FIRST ANNUAL REPORT
OF THE
U. S. AGRICULTURAL
EXPERIMENT STATION
FOR DAKOTA,
FOR THE
FISCAL YEAR ENDING JUNE 30, 1888.
Dakota Agricultural College,
Brookings, Dakota.

Brookings:
Press Steam Printing House.
1888.
NOTICE.

Any farmer in Dakota can have the Bulletins of the Station mailed to him free by addressing a request to the Director at Brookings, Dakota.
Brookings, Dakota, Jan. 20, 1889.

To the Honorable Louis K. Church,
Governor of Dakota.

I have the honor of transmitting to you herewith, obedient to the requirements of law, the first annual report of the United States Agricultural Experiment Station for Dakota, located in connection with the Dakota Agricultural College.

Very Respectfully,
F. E. Lally,
President of the Board of Regents.
BOARD OF REGENTS.

F. E. LALLY, Estelline, President pro tem.
GEORGE MOREHOUSE, Brookings, Treasurer.
CHESTER M. DURLEY, Brookings.
OSCAR P. KEMP, Watertown.
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GEORGE G. CROSE, Aberdeen.
Gov. LOUIS K. CHURCH, Bismarck, Ex-officio.

OFFICERS OF THE STATION.

LEWIS McLOUTH, Director.
LUTHER FOSTER, Supt. of Agricultural Experiments.
CHAS. A. KEFFER, Supt. of Forestry and Horticultural Exper-
I. H. ORCUTT, Entomologist.                  [periments.
JAS. H. SHEPARD, Chemist.
C. J. ALLOWAY, Veterinarian.
C. J. COTYE, Stenographer and Accountant.
NANCY L. VANDOREN, Librarian.
JAS. C. DUFFEY, Foreman of the Gardens.
W. C. COPELAND, Foreman of the Farm.
WILLIAM LAWSON, Herdsman.
Establishment of the Dakota Agricultural College and Experiment Station.

The Dakota Agricultural College was established at Brookings, Dakota, in 1881 by the XIVth Legislative Assembly of the Territory. The college was opened in 1884.

In 1887 the XVIIth Legislative Assembly passed an act of re-organization of which the following are sections 17, 18, and 19:

Sec. 17. There is hereby established an Agricultural Experiment Station in connection with the Agricultural College of Dakota, and under the direction of the board of regents of said college for the purpose of conducting experiments in agriculture, according to the terms of section 1 of an act of Congress, approved March 3, 1887, and entitled "An act to establish agricultural experiment stations in connection with the colleges established in the several States, under the provisions of an act approved July 2, 1862, and the acts supplementary thereto."

Sec. 18. The assent of the Legislature of Dakota is hereby given in pursuance of the requirements of section 9 of said act of Congress, approved March 3, 1887, to the grant of money therein made and to the establishing of an Experiment Station, in accordance with section 1 of said last mentioned act, and assent is hereby given to carry out all and singular the provisions of said act.

Sec. 19. This act shall take effect and be in force from and after its passage and approval.

Approved, March 13, 1887.
HISTORY.

During the summer and fall of 1887, 320 acres of land adjoining the original college plat of eighty acres, were purchased for an experiment farm. A few fine specimens of a considerable number of breeds of registered domestic animals were bought, a large stock barn and other buildings were erected, teams and farm tools and machinery secured—all by means of funds granted by the legislature of the Territory. The faculty of the college was, at the same time, somewhat re-organized and enlarged with the view of an active and vigorous opening of the work of the Experiment Station as soon as the Congressional appropriations should become available. During the summer and fall of 1887 some preliminary work of experimentation and of observation was accomplished as will appear in the accompanying reports of the different departments.

At their meeting on the 17th of November, 1887, Lewis McLouth, president of the college, was elected Director of the Experiment Station with authority to choose temporary assistants from the members of the faculty to act as superintendents of departments.

ORGANIZATION.

The Board of Regents of the Agricultural College, who under the Territorial law have the direction of the Agricultural Experiment Station provided by the Hatch Act, at a meeting held on the 13th of March, 1888, adopted the following scheme of organization:

I. The general management of the Dakota Agricultural Experiment Station, located by the last legislature in connection with the Agricultural College at Brookings, shall, under the Regents, be vested in a Council of Control, consisting of the President of the College as Director of the Station, the Professor of Agriculture as Superintendent of Farm and Stock Experiments, the Professor of Horticulture and Forestry as Superintendent of Horticultural and For-
estry Experiments, the Professor of Zoology and Physiology in charge of Entomological work, an analytical chemist in charge of Chemical Analysis, and a Professor of Veterinary Science in charge of investigations of the diseases of animals.

II. The President of the College, as Director of the Station, shall be Chairman of the Council and shall have the same supervisory control of the Experiment Station as of the College. He shall also cause to be kept complete account of all receipts and expenditures and all the necessary records of the Experiment Station.

III. The Director of the Station, with the Superintendent of Agricultural Experiments and the Superintendent of Horticultural and Forestry Experiments, shall constitute an Executive Committee, to determine all matters of interest to the Experiment Station that may arise as emergencies in the intermin of meetings of the Board of Regents.

IV. The Superintendent of experiments in agriculture shall have the oversight, direction and planning, under the advice of the Council of Control, of investigations and researches in all branches of agriculture and stock industry as more fully specified in section 2 of the Hatch Act.

V. The Superintendent of Horticultural, Botanical and Forestry Experiments shall have similar authority in the investigations of his department, and he shall pursue the lines of research indicated in section 2 of the Hatch Act.

VI. The duties of the Entomologist are to investigate the habits and the conditions of growth and multiplication of all injurious insects, their enemies and the best methods of protecting the agricultural interests against their inroads.

