattle bought and fed as long as silage lasted, with good results. A bulletin will soon be issued on this subject giving details.

Experiment No. 3

To determine the relation of feed to the growth and the composition of wool. For this investigation 100 lambs of uniform size and breeding were purchased, divided into different lots of ten head each. One lot was sheared in the fall and the wool analyzed to serve as a check. The other nine lots were fed rations of different kinds and sample of their fleeces analyzed. Results will be published when completed.

Experiment No. 4

An experiment in breeding and feeding pigs was conducted during the summer of 1918, using different rations. The results will be included in a bulletin to be issued soon on pig feeding.
In addition to the annual report, four bulletins were printed during the year, as follows: No. 182 by the Department of Animal Husbandry on “Corn Silage for Beef Production”; No. 183 by the Department of Agronomy on “Barley Culture in South Dakota”; No. 184 by the Department of Agronomy on “Yields From Two Systems of Corn Breeding,” and No. 185 by the Department of Dairy Husbandry on “Ice on the Farm.”

Because of the greatly increased price of everything and shortage of help it was impossible to issue other bulletins.

The following is a report of the work done in the Chemistry Division of the College for the Experiment Station by B. A. Dunbar, head of the Department of Chemistry:

The chemical division continued the work of the late Professor Shepard in the matter of propagation of sugar beets and sugar beet seed. Our examination of the 1918 crop showed a continuation of big sugar content—around 18 percent. It seemed that the end sought by Professor Shepard, during his many years of effort on this project, is being attained, viz.: The fact that the production of a very constant high sugar acreage is practicable for South Dakota soils and climate; that, by fairly careful cultivation and selection, seed can be produced which will keep up this high percentage of sugar in the progeny; that, in this region, a spacing of 30 inch rows and of 8 inches between plants, results in the highest acreage of sugar under necessary methods of large scale production. The work having been practically covered so far as this department might logically carry it, it was deemed best to apportion the continuance of the project between the chemistry and agronomy divisions, since the problem, from this time on, appears to be that of propagation and dissemination of pedigreed seed—of which we have so great need in the post-war period, the chemistry department merely covering the matter of analytical control in selection of mothers. The Chemistry Division also cooperated with the Animal Husbandry Division in the continuance of its project having to do with the feeding value of silage under
varying conditions as to time of cutting—a project still under way. Since the salary of our analytical force is partially derived from college funds, approximately one-fourth of the work done in the station laboratory has been in the nature of miscellaneous analytical work for farmers and other outside persons, the expenditure of materials and apparatus being replaced from the general college stock.

Receipts

From Hatch Fund—for maintenance............. $ 395.74
From sale of beets .................................. 9.90
From Hatch Fund—salary ............................. 716.64

Total .............................................. $1122.28

Expenditures

Labor—beet project .................................. $ 317.50
Materials and repairs—beet project ............... 13.05
Books—station library .................................. 12.85
Photographs—beet project ............................ 9.00
Materials and apparatus—general upkeep of stock ........................................... 53.24

............................................................ 405.64

Salary of analyst ..................................... 716.64

Total .............................................. $1122.28

For a more detailed account, I inclose and make a part of this report, the report from each division of the Station.

Respectfully submitted,

JAMES W. WILSON, Director.
In response to your recent request, permit me to submit report of our experiment station work for the fiscal year just closed. Agronomy Department has been able chiefly to continue work previously under way with minor changes and some improvements. It is needless to say that the year just closed has been a difficult one owing to war conditions. Our Department has prevented the main features of work from going to pieces under war strain.

First, we may report upon the progress of three Adams projects now being conducted:

**ADAMS PROJECT NO. 1**

*A Project on the Influence of Rotation Upon the Maintenance of Soil Fertility*

It is the essence of this project to discover if possible whether changes will occur in soil composition and soil characteristics due to differences in rotation systems. At the beginning of the project soil samples were taken from the several field plots included in the experiment. During the past year progress has been made in taking a second series of samples and also in completing analyses of the first series of samples and also this second series.

Analyses have been made especially for the elements nitrogen, phosphorus, calcium and magnesium. It has been necessary for our analyst, Mr. Howard Loomis, to accomplish as much analytical work as he could carry out without much assistance. In due course comparisons will be possible between the analyses taken at different periods of time. Furthermore, it may be possible to make other studies of soil effects due to several rotation treatments. The following table of crop yields which have developed during the progress of this project have been handed to me by Professor J. G. Hutton, who has charge of the project:
RESULTS OF TRIALS WITH MANURE AND ACID PHOSPHATE
AND MANURE AND ROCK PHOSPHATE
Plats 240 to 549,
East Farm—Brookings

<table>
<thead>
<tr>
<th></th>
<th>CORN 6 years Bu.</th>
<th>OATS 5 years Bu.</th>
<th>WHEAT 4 years Bu.</th>
<th>CLOVER Hay-pounds 3 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>O</td>
<td>41.77</td>
<td>66.08</td>
<td>23.55</td>
<td>2194</td>
</tr>
<tr>
<td>M</td>
<td>44.66</td>
<td>69.20</td>
<td>28.27</td>
<td>3006</td>
</tr>
<tr>
<td>MAP</td>
<td>45.26</td>
<td>71.08</td>
<td>29.15</td>
<td>3056</td>
</tr>
<tr>
<td>MRP</td>
<td>45.83</td>
<td>71.40</td>
<td>26.98</td>
<td>2980</td>
</tr>
</tbody>
</table>

ADAMS PROJECT NO. 2
A Study of Correlations Between Certain Physical Characters of Plants and Their Capacity for Yield

This project was begun in 1913, especially with the use of Bluestem wheat selections being made for length of head. During the year past, correlation tables have been worked out especially with the cooperation of Professor William Lattin of the Department of Mathematics. These calculations have readjusted the previous numerical results slightly on this project, but the conclusion remains the same in the general respect that apparently there was some advantage from the standpoint of yield of grain in favor of long heads as compared with short ones for the first generation, an effect however which disappeared in later generations which were planted from the progeny of the first selections without continuous selection.

It will apparently be possible for us to make a bulletin of the results of this project within the present year.

ADAMS PROJECT NO. 3
A Project to Determine Definitely the Extent to Which Water is a Limiting Factor in the Growth of Sweet Clover (Melilotus alba)

At present writing, Mr. Loomis, who has direct charge
of this project has succeeded in getting sweet clover plants to grow on all of the 24 pots included in the experiment. As has been explained in previous reports, this project comprises an evaporation experiment with sweet clover growing on 24 separate pots. These pots contain soil which weighed at the beginning, the soil being of three types representative of large areas of South Dakota. Within each of these types a variable water content has been arranged also by figuring the percentage of moisture in the soils on a basis of absolute dryness carefully determined. It is accordingly possible to hold the pots close to a given moisture content with frequent weighings and additions of water. Soft water has been made available.