VII. The duties of the Veterinarian are to make investigation into the diseases of domestic animals, search for remedies and methods of prevention and to make researches in the anatomy, physiology, and hygiene of animal life, as indicated in the second section of the Hatch Act.

VIII. The duties of the Chemist are to make such chemical analyses as are needful for the successful completion of any experiments in any of the other departments, and to
make analyses of soils, waters, foods and forage, as indicated in the Hatch Act.

IX. It shall be the duty of all to prepare for publication in bulletins and in general annual reports, the results of their experiments as fast as facts are ascertained or conclusions reached.

X. All purchases of books, apparatus, machinery, tools, teams, stock or other material necessary to carry on the experiments of the Station, shall be made in the same manner as purchases for the College are now directed to be made, and all expenditures for labor are to be made and controlled as like expenditures for the College.

XI. The treasurer of the Board or Regents shall be treasurer of the Experiment Station, shall have the custody of all funds, shall receive for them on behalf of the Station, shall pay them out as ordered by the Board of Regents and according to their rules, shall keep complete accounts of all receipts and expenditures, and shall prepare the financial statement for the annual report. His bonds are fixed at ten thousand dollars.

By this action the following persons became the working staff of the Station.

LEWIS McLOUTH, Director.
LUTHER FOSTER, Agriculturist.
CHARLES A. KEFFER, Horticulturist & Botanist.
I. H. ORCUTT, Entomologist.
NANCY L. VAN DOREN, Librarian.

Subsequently the following persons were added to the force:

JAMES H. SHEPARD, Chemist.
C. JNO. ALLOWAY, Veterinarian.
C. J. COTHEY, Accountant and Stenographer.
JAS. C. DUFFEY, Foreman of the Gardens.
W. C. COPELAND, Foreman of the Farm.
WILLIAM LAWSON, Herdsman.
At this meeting also the Regents made the following apportionment of money among the different departments for the first fiscal year:

<table>
<thead>
<tr>
<th>Department</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salaries</td>
<td>$3,300</td>
</tr>
<tr>
<td>Labor</td>
<td>1,550</td>
</tr>
<tr>
<td>Library</td>
<td>1,200</td>
</tr>
<tr>
<td>Chemicals and Apparatus</td>
<td>1,200</td>
</tr>
<tr>
<td>Horticultural and Forestry Supplies</td>
<td>1,700</td>
</tr>
<tr>
<td>Agricultural Supplies and Apparatus</td>
<td>1,700</td>
</tr>
<tr>
<td>Plant House</td>
<td>3,000</td>
</tr>
<tr>
<td>Entomological Supplies</td>
<td>200</td>
</tr>
<tr>
<td>Printing</td>
<td>200</td>
</tr>
<tr>
<td>Stationery and Office Supplies</td>
<td>100</td>
</tr>
<tr>
<td>Incidental, Fuel, Lights, etc.</td>
<td>300</td>
</tr>
<tr>
<td>Contingent</td>
<td>550</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$15,000</strong></td>
</tr>
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It has seemed wise to the management of the Station to undertake at first only those problems which most closely touch the agricultural interests of this territory. These problems are largely such as include the element of climate. Questions of butter and cheese making, questions of fattening, the comparative values of different kinds of feed, the relative profitableness of different breeds of animals, the composition of artificial fertilizers, etc., are questions which, when settled in Minnesota or Wisconsin, are settled as well for Dakota. But the questions whether corn is a profitable crop here; what tame grass will grow here; what fruits will thrive; what trees can be made to grow well here for shelter-belts or for fuel; what cattle, horses, swine and sheep are best adapted to our climate—these are questions that can only be settled by trial in Dakota. Consequently these and similar problems are the ones which it has been determined to attack. Discoveries in pure science are ultimately of great value to ordinary human industries, but in the division of labor it was thought best to leave such to the older and better equipped Stations, while the coarser but more pressing questions, that touch the immediate needs of the farmers of Dakota, were taken up for study. There is plenty of work for our Station in this field of experimentation.

With these considerations governing, the Station has started out to determine the length of the corn season, to find what grasses can be cultivated to take the place of the prairie pastures, to learn the profitableness of various root crops, to ascertain what forest and what fruit trees will grow best, and what kinds of garden vegetables can be easily cultivated to add variety to the farmers' bill of fare and to increase his profits. The chemist is prepared with his art to assist in this work, and the entomologist is trying to find out the most successful manner of making war upon the predatory insects that prey upon the growing crops from seed time to harvest.

Quite full sets of meteorological instruments have been procured, in part by purchase and in part by the courtesy
of the U. S. Signal Service, and weather observations are being carefully made and records preserved. Every effort is being put forth to study the climatic conditions, and to procure the enlargement and efficiency of the weather service of the Territory. As an illustration of the possible value of this service it may be stated that on the twelfth of last January full telegraphic signals, sent in advance of the not rapidly advancing storm, would have saved many lives and much suffering.

It must, of course, be borne in mind that the work above briefly outlined will take a long time to complete; but the Station proposes to be diligent and active to its utmost, and hopes to add each year—even the first—something of value to the knowledge of the resources and possibilities of this Territory.

For a more detailed statement of the work undertaken the reader is referred to the special reports of the departments of Agriculture and of Forestry and Gardening subjoined.

It is to be kept in mind that owing to the want of land, teams, tools and other means none but meager operations were possible before the opening of the season of 1888.

FINANCIAL REPORT.