Up to the beginning of the present year, it has been from a single mother plant. The plants growing on the 24 pots this year show a pleasing degree of uniformity such as it has never been possible for us to secure in previous years. It is our belief that the use of one more generation of plants on these pots will enable us to arrive quantitatively at certain factors of error and that these factors will be greatly stabilized by improvements that have been made in details. Since last year improvements have included the use of three plants on each pot instead of only one, a corresponding improvement in the covers of the pots, new covers having been designed and manufactured, the use of white oil cloth covering to increase solar radiation. The following memorandum of progress is handed me by Mr. Loomis:

1. With respect to moisture content of soil: Within the limits of moisture content employed—9 percent to 32 percent, basis of dry soil,—a decrease in the moisture content of the soil has been accompanied by a corresponding decrease in the growth of sweet clover, as indicated by measurements of:
   a. Quantity of water utilized
   b. Quantity of dry matter produced
   c. Water requirement
   d. Height of plant; number and length of main stems
   e. Number and length of branches
   f. Number and total area of leaves, and mean leaf area.
2. With respect to soil type: Within the range of soil types employed the growth of sweet clover has varied with the soil type employed, as indicated by the mean of each of the measurements cited in (1) above for each soil type. In general, these may be summed up as follows: The best growth of sweet clover occurred upon the Rosebud silt loam, the poorest upon the Pierre clay, with the growth upon the Marshall (now Barnes) sandy loam rather nearly approaching the growth upon the Rosebud silt loam. This will probably hold independent of moisture content.

HATCH PROJECTS

One of our principal Hatch projects includes several systems of corn breeding for yield. These results with corn breeding will be reported in two bulletins now in press, numbers 184 and 186.

Also variety tests and cultural experiments have been conducted in part with the use of Hatch funds and these have been reported in the bulletin written by Professor Champlin, namely, bulletin 181.

A large amount of cereal investigation work is in progress not only on our plots at Brookings but also at the four substations. This work in cereal breeding and variety testing is in part conducted with Hatch funds at this station and is also cooperative with the Office of Cereal Investigations. A part of this work with cereals has been reported upon during the past year in bulletin 179, entitled “Emmer in South Dakota.” Experiments are being conducted with the use of Hatch funds also involving a comparison of two series of five plots each; one series with turning under green manure and the other series with turning under an equivalent of stall manure. This complete series of plots is considered to be a comparison between a livestock system and a grain system of farming.

On our West farm another series of two rotations are being conducted one of which involves a comparison of acid phosphate and manure and rock phosphate and manure with and without limestone. Following is a summary which indicates progress:
RESULTS OF TRIALS WITH MANURE AND ACID PHOSPHATE AND MANURE AND ROCK PHOSPHATE, WITH AND WITHOUT LIMESTONE

Plats 240 to 549, East Farm—Brookings

<table>
<thead>
<tr>
<th></th>
<th>CORN 2 years Bu.</th>
<th>OATS 1 year Bu.</th>
<th>WHEAT 3 years Lbs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>O</td>
<td>42.98</td>
<td>41.36</td>
<td>2194</td>
</tr>
<tr>
<td>M</td>
<td>47.80</td>
<td>46.90</td>
<td>3006</td>
</tr>
<tr>
<td>MAP</td>
<td>48.30</td>
<td>50.90</td>
<td>3056</td>
</tr>
<tr>
<td>MRP</td>
<td>49.95</td>
<td>47.50</td>
<td>2980</td>
</tr>
<tr>
<td>L</td>
<td>42.50</td>
<td>42.50</td>
<td>2153</td>
</tr>
<tr>
<td>LM</td>
<td>47.05</td>
<td>45.60</td>
<td>3046</td>
</tr>
<tr>
<td>LMAP</td>
<td>45.40</td>
<td>45.90</td>
<td>3206</td>
</tr>
<tr>
<td>LMRP</td>
<td>47.10</td>
<td>42.50</td>
<td>3006</td>
</tr>
</tbody>
</table>

The other series of similar plots on the West farm involves a comparison of results that may be due from depth of tillage involving 4 inch plowing, 7 inch plowing, plowing with subsoiling and plowing with a deep tilling machine to a depth of 12 inches. The results from this series have been summarized recently by Professor Hutton. It is sufficient to say at this point that differences in crop yield which are apparently due to tillage are not great from a practical standpoint, although probably the results from this series can be published in bulletin form within the coming year.

In addition to the work conducted at Brookings as has already been suggested, extensive plot experiments are in progress at the several substations, namely Eureka, High-
more, Cottonwood and Vivian. Experiments at these stations in the main are carefully coordinated with the work at Brookings. The substations are however supported entirely from the state of South Dakota and do not involve the use of either Adams or Hatch funds. Results secured from substations are published in the main along subject matter lines and are include as a unit with other experimental results arrived at in South Dakota.

The personnel of the Agronomy Department suffered changes only due to the fact that Professor Hutton was on leave for about two-thirds of the year in military service as Second Lieutenant in the United States Army. The work of our Department also suffered a loss in the fact that Axel Berglind, who was in military service in France, lost his life while in that service.

The following bulletins have been issued from the Agronomy Department during the past fiscal year:

179—Emmer in South Dakota. By Champlin and Morrison.
181—Corn Culture in South Dakota. By Champlin and Winright.
184—Two Systems of Corn Breeding. By A. N. Hume.
186—Corn Families of South Dakota. By A. N. Hume.

Very respectfully,

A. N. HUME,
Agronomist and Superintendent of Substations.

DEPARTMENT OF DAIRY HUSBANDRY

Professor James W. Wilson,
Director of the Experiment Station.
Dear Sir:

In compliance with your request, I am glad to give you herewith a report of this department for the last year ending June 30, 1919:
CHANGE IN STAFF

Late in July, 1918, Mr. B. L. Johnson, our dairy analyst, entered the military service, and a successor was not found until the first of November, when Mr. Harold Hoover began work. Mr. Johnson returned to his work the first of April. Mr. Hoover also remained until the end of the year.

Mr. Robert Wylie who looked after the details of the work in dairy production left the first of May to take up county agent work. He has been succeeded by Mr. Horace Jones.

ADAMS FUND

The work has been completed on the project, "Relative Value of Proteins of Different Feeds in Dairy Cows' Rations", and is ready for publication.

During the winter and spring, 1918-1919, four cows were fed through four periods of either five or ten days each. In these periods gluten feed and oil meal were compared. These were the same feeds as were studied during the previous year.

The detail work of the experiment will not be given here but some of the more important facts are as follows:

1. The question of the proper interpretation of results obtained from substituting one protein feed for another in the ration of a cow producing milk is difficult.

2. Because of other factors which effect the results—the most important of which are probably energy supply and variations in production of milk—it cannot be said that the most valuable protein is always the one which in least quantity establishes and maintains approximate nitrogen equilibrium.

3. Unless the energy content of the ration is abundant a part of the protein will probably go to satisfy energy requirements rather than nitrogen requirements.

4. The relative efficiency of oil meal and gluten feed in establishing a nitrogen equilibrium was apparently, oil meal 52.4 percent and gluten feed 76.4 percent, or as 1 is to 1.46.

5. In all but two instances gluten feed protein seemed to show a higher relative value than oil meal protein. This
higher value, however, may be due not necessarily to the source of the protein, but possibly in part to the increased percentage of therms net energy in the hay and silage.

The other Adams Fund project under investigation is "The Manufacture of a Skimmilke Cheese That Will Keep". This work has been continued from the preceding year. During the year fifty different batches of milk have been made up into cheese with more or less success. The difficulty, of course, in the manufacture of skimmilk cheese is in securing a good flavor and a good body. It seems necessary to sacrifice the body to some extent in order to insure good flavor and keeping quality.

Bacteriological and chemical analyses are being made of some of the cheese at various ages in order to determine what changes take place in the cheese during ripening.

The allotment on the Adams Fund was $1719, with a credit of $41.67 unpaid salary (Dairy Analyst), making a total of $1760.67. It was expended as follows:

<table>
<thead>
<tr>
<th>Item</th>
<th>Amount (USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cows</td>
<td>430.00</td>
</tr>
<tr>
<td>Supplies</td>
<td>301.20</td>
</tr>
<tr>
<td>Equipment</td>
<td>25.20</td>
</tr>
<tr>
<td>Labor</td>
<td>968.50</td>
</tr>
<tr>
<td>Feed</td>
<td>35.77</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$1,760.67</strong></td>
</tr>
</tbody>
</table>

**HATCH FUND**

The work done with the manufacture and storage of ice on the farm has been written in bulletin form and is now in the hands of the printers.

It was found that ice can be frozen satisfactorily in cans. The size used most was 12”x18”x28”. This will freeze a cake of ice about 10 inches thick weighing 200 pounds.

The bulging of ice frozen in cans may be prevented by inserting certain devices to take up the expansion due to freezing, but the bulging of the ice does not seriously effect the success of ice manufacture by the can method. A pit in the ground may be used satisfactorily for the storage of ice in case an ice house is not available.
The milking machine experiments have required the largest portion of the Hatch Fund. The comparative practicability of all the different leading machines is tested. At the present time we have ten different kinds of machines in use at the dairy barn. We have been unable to use these machines all at one time. We plan to continue with the makes which were first started. A good many cows are needed in order to operate so many machines continually. The effect of machine milking on the length of lactation period; the effect of machine milking upon the shape and condition of the cow's udder and teats, and the effect of machine milking upon the total amount of milk during her total lactation period, are questions that can be decided only by continuous use of the milking machine in a dairy herd.

The record pertaining to the production, feeding and breeding of the dairy herd were kept as usual. No experimental funds, however, were used for this purpose. Everything that has been produced on the dairy farm has been weighed and analyzed and records kept of same.

The Hatch Fund allotment was $659. It was expended as follows:

<table>
<thead>
<tr>
<th>Category</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supplies</td>
<td>$ 57.19</td>
</tr>
<tr>
<td>Equipment</td>
<td>435.31</td>
</tr>
<tr>
<td>Labor</td>
<td>166.50</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$659.00</strong></td>
</tr>
</tbody>
</table>

Respectfully submitted,

C. LARSEN,
Professor of Dairy Husbandry.

DEPARTMENT OF ENTOMOLOGY

Director James W. Wilson,
Agricultural Experiment Station,
Brookings, S. Dak.

Dear Sir:

In compliance with your request of August 1, I am send-
ing you enclosed a report of the station work done by the Entomology Department during the fiscal year ending June 30, 1919.

The projects which are being investigated by this department are financed thru Adams Funds. A brief account of the work done upon each project follows:

**ADAMS PROJECT 2**

Title: The Web-Spinning Sawfly of Plum and Cherry, [Neurotoma inconspicua (Norton) Mac Gillivray], its distribution, food plants, economic importance, life history, habits, natural enemies and control. This project was completed during the past year except for a few details in the life history. A brief account of this work follows but the detailed results will appear in bulletin form later.

The distribution of this pest is general over South Dakota, but the greatest amount of damage is done in the eastern third of the state. The principal food plants attacked are the wild plums (Prunus americana Marsh), the common garden plums (Prunus domestica Linn.), the Canada plums (Prunus nigra Ait), the western sand cherry (Prunus besseyi Bailey), the compass cherry (Prunus besseyi x americana), and the hybrid plums Prunus besseyi x P. triflora, Prunus americana v. P. simonii and Prunus americana x triflora.

The damage done by this pest consists in the destruction of the foliage. This is done by the larval stages of the insect, the larvae being gregarious and web-spinners. Whenever the pest is at all abundant, the entire foliage of a tree is devoured and an unsightly web covers the branches and uneaten midribs of the leaves.

A brief account of the life history of the plum web-spinning sawfly follows:

The Neurotoma sawflies make their appearance in South Dakota during the month of June, the first sawflies being usually found during the first or second week of this month. During the four or five days following the appearance of the first sawflies, the insects increase rapidly in abundance and they usually maintain their numbers at this high level for a week and then rapidly decrease in numbers.
Mating takes place usually within two days after the sexes have appeared and within another two days the females deposit their eggs and die. An egg mass averaging 46 eggs is laid by each female upon the under surface of the midrib of plum, sand cherry, etc., leaves, and these eggs, after an incubation period of 4 to 8 days, hatch, giving rise to larvae. The larvae feed for two to three weeks upon the leaves of plum, sand cherry, etc., webbing together the foliage and feeding within the web, or with the anterior part of the body protruded from the web. After the larvae are full-grown, they drop to the ground, enter it to a depth of $1\frac{1}{2}$ to $10\frac{1}{2}$ inches and here hollow out a chamber. The larvae remain inactive in their cells throughout the remainder of the summer, fall, winter and early spring, but during the latter part of May and early June they pupate. Usually within one to two weeks the pupae give rise to sawflies.