All expenditures have been made under orders of the Board of Regents, and the itemized vouchers receipted by the payee and audited by the Board before payment was made. These vouchers, properly classified, are on file in the office of the Director. After the business of the year was closed the Board of Regents examined and compared these vouchers with the accountant’s books, and found them correct in every particular. The sums actually expended for the different purposes vary slightly from the apportionment made early in March. For instance the sum of $3,300 was set apart in the apportionment for salaries, but only $2,892.69.
were expended; on the other hand nothing had been set apart in the apportionment for veterinary supplies, while it was found best to expend for that purpose $300. The best prevision could not guard against such discrepancies.

**BALANCE SHEET.**

1888.

**RECEIPTS.**

April 2, U. S. Treasury draft $7,500
April 16, U. S. Treasury draft 3,750
July 24, U. S. Treasury draft 3,750

Total, $15,000

**DISBURSEMENTS.**

Salaries of Station employees $2,892 69
Agricultural Implements and Tools 417 98
Labor, Hand and Team 1,575 11
Teams and Harness 899 30
Horticultural Implements and Tools 706 66
Freight and Cartage 151 47
Seeds, Trees and Plants 702 60
Hot Beds, Marking Targets, etc. 134 13
Feed and Forage 431 30
Plant House 3,000 00
Library Books, Periodicals and Cases 1,391 13
Office Furniture 283 00
Chemical Supplies and Apparatus 1,141 15
Express and Telegrams 80 75
Stationery, Postage and Incidental Office Supplies 55 80
Meteorological Instruments 58 85
Veterinary Supplies and Apparatus 300 00
Fertilizers 196 28
Printing 171 50
Entomological Supplies and Apparatus 391 37
Sundries not classified 18 93

Total $15,000 00
CERTIFICATE OF THE BOARD OF REGENTS.

We, the undersigned committee of the Board of Regents, appointed for that purpose, have examined the vouchers covering the expenditures of the Experiment Station for the fiscal year ending June 30, 1888, and have compared them with the books of the Director, and we hereby certify that the books and vouchers agree, and that the expenditures have been made in accordance with the rules and regulations of the Board of Regents.

Brookings, Dakota, Nov. 22, 1888.

F. E. Lalley, Oscar P. Kemp, Geo. G. Crose, Com.
WORK OF THE STATION.

Departments of Entomology, Chemistry and Veterinary Science.

Owing to the lateness of the time when the Congressional funds for the support of the Station became available, and the necessary delays in making appointments, the above departments during the first brief fiscal year were hardly able to do more than prepare for work.

The Entomologist has succeeded in fitting up a fair working laboratory, and in equipping it with cases, tables, microscopes and accessories, spraying apparatus, and insecticides and in securing some cases of specimens. He has already entered upon the study of the life history of our predatory insects and their insect enemies.

He is conducting an extended series of experiments to ascertain the best insecticides and the best means and apparatus for their application. Already he has rendered good service to the Farm and Garden departments in assisting them against their insect enemies. In order that his department may have its usefulness raised and extended he has invited the people of the Territory to co-operate with him by correspondence and by furnishing specimens and descriptions.

The Chemist has by aid of territorial appropriations for that purpose fitted up and furnished with necessary fixtures and some of the apparatus a working analytical
laboratory. By aid of the amount apportioned to him from the Experiment Station funds he has now furnished himself with the additional necessary appliances for doing his work. One of the first lines of work he proposes entering upon is an extended examination of the purity and healthfulness of the well waters of the Territory. Many especially of the artesian waters are said to have large amounts of mineral ingredients: these will be determined and pronounced upon. He will also make numerous soil analyses, especially of the so called "alkali" soils.

He is also prepared to co-operate with and assist the other departments of the Station by the analysis of roots, grains, grasses, etc.

The Veterinarian was appointed so late that he has thus far only had time to provide himself with some of the necessary tools for his use.

DEPARTMENT OF FORESTRY AND HORTICULTURE.

Chas. A. Keffer, Superintendent.

A building has been erected for the use of the department of Forestry, Horticulture and Botany at a cost of $3,000, this amount including the purchase of a Spence hot water heating apparatus for the propagating room.

The building is a one story structure, brick veneered to the tops of the windows, with a shingle course from the window caps to the eaves. It is 28x46 feet in size, with a propagating room along the south side, 18x46 feet, the roof and sides of which are of double strength glass. The main floor is divided into the following rooms: an office, microscopic laboratory, herbarium, grafting room, and tool room.

The cellar is 28x46 feet, eight feet in the clear; it contains a commodious graft storage room, besides fuel, boiler and packing rooms. The attic is large, well lighted and airy, and will be used for storing seeds. The floors of the
main story are of hard pine, the wood work of white pine, finished in oil.

The work of this department thus far has been largely of a preliminary nature, and in order to reach the most valuable results it will be necessary to extend the experiments and observations over a number of years. There is printed herewith a list of the various trees, plants and seeds with which the year's work has to do.

The spring was most favorable for extensive planting, being wet and backward, but the weather was not at all favorable to that early growth which is so much to be desired in tree culture.

THE EXPERIMENTAL ORCHARD.

An orchard containing between three and four acres was planted in the spring with the following kinds and varieties of trees:

**PLUMS.**—DeSoto, Forest Garden, Van Buren, Miner, Wolf, Milton, Wild Goose, Rare Ripe, Hawkeye, Winnebago, Crescent City, Harrison's Peach, Golden Beauty, Rollingstone, Esther, Speer, Chas. Downing, Wyant, Rockford, Weaver, New American, Owatonna, Moldavka, Black Prune, Early Red, White Nicholas, 19 Orel, 20 Orel, 21 Orel.

*Note.*—The last seven varieties named were imported from Russia by Professor J. L. Budd, of the Iowa Agricultural College.