Quite a large number of invertebrate enemies of this insect were discovered, the most important of these being the following:

A tachinid fly (Eubrachymera debilis Townsend) parasitic upon the larvae of Neurotoma. This fly was described by Townsend as a new genus and species. It may, at times, destroy as high as 50 per cent of the sawfly larvae, but the host is killed only after it has reached its full growth and entered the ground.

Larvae of Chrysopa and nymphs and adults of Podisus maculiventris Say are important predaceous enemies of the Neurotoma larvae and while they kill off large number of them, they, together with the other natural enemies, are not sufficiently abundant to warrant neglect of artificial control measures.

The most satisfactory artificial control measure to practice is to spray the trees while the larvae are still small with arsenate of lead, 2 pounds of the paste form or 1 pound of the powder to 50 gallons of water. Dusting with powdered lead arsenate will kill the larvae but not nearly so quickly as spraying with this poison.

Spraying plums with calcium arsenite, zinc arsenite,
Magnesium arsenate or Paris green, using each of these poisons at the rate indicated in the formulas below is not advisable because of the danger of burning the foliage.

**Calcium arsenite** ........................................ 1 pound
**Freshly slacked lime** ................................. 2 pounds
**Water** .................................................. 100 gallons

**Zinc arsenite** ........................................ 1 pound
**Freshly slacked lime** ................................. 2 pounds
**Water** .................................................. 100 gallons

**Magnesium arsenate** .............................. 1 pound
**Water** .................................................. 50 gallons

**Paris green** .......................................... 1 pound
**Freshly slacked lime** ................................. 2 pounds
**Water** .................................................. 150 gallons

Dusting plums with these same poisons, diluted at the rate of 1 pound to 15 pounds of air slacked lime is not to be advised because of the danger of burning the foliage.

Contact sprays such as black leaf 40, soap solution and kerosene emulsion cannot be recommended, first because they are not so effective as lead arsenate and second because the killing effect disappears with the evaporation of the spray.

**ADAMS PROJECT 3**

Title: Distribution, life history, economic importance, habits, natural enemies and control of the common field cricket (*Gryllus abbreviatus* Serv.)

The distribution of this pest and the economic importance of it have been largely determined. The habits, life history and natural enemies have been studied, but considerable remains yet to be learned along these lines. As time goes on, it becomes more and more necessary to widen the scope of this project, so that it will probably finally include a study of all the crickets of the genus, *Gryllus*. 
The chief damage done by the field crickets of the genus, Gryllus, consists in the injury done to alfalfa seed and seed pods, to shocked grains and to binder twine.

Two egg parasites of Gryllus abbreviatus were discovered. One of these, Ceratoteleia marlatti Ashmead is very common and quite a factor in keeping down the numbers of this pest; the other Paridris n.sp. is not so common.

The control measures which we are able to recommend at present are the following:

Renovate alfalfa fields in the fall to destroy the cricket eggs.

Plow or disk and harrow in the fall, fields containing cricket eggs.

Burn cocks or stacks of old hay or thrashed alfalfa, setting fire to these completely around the lower edge.

Because of war conditions, Mr. G. Gilbertson, assistant Entomologist, was not available for station work during the past year. Since it was impossible to secure other help, projects 1 and 4 were discontinued temporarily.

Respectfully,

H. C. SEVERIN.

DEPARTMENT OF HORTICULTURE

James W. Wilson, Director,
Agricultural Experiment Station,
Brookings, S. Dak.

My Dear Sir:

Creative horticulture has been for many years the main work of the Department of Horticulture. This is because the severe climate of the prairie Northwest demands hardier and better orchard and small fruits than we have at present. In the extreme south and southeastern part of the state the conditions are much the same as those obtaining in Iowa and Nebraska, while in the northern part the conditions are more like those in North Dakota.

After new varieties are obtained by our fruit-breeding
experiments they should be tested at trial stations in various parts of the state. In addition they should be tested by many planters, especially those interested in this line of work. We need room for large blocks of new seedlings now coming on. In last year's report I asked for eighty acres of land and $10,000. This appropriation could be increased with advantage to the state.

I believe it possible to develop an absolutely hardy set of not only orchard and small fruits but also ornamental trees and shrubs. My standard so far has been the ability to stand 40 degrees below zero with the ground bare. This effort has been done to make results of the work of value to the entire Northwest. I do not believe in the general cultivation of plants that demand winter protection as that is horticulture on crutches. The busy farmer will not take time to coddle plants.

My policy has been to propagate and distribute new varieties as soon and as widely as possible. Some of these new seedlings should go farther north and others farther south than this immediate locality.

**ADAMS FUND PROJECT: FRUIT BREEDING**

The past spring three varieties of the apple and eight varieties of crab apples were distributed for the first time, as follows:

**Beauty Crab**

Offered for the first time. One of our seedlings of *Pyrus baccata cerasifera* raised from seed received from the Botanical Gardens at Petrograd, Russia. The name Beauty has been given to this seedling because it is perhaps the brightest in color of all our crab seedlings. It is brilliant solid cherry, red all over with orange red underneath, especially on the shaded side. Size is about one and one-fourth inch in diameter. Dots distinct, few, white. Basin deep, irregular. Calyx deciduous with russet scar, and no opening into the core. Flesh white, firm, very juicy, acid. This is of the Cherry crab type. Tree is a very heavy bearer. It is of special promise owing to its tendency of late keeping. The fruit
makes a bright red sauce like the Hyslop crab but the flesh has not the astringency of the Hyslop. We have kept the fruit into January in a rather warm cellar. Tree is a very stocky, and vigorous grower of wide and strong forks and strongly resistant to blight. This tree should be of special value at the far North as it may mean the beginning of the development of the Siberian crab as a late keeper.

The trees sent out were one year buds on three year old *Pyrus baccata* stock.