**CHERRIES.**—(Russian and German varieties, imported by Prof. Budd.) Brusseler Braune, Lithauer Reischel, Ostheim, Vladimir, Lutovka, No. 62.

**PEARS.**—(Russian varieties from Prof. Budd.) 4 M. Dula, 392, Kurskaya, 347 Gakooskaya, 508 Bessemianka, 391 ———, 418 Early Bergamot, 9 M. Winter.

**APPLES.**—316 Red Reinette, 290 Ukraine, 245 Borovinka, 190 Tiesenhausen, 985 Red Anis, 10 M. Ukraine, 261 Repka Aport, 29 M. Melonen, 159 M. Crooked Spike, Babuschino, 324 German Calville, 413 Cross, Antonovka (Vilne), 25———, Switzer, 257 Arabka, 24 M. Sandy

Note.—Both name and number are printed for the Russian sorts, so that anyone who has received any of the Russians in this list by number only, can here find the name. The nomenclature is that of Chas. Gibb as published in the American Pomological Society’s Report for 1887.


In addition to the above named fruit trees, two thousand apple grafts, including sixty varieties, were planted in nursery rows.

SMALL FRUITS.

An effort has been made to secure of each variety of the different small fruits to give a thorough test as to quality, hardiness, strength of growth, etc. All of the varieties of the various fruits are receiving the same care, and are growing under similar conditions, so that in all cases their relative merits may be apparent.

RASPBERRIES.—Turner, Brandwine, Cuthbert, Wild Red from Bottineau County Dakota, Philadelphia, Shaffer’s
Colossal, Doolittle, Gregg, Mammoth Cluster, Souhegan, Ohio, Johnson’s Sweet.

Strawberries.—Cumberland, Wilson, Chas. Downing, Green Prolific, May King, Red Jacket, Sharpless, Glendale, Manchester, Countess, Windsor Chief, Crescent, Mt. Vernon, Captain Jack, Sucker State, Belmont, Indiana, Prince, Jumbo, Kentucky.

Currants.—White Grape, White Dutch, Red Dutch, Victoria, Cherry, Fay’s Prolific, Native wild Black from Bottineau County.

Gooseberries.—Houghton, Chas. Downing, Industry, Mountain Seedling, Native from Bottineau County.

Other Small Fruits.—Native Sand Cherry from McCook County, Native Dwarf Juneberry from Bottineau County, Windom Dewberry, Stone’s Hardy Blackberry, Native Buffalo Berry from McCook County.

Grapes.—The College grounds offer no very favorable location for a vineyard. Six vines of each of the following varieties have been planted. A large addition will be made to this list next spring.

Varieties—Janesville, Agawam, Salem, Prentiss, Pocklington, Lady, Worden’s, Hartford Prolific, Brighton, Ives Seedling, Martha, Merrimac, Moore’s Early, Delaware, Niagara, Concord, Roger’s No. 9.

GARDEN.

A large number of garden seeds, including several varieties of each of the vegetables common to this latitude, have been planted, the purpose being to note the comparative value of different sorts for this locality. Especial attention is being given to the tomato and celery, vegetables not commonly grown in this region.

FORESTRY.

Last October a plat of between two and three acres was planted to forest tree seeds. The different kinds were planted in irregular groups, in hills four feet apart, the intention being to have the trees stand permanently where the seed was sown, and it was thought by grouping the
different varieties, a mixed grove might ultimately be obtained, which would be similar to the natural woodlands of the east. All of the varieties planted save hickory, basswood and black locust germinated this spring, but many of the seedlings were killed by cut-worms while very young. It is thought, however, enough remain to insure the success of the experiment. The vacant spaces may be replanted this fall. Varieties used: Box elder, white ash, black wild cherry, honey locust, white oak, burr oak, red oak, black walnut, white walnut or butternut, chestnut, hard maple, shell bark hickory and black locust.

The following varieties of seedling trees, in quantities from 200 to 2000, were secured in the spring, and are growing in nursery rows this season. The evergreens were heavily mulched with straw, and have been very successful thus far. They were mostly from four to ten inches high when planted, and have made a growth of from one to three inches. Next spring a forest plantation of five acres will be planted, using the trees which have been grown this season in the nursery.

Varieties.—European larch, yellow birch, black wild cherry, European white birch, box elder, white ash, white elm, cottonwood, soft maple, white walnut, white oak, basswood, Scotch pine, white spruce, Norway spruce, balsam fir, Colorado blue spruce, Douglas spruce, arbor vitae, white pine, red cedar, Black Hills native spruce, Black Hills native pine, hemlock, red pine, gray pine.

Experiments in the Germination of Forest Tree Seeds.—At the time of planting the forest tree seeds last October, a quantity of seeds of several of the varieties used—principally box elder and native white ash—were mixed with sand, boxed, and exposed on the north side of the main college building until the spring was well advanced when they were planted in nursery rows. The box elder and ash germinated, and I judge all grew. The oaks, walnuts and hickories failed to germinate. I think probably they would have grown had they been planted earlier in the spring.

This spring a number of varieties of seeds, named below, were purchased, but were not delivered until late in April.
They were soaked in cold water twenty-four hours except the locust, on which boiling water was poured. They were then planted by the side of the seeds which were kept in sand over winter. Very few of the soaked seeds germinated, and with the exception of the honey locust, all are now dead. The varieties used were white ash, box elder, sugar maple, blue ash, European ash, black ash, European basswood, American mountain ash, basswood, honey locust, mountain maple, white thorn, choke cherry, black wild cherry.

Cuttings.—A barrel of cuttings, of varieties named below, was presented to the department by Mr. James Smith, of Cresbard, Faulk county. They arrived before the ground could be prepared, and were kept in a root cellar. When the ground was in good condition they were soaked in water forty-eight hours, and planted in subsoiled rows. All have grown well save a few which were very thin and weak, having been taken from slender twigs. The varieties planted were laurels, leaved willow, and the following named poplars: Populus certinensis, P. pyramidalis, P. nolester, P. pyramidalis suavolens.

A number of cuttings of the poplars named were stuck along the creek which flows through the college farm, one bend being planted full of them. An examination shows that many buds started but few have lived. The land had never been broken, and the cuttings were stuck just after a heavy rain. The place is now covered with high grass.

NOTES ON THE GROWTH OF TREES IN THE AGRICULTURAL COLLEGE GROUNDS.

The following notes on the growth of the trees in the Agricultural College grounds are given as showing the action of different varieties under similar conditions. The trees were planted one and two years ago, having been shipped from Lake City, Minn., a town on the Mississippi River. They were placed in what is destined to be the campus; and having been set in irregular groups, with a view to ultimate landscape effect, it was impossible to give them much cultivation. They were carefully planted
liberally mulched with coarse manure, and left with but little care until September last. The campus occupies the summit and slopes of a slight ridge, and being exposed to winds on all sides, the trees were so blown as to make holes at their bases, in many instances as much as six inches deep and three inches in diameter. In September the mulch was removed from the trees and the ground around them was firmly tamped, after which the mulch was replaced and the trees left for the winter.

The soil is the usual black loam of the prairies with compact subsoil of yellow clay, containing a little sand. One crop of wheat had been taken from part of the ground, the remainder having been broken in June, backset in the fall and set to trees in the spring. The land had been but poorly plowed for the wheat crop, so that the entire plat might be considered new. About the only favorable condition for tree growth was the mulching. The early part of the season was rather dry, but copious rains fell in August, to the great benefit, no doubt, of the trees.

In the notes which follow, the figures given are the result of actual measurements, the longest leader that could be found on any tree of the variety having been measured. In most cases an estimate of average growth is given, this estimate was made after a careful examination of all the trees and may be considered reasonably accurate. The leaves of most of the trees having fallen when this bulletin was prepared, the species of a few sorts could not be definitely determined. In such cases the genus is given, followed by an interrogation point.

Betula alba. White Birch. The trees of this variety, taken as a whole, have made better growth during the past season than any others on the college grounds except white willow. When planted, they averaged not more than four feet in height. The average growth of over thirty trees, located in different parts of the grounds, was more than a foot. The longest leader measured three feet one inch. No apparent difference in growth was observed between the trees on the tops of knolls and those in lower ground. Birch wood is now being used very much in the manufacture of
furniture; a large part of the so called "mahogany finished" furniture being stained birch. The foliage is healthy, and the graceful habit of the tree, with the white bark of its trunk, makes it very ornamental. This, with the commercial value of its timber and its rapidity of growth, should commend it to planters generally.

Betula alba pendula laciniala. Cut Leaved Birch. This is one of the most ornamental trees that will thrive in Dakota. The leaves are deeply cut and the long slender branches are quite pendulous after the trees have attained a height of sixteen feet, more or less. The few trees we have did not make half as much growth as did the white birch. The longest top branch found measured nine inches.

Betula. var. fol. purpurea. Purple Leaved Birch. A number of small specimens, budded a foot from the ground on a dwarf species—probably B. nana—have made scarcely any growth during the season, the beautifully tinted foliage not being able to stand the dry weather of this region. It cannot be recommended.

Alnus glutinosa. (A) Alder. A dozen or more alders in the college grounds passed through the last severe winter without injury, and made a fair growth the past season several trees showing new wood ten inches long. One leader measured one foot three inches in length. The alder is a fine ornamental tree with foliage somewhat resembling the small leaves of the hazlenut. It seldom exceeds thirty-five feet in height and its wood is not particularly useful; for lawn planting, however, it should prove a valuable sort.

Negundo aceroides. Box Elder. This is one of the varieties most largely used in the planting of tree claims. The trees on the college grounds did not make a great growth last year, the longest shoot found measuring two feet two inches, while the average growth would hardly exceed ten inches. The species has made a remarkable record under cultivation, and our specimens, while they have not equaled the white birch in growth the past season, have been healthy and are evidently in good con-
dition for work next spring. The box elder is probably the toughest of the soft wooded, rapid growing trees, and for this reason it would make good live fence posts.

*Acer dasycarpum*. Silver Leaf or Soft Maple. Only a few trees of this kind have made a good growth this year, most of them showing little more than a tuft of leaves. One had a leader two feet three inches long, but this was exceptional. The soft maple cannot be recommended for prairie culture because the wood is not tough enough to withstand the heavy winds. Its timber is no more valuable for farm uses than box elder, which will give greater satisfaction to the planter.

*Acer *var* laciniata*. Cut Leaf Maple. This unique variety of soft maple has made a growth of five inches the past summer. The leaves are smaller than in silver maple and deeply cut, the lobes being divided and pointed. If it prove hearty it will be a valuable lawn tree.

*Pyrus Americana*. American Mountain Ash. The trees of this sort have grown well and been free from blight the past season, several branches being found which measured one foot six inches in length. The trees do not show any injury from freezing. The beautiful compound leaves and the clusters of brilliant red berries of this species make it a most desirable variety for the lawn.

*Pyrus aria*. Wheat Beam Tree. Like the mountain ash, which it resembles, this is an ornamental tree of great beauty. Its leaves are darker and thicker than those of the mountain ash, and they are lobed or cleft rather than divided; the tree is also a more upright grower. A leader was found which was nine inches long, and the average growth was but little less. Some of the trees blighted badly; a very grave fault in an ornamental sort. Aside from blight, it is a question whether the mountain ash or the white beam tree is perfectly hardy.