**Olga Crab**

Offered for the first time. Pedigree: Female parent, Duchess of Oldenburg apple. Male parent, *Pyrus baccata cerasifera*, which is much like the old Cherry crab. This combines the Russian apple with the Siberian crab. Fruit is regular, oblate, fully 1½ inch in diameter on the original seedling tree. Color solid bright cherry red all over with blue bloom; dots distinct, white, many large; basin quite shallow, smooth; cavity wide, obtuse with considerable russet. Calyx mostly deciduous. Flesh is yellowish white, crisp, juicy, acid, of good quality. Flesh is yellow with red core outline. Very good to eat raw as it mellows. The fruit cooks up very quickly, as easily as the Duchess apple itself, and the sauce is of an attractive deep salmon red. Under propagation the trees may increase slightly in size of fruit. The tree is a vigorous stocky grower with strong forks and extremely productive.

The trees distributed were one year buds on Yellow Siberian crab seedling stock.

**Izo Crab**

Offered for the first time. Female parent Yellow Transparent apple. Male parent, Fluke No. 10, which is a seedling of Mercer Wild crab with some standard apple. This makes this pedigree one-half Russian apple, one-fourth West European apple and one-fourth wild crab from Mercer County, Illinois. Izo is the Sioux Indian word for peninsula. Regular, oblate. Yellow with bronze check. Russet dots and firm sub-acid flesh. The compact entire carpels of the core show in-
fluence of the wild crab. Flesh is clear acid. Appears promising as a crab that will keep well into winter.

The trees sent out were one year buds on Red Siberian stock.

Sugar Crab

Offered for the first time. A large flavored winter sweet crab. One of our seedlings of Antonovka. Fruit 2 inches in diameter, round oblate, yellow with bronze blush. Flesh a rich sweet. This has fruited several times and has increased considerably in size since it first fruited. The fruit cooks up easily into a dark yellow sweet sauce that is very good. Tree has been free from blight so far. Its really excellent flavor should commend it to those who like sweet apples.

The trees sent out were one year buds on Red Siberian seedling stock.

Alexis Crab

Offered for the first time. Alexis is a Russian man's name. I have grown thousands of seedlings of Siberian crab apples, hoping to obtain varieties free from blight. The Alexis was raised from seed obtained from the Imperial Botanic Gardens at Petrograd, Russia. Fruit much like the Dolgo crab, long conical, polished, brilliant, dark solid cherry crab with attractive blue bloom. Flesh yellow, acid. Tree very productive, free from blight so far.

The trees sent out were one year buds on Red Siberian crab seedling stock.

Cathay Crab

Offered for the first time. Cathay is the ancient name for China, referring to its native home. One of our seedlings of Pyrus ringo descended from the original importation from Russia by Professor J. L. Budd. The name as now given in Bailey’s Cyclopedia of Horticulture is Pyrus prunifolia, Willd. var. Rinki. This seedling is a good representative of this species. Fruit, one and one-half inch in diameter; clear bright yellow all over with some orange blush. Calyx deciduous. Flesh clear, juicy, acid. Original tree has been very productive. The fruit cooks up as easily as Duchess making
a light yellow acid sauce of good flavor. May be of value for ornamental purposes on the lawn as it is a dwarfish tree.

The trees sent out were one year buds on Yellow Siberian crab stock.

Red Tip Crab
Offered for the first time. Female parent, a wild crab from Elk River, Minnesota. Male parent, Pyrus Malus Niedzwetzkyana, a small red-fleshe food apple from Turkestan in the high mountains between Turkestan and China. This tree has not fruited and the pedigree does not indicate any promise as a table fruit, but the red-tipped young leaves make it an interesting tree from the ornamental standpoint.

The trees sent out were one year buds on Pyrus baccata stock.

Caramel Apple
Offered for the first time. One of our seedlings from mixed seed of choice standard Northern apples. Fully medium size, two and three-fourths inch in diameter. Late, yellow mostly covered with red stripes. Evidently of the Fameuse type. Flesh snow white, sweet, excellent. Of promise as a winter sweet apple of highest quality, but probably should go south rather than north. The name Caramel is given to it because it is a sweet apple.

The trees sent out were one year buds on Pyrus baccata stock.

Sasha Apple
Offered for the first time. Female parent, Hibernal; male parent, Gravenstein. Tree has not yet fruited, but is of strong, stock growth. Blighted some in nursery the past season, but not more than some of the standard varieties. The pedigree indicates it should combine hardiness and quality. Sasha is a Russian man’s name.

The trees sent out were one year buds on Red Siberian crab stocks.

Chance Apple
Offered for the first time. One of our chance seedlings from mixed seed of northern grown apples. Original tree
productive. Fruit oblate, regular, of full commercial size, red striped all over with attractive blue bloom. Flesh white, pleasant subacid. Season probably January or later. I hope this will help some on the late-keeping apple problem.

The trees sent out were one year buds on Pyrus baccata stocks.

**PROGRESS WITH AMERICAN WILD CRABS**

For some years I have been collecting large fruited varieties of our American native wild crabs, especially those from the northwestern part of their habitat. In time our American wild crab apples will be improved, but whether by hybridization or by straight selection is for the future to disclose. I have made many hybrids but the Izo and Red Tip are the only ones sent out so far.

In the spring of 1919 trees were distributed of the Giant Wild, Missouri Wild, and the Mercer Wild crabs.

**Giant Wild Crab**

Offered for first time spring 1917. Probably the largest wild crab found so far. Good specimens of the fruit run three inches in diameter and weigh four ounces. A brief note by W. H. Shroyer, of Sherrard, Illinois, calling attention to a large fruited wild crab, appeared in the Fruit Grower (St. Joseph, Mo., November, 1911, page 32). The article was illustrated with a cut of a specimen of the fruit. Early in December, 1911, I visited the original tree near Sherrard, Illinois, and obtained scions. The original trees was cut down in clearing out the brush some time in the winter of 1912-13, so it is fortunate that these scions were saved. As near as I could determine, the original tree of the Mercer (Fluke) wild crab was within about four miles of this place, but it had been grubbed out of the open pasture of native timber where it was found. In color and quality the fruit of the Giant is much like the other large wild crabs, such as Soulard and Mercer, and will be useful mainly for jelly, or for adding a quince-like flavor to common apple sauce.

The trees sent out were one year old budded on Siberian crab (*Pyrus baccata*) apple roots.
Missouri Wild Crab

Found many years ago somewhere in Missouri by the late Col. J. C. Evans of Kansas City, Missouri. This fruit was named and introduced by Col. Evans but I find no record of just where in Missouri it was found. Fruit roundish, two and one-half inches in diameter, truncated, regular, rich golden yellow all over. Its native acerbity is considerable toned down but still it is a wild crab. Worthy of preservation as a curiosity and perhaps as a basis for further work.

The trees sent out were one year old on Red Siberian stock.