*Fraxinus Americana*. White Ash. This variety has grown but little during the past season. Only one tree of the hundred or more living in our grounds shows even a moderate growth; the year's growth consisted of a mere tuft of
leaves on a very short axis. If the lesson to be learned from this fact is that the ash needs good cultivation, it is an important one. Our trees were nursery grown and few of them were more than one inch in diameter when planted.

*Tilia Americana.* Basswood, Linn, Linden. The trees of this variety spent most of the season in determining whether to live or die, and that question settled, they had not much time or energy left for growth. The longest branch measured nine inches. The timber of basswood does not equal that of box elder in value. As an addition to our short list of ornamental trees it is to be prized. Its round leaves make fine shade during the summer, and its fragrant, cream-colored flowers add much to its beauty.

*Salix alba.* White Willow. There are only three trees of this species in the college grounds, and they seem to have determined to make a good reputation for themselves. One bore a lateral shoot which measured five and one half feet in length. The best terminal shoot was two feet long. The tree on which it grew stood on top of a low ridge. The trees were all healthy, and being quite young, the branches reached to the ground, making a dome of green.

*Quercus alba.* White Oak. Of the two dozen or more oak trees set, but one showed any life this fall, and in it the top had died to the ground, but a healthy young shoot, several inches long, has sprung from the root. The great value of oak timber need scarcely be mentioned. As the tree is a very slow grower, and makes a tap root that descends deep into the earth, it is difficult to transplant. Every planter should put acorns into his tree claim. While the more rapid trees are reaching upward, the little oak will be sending its root deep down, and after a few years, when he has almost forgotten its existence, the planter will be astonished to see the young trees appear among their rapid growing fellows.

*Catalpa speciosa.* Hardy Cattapa. Probably no tree has been more extensively experimented with in the west than the catalpa. The specimens here seem to be out of their latitude. The longest branch of this year's growth is
six inches and all the growth is weak. The catalpa cannot be recommended.

*Populus dilatata.* Lombardy Poplar. The two trees of this variety have both been broken off, one near the ground and the other about three feet above; both sent up vigorous shoots the past season, the longest measuring four and one half feet. The Lombardy poplar is very erect in habit, its branches rising close to the trunk and thus making a pillar of green.

*Larix Europaea.* European Larch. The half dozen trees in the grounds suggest great possibilities in the species for forest culture. One tree made a leader a foot long and all grew well. The larch is a native of high latitudes, and is grown in vast quantities in many parts of Europe. The trunk is very straight, the laterals small and the thinnings from a plantation can be used for fence poles, stakes, etc., while the trees are still quite young. As the leaves start very early in the spring, transplanting should be done sooner than with other deciduous trees.

*Ulmus Americana.* White or American Elm. Next to white birch, the white elm has made the most satisfactory growth during the past season. Unlike the birch, the elm has not thrown out strong leaders, but a great many small twigs have appeared, each clothed with glossy foliage, and the trees have proved themselves in fine condition. The longest shoot found measured only a foot, but on each tree there were several branches of almost equal growth. The elm is a most valuable tree for the Dakota planter; the wood is tough and can be used in many places where strong timber is necessary. It makes a steady growth, and is perfectly hardy.

*Pinus strobus.* White Pine. Several white pine trees, six or eight feet high when set, barely lived through the past season, their weak and scanty foliage making them anything but ornamental objects. The small trees, while they have grown but little, are healthy and promising.

*Pinus sylvestris.* Scotch Pine. Trees of this variety which were four or five feet high when planted show good foliage and have perfectly matured buds, indicating a fine
growth next season. The young trees also are in excellent condition. This species seems better adapted to the climate of this region than the white pine.

*Thuya occidentalis.* Arbor Vitæ. White Cedar. A hedge of Arbor Vitæ borders the front of the College grounds and its growth has been entirely satisfactory; a few leaders in it measured a foot, but these were exceptional, the average growth probably not exceeding seven inches. Isolated trees made six inches of new wood. The arbor vitæ is one of the prettiest of the evergreens and should be extensively used for ornamental hedges.

*Picea.* The Spruces. The white spruce (*P. alba*) has grown very little, but a few trees of the species seem determined to live, and may yet make fine trees. Norway Spruce (*P. excelsa*) shows a fair average growth, several branches measuring six inches in length. The trees are healthy and have fine buds.

*Abies balsamea.* Balsam Fir. There are a number of healthy young specimens of this tree, but they have grown but little the past year, the longest leaders measuring three and four inches.

*Juniperus Virginiana.* Red Cedar. Our specimens were all planted singly, and have made a ragged growth, the leaders measuring from four to eight inches. The tree may be used to good advantage for hedging, but it is inferior to arbor vitæ where isolated.

**WHAT TO PLANT.**

White elm, white ash, box elder, silver-leaf maple and cottonwood are native along Dakota streams and are presumably hardly. It is a well known fact that the native form of the white ash (*Fraxinus Americana*) differs quite a little from the white ash of Michigan and Indiana, and there is a noticeable difference between the Iowa and Dakota grown trees of this species. But the peculiarities of the native trees are due to climatic conditions and their exposure to almost constant winds. The native box elder, also, differs from the Eastern form. It is probable that under cultiva-
tion both species will take on more of the appearance of their fellows of more favored localities. It is safe, then, to plant any or all of the above named varieties. To this list a few additions might be made by those having a taste for experiment: The birches, especially the yellow and white, are promising; black wild cherry has proven a success, I am told, as far north as Cass county; basswood is native and should grow well in wet places. White willow will always be valuable because it is easily grown from cuttings and does well alike on high and low land. The Russian willow and poplars, and especially *Populus certinensis*, should be grown wherever they can be secured. *P. certinensis* has proven a success under the most adverse conditions in Faulk county. It is a very rapid grower, is absolutely hardy, not so subject to disease of foliage as cottonwood, and is said to yield a much more valuable timber than that variety. It grows readily from cuttings.