Mercer Wild Crab

Found growing wild near Sherrard, Mercer County, Illinois, by the late N. K. Fluke of Davenport, Iowa. Fruit yellow, oblate, and up to two and five-eighths inches in diameter. Weight three ounces. This tree has been especially productive here at this station when top-grafted on Hibernal apple. Flavor acid and acerb, so it is useful mainly for jelly or for adding a quince-like flavor to apple sauce.

The trees sent out were one year old on Pyrus baccata stock.

As Downing's "Fruits and Fruit Trees of America," 1886 edition, page 273, shows that there is a Mercer apple, it will save confusion if we hereafter give the name Fluke wild crab to the Mercer wild crab apple. In this way we will also honor the discoverer.

Apples on Crab Apple Roots

Root-killing of the common apple stocks is now one great source of failure in apple culture in the prairie Northwest. It is time that definite experiments were conducted over a wide area with standard varieties of apples grown on the Siberian crab root. Such trees will be free from root-killing, will attain less size and bear earlier. Last spring we distributed one year budded trees of Scott's Winter, Red Warrior, Milwaukee, Anisim, Salome, Duchess, Hibernal, Wealthy and Yellow Sweet apples and Estalline, Sweet Russet, Whitney, and Gideon No. 25 crab apples and other standard var-
ieties. Also some new varieties, including Ivan crab, Dolgo crab, and Giant Wild crab. The plan is to put these in the hands of careful people who will plant them, give good care and keep careful records. My impression of preliminary tests here at this station is that such trees may be planted close together and will no doubt be easier to spray.

**BREEDING PEARS IMMUNE TO BLIGHT**

The experiments in breeding pears immune or resistant to blight are described in Bulletin 159 of this Station. In the spring of 1915 scions of 39 varieties were distributed to 24 men in four different states. The later developments of this work I noted in the Minnesota Horticulturist for August, 1916, and in the 13th report of the S. D. State Horticultural Society. Since the publication of Bulletin 159 the tree called *Pyrus sinensis* or *Pyrus Simonii* has been separated from the other Chinese pears by Dr. Alfred Rehder of the Arnold Arboretum into a new species and is now called *Pyrus ovoidea*. The seasons since 1914 have been marked by the most severe invasion of blight in the history of the Station. No attempt was made to cut out the affected pear, apple and crab apple trees so these resistant pear seedlings have had every opportunity to blight standing as they are in the same row with the blighted trees.

These new hybrid pears have not fruited, but the fruit cannot be expected to be smaller than that of *Pyrus ovoidea* itself which, although only one and five-eighths inches in diameter, is sweet, juicy and of fair quality.

None of our other hybrid pears were available for spring distribution simply because the Japan pear seedlings on which they were budded winter-killed. This definitely determines the fact that we must find a hardier stock than the common Japan pear seedlings, or the trees may be raised further south and then when planted at the North should be set deeply and carefully mulched each winter. *Pyrus ussuriensis*, the wild pear of the Pacific coast of Siberia bore a good crop 1917 and 1918, and we have saved every seed. This and *Pyrus ovoidea* will probably be the hardy blight-proof pear
stocks for the North. I am endeavoring to secure a supply of this seed for raising stocks.

The past spring pear trees were distributed of the following varieties: S. D. Usuri, Tolstoy, Pushkin and Gogol.

**S. D. Usuri Pear**

This is *Pyrus ussuriensis* from my own importation from Russia in the fall of 1907. We have attached the abbreviation S. D. for South Dakota so as to distinguish this importation from all others. They have proven practically immune to blight; of fine, vigorous upright habit, and very hardy, although standing in a crowded and unfavorable place.

*Ussuriensis* refers to the Usuri river in its native home on the Pacific coast section of eastern Siberia. The Usuri river starts due north of Vladivostok and runs a distance of about 400 miles north of the Amur river. Here this pear is native of vast forests of that region. *Pyrus ussuriensis* and its near relative *Pyrus ovoidea*, from north China, combine the necessary qualities of winter hardiness and blight resistance.

These trees should be carefully mulched over winter to prevent root-killing of the Japan pear seedling stocks upon which they are budded.

**Tolstoy Pear**

Pedigree: Clapp's Favorite pear x Pyrus Ovoidea pollen. This is a seedling of Clapp’s Favorite pear crossed with pollen of Pyrus ovoidea. The original tree is a beautiful tree of strong upright growth. It has shown no blight up to date, even after the severe blight invasion from 1914 to 1918, inclusive. The tree has proven hardy so far showing that it must be a true hybrid. The tree has not fruited but the size of the fruit will no doubt be intermediate between that of the two parents. Clapp’s Favorite is one of the largest and best of American pears. This was the only tree resulting from this hybridization. Introduced spring 1917 as N. E. H. 34; see S. D. Bulletin 159.

**Pushkin Pear**

Pedigree: Pyrus ovoidea x R&K 553 pear pollen.
Seventy-one trees resulted from this cross. R&K 553 is a pear received under this number from Russia. Some of the seedlings have blighted, others not. One of the best appears to be the one we numbered N. E. H. 18 and now named after Pushkin, a Russian author.

**Gogol Pear**

N. E. H. 26. Pedigree: Parrot Pear x Pyrus Ovoidea pear pollen. Two plants resulted from this combination. The Parrot pear we received from England. This one we selected and numbered N. E. H. 26 has been free from blight, except one small twig blighted in 1918. It was injured by rabbits in the winter of 1916-1917.

This seedling is named after Gogol, a Russian poet.

**PROGRESS WITH GRAPES**

The general experience with the standard varieties of grapes in South Dakota is not satisfactory as they winter-kill at frequent intervals. After testing a large assortment of the standard varieties I find the only one hardy without winter protection is the Beta. So much winter protection is required for the rest that they are not commercially valuable. The Beta was originated by the late Louis Suelter by crossing the wild grape of Carver county, Minnesota, with the Concord. The Beta is very productive but leaves much to be desired as a table grape. I have raised thousands of seedlings from wild grapes collected from various parts of the Dakotas but the results have not been very favorable owing to lack of land. Seedlings allowed to trail on the ground I find are shy fruiters. The few that have been able to get up on a trellis have done much better. I also worked with a white wild grape found many years ago on the Des Moines river at Des Moines by the late Mark Miller, one of the earliest pioneer horticulturists of Iowa.

Recently I secured the three other seedlings of the same pedigree as the Beta, viz., Dakota, Monitor and Suelter. These appear to be much like the Beta itself. Later I imported some of the best cultivated grapes from Europe and
hybridized them with the wild grapes. These \textit{Vitis vinifera} hybrids lacked in hardiness. These European \textit{Vitis vinifera} grapes are of the same type as those raised in California. In later years in making new hybrids I have used a smaller percentage of the \textit{vinifera} or European cultivated grape. Last year one of these hybrids bore fruit and again this year. While the berry is small in size it is remarkable for the improvement in flavor and above all for the ease with which the seeds separate from the pulp. The berry is nine-sixteenths of an inch in diameter, black in color, but the size may increase somewhat as the vine gets older. It is a seedling of the Wilder crossed with pollen of a wild grape from Bismarck, North Dakota. The past season I enlarged the work by collecting fruit of the native wild grape near Winnipeg, Manitoba. I hope to enlarge this work as soon as more land is available. As compared with the great importance of the work, South Dakota could well afford to have eighty acres given up to grape seedlings alone as it would afford opportunity for a quick solution of the grape question. There is room for good hardy grapes on every farm in the state.

\textbf{HATCH FUND PROJECT: ROSE BREEDING}

\textbf{Progress with Roses}

The prairie Northwest is greatly in need of double roses that bloom all summer and survive the winter without protection. Hence, rose breeding is one of the leading projects under the Hatch fund. The main materials used in this work are the wild roses of the prairie Northwest and Canada, the Siberian forms of \textit{Rosa rugosa} and as many of the best cultivated roses as it has been possible to get with the means available. Thousands of seedlings have been raised and many discarded.

Only one has been named, the Tetonkaha, described in bulletin 159, and distributed for the first time in 1912. Each year we have sent out as many sprouts of Tetonkaha as we could spare. The plants are root sprouts as we have no satisfactory grafting or budding stock for prairie conditions. Great progress is evident now from year to year as the new seedlings come into bloom. In last year's report I mentioned
our hybrid of the Tetonkaha with the American Beauty. This new seedling contains 45 petals and 20 petaloids and blooms all summer and appears to combine hardiness of plant with large size and rich fragrance of flower. Some of the new seedlings blossomed late into fall until stopped by severe frost.

I trust we will get more land so we can begin to propagate a lot of these new seedling roses. To extend the work of propagation it will be necessary to work out the problem of hardy stocks. Of course by having plenty of land it will be possible to work up a stock from the outdoor standpoint by layering the root sprouts. In the end this may be the best way as we have much trouble with wild sprouts from budded roses. Many of the seedlings obtained so far, while double in flower, will be used more as a stepping stone to something better.

New Plant Introductions

My five trips to Russia, covering a period of three years, mostly as Agricultural Explorer for the United States Department of Agriculture and in 1913 for South Dakota, gave rise to much work with new plants. Among my introductions are a large number of varieties of Durum wheats, two of which, introduced in the fall of 1897 are Kubanka and Arnaoutka. These are all listed in Inventories No. 1 and 2, Foreign Seeds and Plants imported by the Section of Seed and Plant Introduction of the United States Department of Agriculture. The Kubanka and later selections from the Kubanka and other Durum wheats have now attained great commercial importance in the United States. The work with wheat and other cereals was continued by many other introductions by the United States Department of Agriculture. However, there was work with certain other plants which seemed best for me to undertake until they were commercially established. Some of these are alfalfa, proso, esparsette, chee grass and several herbaceous perennials, pears, apples and other fruits.

Progress With Alfalfa

In my report last year I described several alfalfas de-
developed either from my importations from Russia and Siberia, or from hybridizing by transplanting the parent plants alternately. Nature has given us two main species of alfalfa, the blue flowered *Medicago sativa*, native of southern Asia, especially India and southern Persia; and the yellow-flowered, *Medicago falcata*, extending over a wide area of Europe and Asia and even far north into Siberia where the minimum temperature is 85° F. below zero.

In bulletin 159, I described my method of originating new alfalfas in a wholesale way by field transplanting. The Cossack alfalfa is one of these hybrid alfalfas, *Medicago media*, produced by nature herself in Russia. Hansen’s Hybrid alfalfa No. 1 and No. 2 were produced by transplanting at this Station. I have many more that have not been introduced. All are marked by strongly variegated flowers and all show remarkable hardiness. For practical purposes it is really a continuous F1 condition of the plant, the main point demanded being a heavy yield of forage. From the standpoint of stock feeding the color of blossom makes no difference, but this wide range of variegation of blossom in the flower makes it impossible to identify them, so the purchaser is dependent wholly on the good faith of the seed grower and merchant to obtain pure seed. Cossack is marked by a very light colored variegation, including many white flowers.

With the view to obtain a plant with some distinguishing characteristic, for several years I have selected for white flowers. My Hansen’s White Flowered alfalfa showed up 70 percent true to white color last year. The past season it was nearer 97 percent. If more land is provided I think it will be very easy to make 100 percent pure white. If it is equal in all other points, it will have a great advantage over other alfalfas as it has the distinctive trade mark of white flowers. However, I do not yet know whether to introduce it on a large scale as long as the Cossack keeps up its wonderful record. Now there are several thousand acres planted to Cossack in the western part of South Dakota because the farmers find the Cossack is the best alfalfa for general purposes.
Progress with Semipalatinsk alfalfa is described in bulletins 141 and 167. It comes from the dry steppes of Semipalatinsk province of western Siberia. Some of the farmers who have had excellent results with this alfalfa on the driest uplands of the west now abbreviate this word to Semi. It is a variety of great vigor and especially adapted to transplanting into cultivated rows. It is not at its best the first season as it first makes its remarkable root system. It does its own subsoiling on hardpan. Flowers are yellow. I find this to be the strongest in growth of all the varieties of Medicago falcata. This variety shells its seed through a long season, which is Nature's way of securing a stand in its native country with only eight inches total annual rainfall. To improve the seeding habit from the standpoint of raising seed, let the plants stand uncut and select seed from the plants that hold their seed the longest. Some will hold the seed until frost.

From a number of letters received from farmers in some of the dry uplands of the Northwest I am satisfied that this plant has a future. In my trip to Saskatoon, Saskatchewan, last fall I learned it was one hundred percent hardy. This is the general record throughout the Northwest. Its present habit of scattering the seed as already described, can, I think, be easily overcome. At the alfalfa station at Lemmon, South Dakota, the past season, I had some work done in selection for this character. Some of the plants held the seed until frost. Its frost-resistant character is remarkable. A number of reports from high uplands in several states indicate that this plant endures unhurt severe frosts every month all summer.