Of the trees above named, the most rapid growers under ordinary culture are white willow, cottonwood and *populus certinensis*; after these—though none are named in order—are the birches, black wild cherry, box elder, maple, white elm, white ash. When the value of their timber for farm use is considered, white ash will take the lead; the wood of yellow birch, black wild cherry and white elm is of great commercial value and for many farm uses is unexcelled.

The cone-bearing trees should be extensively tested on the Dakota prairies, for no others are so good for windbreaks. Young trees of Scotch pine, white spruce and European larch, if properly managed, are almost as sure to grow as ash and elm. They form as perfect a barrier to the north winds as tight board fences, and once established they need no repair.

It may be well in this connection to suggest a few much advertised trees that are not reliable for planting in the territory. Hardy catalpa cannot be successfully grown in Dakota unless in the extreme Southern part of the territory; it is a native of Illinois and Indiana, and is at its best south of the central part of those States—regions of far greater humidity than Dakota, hence it winter kills badly
For a general planter a hardier tree is necessary, and money will be saved if the catalpa is left for our Southern neighbors to deal with.

Russian mulberry is a failure as a tree. It branches freely from the ground up, and is admirable for ornamental hedging. It is almost impossible, however, to make it form a clear trunk, or even a low topped tree. The fruit of by far the great majority of the trees is very small—not worth bothering with. The foliage is beautiful and wherever a large shrub, or, as was said, an ornamental hedge is needed, the Russian mulberry will fill the bill satisfactorily.

Soft maple is not adapted to exposed situations, because of the tendency of its branches to break; it cannot withstand our strong winds. Box elder and white elm are almost perfect in this respect.

**HOW TO PLANT.**

If a good windbreak is desired it can be secured by laying out a plat 48 rods long and 13 rods wide, on the north side of the farm yards, and sufficiently removed from them to permit the forming of drifts between the trees and buildings. On the west end of this plat, and at right angles to it, lay off a piece 24 rods long and 13 rods wide, extending south from the west 13 rods of the longer piece. Plow deep; at least ten inches, while twelve is better, and deeper than that is best. It may be difficult to set the plow so deep in new ground, but in almost all cases deep plowing is essential to successful tree growing. Harrow smooth and mark off the land the same as for corn. The land thus laid out will measure about six acres, and a well made grove in this shape will afford almost complete protection for a space amply sufficient for barn yards, feeding lots, garden and lawn.

It is certainly not the best plan to set a grove entirely of one kind of tree, even though the variety chosen have many virtues. It is true that along our rivers it is not unusual to see native groves composed almost exclusively of cottonwood; but it is also true that these groves are usually short lived, few of the trees reaching maturity; while in groves where elm and ash and box elder or soft maple grow togeth-
er, fine specimens of each variety are of frequent occurrence. Thus Nature herself teaches us an important lesson at the very outset.

Having, then, plowed deep and harrowed well, and laid off the ground as suggested, place the trees in a tub half filled with water, and begin the work; plant with a spade; let the roots assume their natural position; set the trees a little deeper than they stood before, and tramp the dirt on and about the roots firmly. This may seem a slow way of planting, but it is a safe way. The essential points are three: deep plowing, keeping the roots moist from the time they are taken up till they are set, and planting firmly.

If it is intended to have a mixed grove, the most practical way is to plant all of one kind first, then fill in the vacant spaces with a second and third variety, or several sorts may be carried along at once and the mixing done at one going over.

For the very best windbreak nothing can surpass the Scotch pine. If the transplanted trees are too expensive, seedlings can be secured at a very low figure, and after a year's growth under shade they can be transplanted to permanent groves with perfect safety. European Larch is an excellent tree for mixing with this pine; it has been grown successfully also with elm, ash and box elder.

These suggestions are given on the supposition that trees are to be set. If seeds are planted, the ground should be plowed with the same care, harrowed till fine, and marked off as for trees.

The earlier most forest tree seeds are planted in the spring the better; so that if Arbor Day is to be celebrated by the planting of seeds, it might be well to fix upon an earlier date than the one appointed by the Governor.

As is well known, most tree seeds ripen in the autumn and lie on the ground, covered more or less with grass, leaves and snow all winter; they are thus subjected to freezing and thawing. The same treatment can be given saved seeds by mixing them with sand, or placing them in thin layers on well drained ground and covering with boards or straw. But in using seeds that have been kept dry all
winter it is important that they should be well soaked before planting. Ten hours is not too long for the most delicate seeds to soak, while good success has followed the soaking of box elder and ash seeds for two days. The seeds of honey and yellow locust should be covered with boiling water and left standing for a day or two. Where the seeds are not soaked most of them will not germinate till the second year after planting.

From four to ten seeds should be planted in a hill, as it is much easier to pull out the surplus plants than to fill in empty places.

The culture for both seedlings and transplanted trees is the same, and should be just about what is required for a good corn crop. Keep the ground well stirred through the early part of the season, but do not encourage late growth.

It will be noticed that a width of thirteen rods is suggested for the shelter belt or grove. To many this may seem wider than necessary, but every year will make more apparent the advantage of good breadth; for the greatest force of the wind is spent on the trees in the border of the grove, which thus forms a protection for the more central plants. In this way we approach the true forest conditions, and in a very few years the trees become a complete protection to one another.