Special State Work With Alfalfa

June 30, 1919, ended the eight years of special state appropriations under my direction for the propagation and distribution of alfalfas from various parts of Russia and Siberia. It has been a big extra load to carry but one that has been a great pleasure to me as I felt it was a worthy cause. The hardiest alfalfas of the world have been collected and the basis is here now for future work. They will form a very prominent
part in the subduing of the great dry upland region of many western states, once called the Great American Desert. If we could solve the problem of the centuries to combine science with political power, we could hasten by a century the solution of our dry land problems, because there would then be state appropriations large enough to insure the adequate and quick distribution of all the plants that have proven their adaptability to the most severe conditions of cold and drouth.

My conclusion from all this alfalfa work is that if each western state could aid and guide the work of getting a million acres of our driest uplands into the right kind of alfalfas and certain other drouth-resistant plants, it would prevent the usual exodus of disappointed settlers when the dry seasons come again.

**Progress With Proso**

In last year’s report I reported on the work with Hansen’s White Siberian Proso, which I brought from Semipalatinsk, Siberia, in 1913. Semipalatinsk is a steppe region with only eight inches annual rainfall. Since then I have endeavored to develop a pure line by hand-picking the seed, my aim being to eliminate for table use the few grains of other colors mixed with the original stock. The past season we distributed much seed of Hansen’s White Siberian Proso. Several hundred individual plants were selected and the seed harvested separately. This I think will greatly hasten the work of developing the select variety. It is good both as a table food and as a grain for all kinds of live stock. I imported the first Proso hulling machine from Russia which was received in August, 1917, and exhibited the following month at the South Dakota State Fair at Huron. Much of this hulled seed for cooking tests was distributed and a number of good recipes have been worked out by ladies who were willing to help in this work of developing a new cereal for the Northwestern prairies. Some of these recipes save from one-third to three-fourths or all of the wheat.
Progress With Sweet Clover

In my visit to the Experiment Station of the University of Saskatchewan last fall I found excellent results with my Hansen’s White Siberian Sweet Clover. As found in cultivation the common white sweet clover, *Melilotus alba*, is probably the only native form from western Europe; its native habit is recorded also as North Africa and middle Asia. But the exact origin of the stock now in cultivation is unknown. In my 1913 trip to the Semipalatinsk province, Siberia, I found this species a common plant on the dry steppes with eight inches of annual rainfall, with temperature ranging from 50 degrees below zero Fahrenheit in winter to 106 degrees above in summer. The plants are extremely vigorous. This seed may or may not be better than the ordinary white sweet clover, but should be given a thorough trial in the driest sections. I was pleased to furnish five pounds more of this seed to the station at Saskatoon, and will continue the propagation of this special drouth-resistant form of *Melilotus alba*.

A Giant Grass For Alkali Land

In my visit to the Experiment Station of the University of Saskatchewan last fall I noticed they were having good result with Chee grass. It was of tall sturdy growth and perfectly hardy. We only have a few plants left at the station here at Brookings. The seeds are very small but as the plants stool freely it will be easy to propagate by division of the roots. Our only trouble is that we do not here have the white alkali soil which they demand for the best development. Chee grass is *Lasogrostis splendens*, a giant grass growing up to 16 feet or more on pure alkali soils on the dry steppes at Semipalatinsk. Eaten by stock when young; the older stems are used for matting. The plant really merits attention. There are large areas in alkali deserts in northern Turkestan and southwestern Siberia where the chee grass is indispensable to the Kirghiz Tartar nomad population. I feel very certain that it can be very quickly increased by machine transplanting, as was done with the Cossack alfalfa, the first one thousand pounds of which was obtained by field transplanting as described in bulletins 141 and 167.
Field Collecting

As Agricultural Explorer for the United States Department of Agriculture in 1897-8, 1906, 1908-9, and for the state of South Dakota in 1913, I collected many new plants, especially from northern Europe and Asia. In order to complete this circumpolar work I have from time to time secured seeds and plants from farmers and other people interested in horticulture from many parts of the prairie Northwest, including Manitoba and Saskatchewan. I have secured much material also by field explorations from time to time. In order to get more and better material I have determined to do much more of this work. In the summer and fall of 1918 I made three tours to North Dakota visiting especially three Indian Reservations, viz., Fort Berthold, Devil’s Lake and Turtle Mountain, also northwestern Minnesota. Two of these tours extended into Manitoba and one of the tours extended into Saskatchewan. Over one thousand miles was covered by automobile. Much valuable material was collected which is now making a good growth at this station. It is not possible to get all the material desired on one tour as the seeds are not ripe at the same time and the fruits should be collected while they are at their best. It is planned to continue this as much as time and facilities will permit.

Progress With the Pear, Apple and Rose

To hasten the work of improving the pear, apple and rose, much new work was done in hybridization the past spring. In order to secure pollen I visited a number of nurseries and orchards in the southwestern quarter of Iowa, especially Adel, Des Moines, Ames, Knoxville, Shenandoah, and Hamburg. Also went south to Kansas City, Missouri, and Rosedale, Kansas. Later in the season I worked north into North Dakota, Manitoba and Saskatchewan to gather pollen. Considerable seed was obtained as a result of the work and I trust this will help us on the way to better and hardier varieties for the northwestern prairies.
A Million Seedlings

The Association of Official Horticulturists of the Great Plains Region was organized at the Experiment Station, Mandan, North Dakota, August, 1918. Mr. Max Pfaender of the Mandan Station started the association and is secretary. The writer has the honor of being the first chairman or president of the association. As chairman of the executive committee I present the plan of raising a million seedlings for each state and province in the great plains region. The work of improvement shall be by hybridizing where possible and in all cases by raising as many generations of seedlings under cultivation as possible.

Since this will take longer than the active life time of any one man it will be advisable and necessary to plan the work for one hundred years, the idea being to have each state or province consider it as a continuous project.

I sincerely trust that South Dakota will furnish land and money sufficient to carry out this vast project. I will repeat the closing portion of my report of last year: The State should grant sufficient funds so that we may carry on the work in the right way. To cramp, hinder and slow up the work for lack of land and money, when compared with the great interests involved, is a policy that is penny-wise and pound-foolish. I have the necessary ideas and right philosophy in the matter. It is up to the state to furnish the money to carry out these plans, which are founded on my experience since 1895 in South Dakota and a wide study of horticultural conditions in countries of similar climate in Europe and Asia.

Very truly,

NIELS E. HANSEN,
Horticulturist.