Doubtless many citizens will plant a few evergreens on Arbor Day. The observance of a few simple rules will in most cases insure success.

1. If possible get your trees of a Dakota grower. The home nurserymen should be patronized whenever possible, but it is especially important that coniferous trees be purchased as near home as possible. If you can, drive to the nursery with a wagon box full of straw and old rags or sacks, and select your trees, having them dug with care.

2. From the time the trees are taken up until you set them, do not permit the dry air to strike the roots if it can be avoided. This is essential. Have wet straw at hand, and as soon as the trees are out of the ground wrap the roots well in it. Put wet straw in the bottom of the wagon, pack
the trees closely, and cover with wet blankets or sacks.

3. Choose small trees. Trees a foot high are far better than those of greater size, and in five years will be larger than those two feet high when planted.

4. *Set the trees firm.* Put fine soil among the roots, shaking the trees to make it fill the crevices; then *tramp the ground hard.*

5. Mulch deep with coarse litter.

The care of trees when first received from the nursery is an important item. As soon as received they should be unpacked. Prune the bruised roots with a sharp knife. Then puddle the roots in a mixture of fresh cow dung, clay and water in equal parts. The trees should be "heeled in," or partly buried until wanted.

In providing for a public celebration of Arbor Day, the holes in which the trees are to be planted can be dug the day before, keeping the rich surface soil to itself. In setting the trees this surface soil should be fined and put on the fibrous roots, leaving the lower soil for the top. Street and lawn trees should be tamped hard and mulched heavily with coarse stable litter or straw. If large trees are planted it is best to anchor them by means of wires fastened where the branches start and stretched to three or four posts at equal distances from each other and the bases of the trees.
The following is hardly more than a catalogue of the Agricultural Department of the Experiment Station as giving some notion of what is being done, and an intimation of the reports to follow at the close of the season.

**Corn.**—The corn experiments cover thirty-nine plats, each containing sixty rows, twenty-four hills in length. Thirty-three of these plats were planted with different varieties of corn, eighteen of dent and fifteen of flint, and the rest were used for experiments in deep and shallow cultivating and depth of planting.

The planting began the seventh of May and two rows of each plat were planted every day, Sundays excepted, for thirty days.

The stand is quite irregular, resulting in some cases from poor seed and in others from the work of ground squirrels.

The early part of the season has not been favorable for corn. Dakota grown seed was obtained for this experiment as far as possible.

The following is a list of the kinds planted. Some of these are no doubt the same varieties with different names.

**Dent Varieties**—White Rustler, Chester County Mammoth, Illinois Premium, Clearance Yellow, Wason’s Yellow, Dakota Yellow, Hickory King, Austin’s Yellow, Pride of the North, Improved Leaming, Bloody Butcher, North Star Yellow, Dakota Gold Coin, Edmund's Premium, Davis’ Yellow, Golden Dent, Davis’ White, Austin’s Calico.

**Flint Varieties**—Smut Nose, Self-Husking, Chadwick, Mercer, Washakum, Angel of Midnight, King Philip,
GRASSES AND CLOVERS.

Thirty eighth-acre plats have been seeded with grasses, clovers and mixtures. These have all been sown without grain. Still other pieces were sown with grain to compare methods of seeding. The drives and walks have been kept free from weeds by cultivation. Aside from this it has been the aim to make the conditions as nearly as possible the same as those of a farm field.

The following is a list of the kinds that have been sown:

GRASSES.—Kentucky Blue, Orchard, Red Top, Timothy, Italian Rye, Meadow Fox-Tail, Rhode Island Bent, Herd Fescue, Crested Dog’s Tail, Sheep’s Fescue, Meadow Fescue, Tall Meadow Oat, Wood Meadow, Creeping Bent, Yellow Oat, Perennial Rye, Rough Stalked Meadow, Wood Fessue, Sweet Vernal, Johnson Grass.

CLOVERS.—White, Red, Crimson Trefoil, Mammoth Red, Yellow Trefoil, Alsike, Sanfoin, Alfalfa, Sweet White (Melilot.)

ALFALFA.—The land used for this experiment had produced two crops, the first wheat and the second cabbage. It was selected on account of its thorough cultivation the previous season and consequent comparative freedom from weeds. The seeds were drilled in rows twelve inches apart, a Planet Junior garden seeder being used for the purpose.

A portion was sown at the rate of twenty pounds of seed to the acre, and the rest at fully thirty. The only difference observable in the sowing is shown in the size of the stems, those of the thin sowing being much larger and coarser. Two small pieces were also sown broadcast, one at the rate of twenty pounds of seed to the acre and the other at forty. The first of these pieces was almost entirely choked out by the weeds, and the second required assistance to keep it from suffering a like fate. That sown in drills was hoed thoroughly twice and after that
all weeds were kept pulled out. It was not mowed at all but left to make the strongest possible growth the first season. This was good, save one backset caused by the ravages of the black beetle in June, when they left the potato field and came in full force to the Alfalfa. Here they staid until most of the young leaves and tenderest shoots were devoured. The piece is now covered with snow and has been throughout the entire winter.

**White Dutch Clover.** Toward the latter part of June, 1886, a portion of the campus was sown in White Dutch Clover. Although put in thus late it made an excellent growth, covering the ground nicely before cold weather set in. During the winter, all except a small portion was covered with snow and was not injured in the least, but the portion not so protected nearly all died, not a tenth part living through the winter. Last summer it did well notwithstanding its use as a portion of the students' play ground.

**Alsike or Swedish Clover.**—A small piece was sown broadcast early in May, 1886. It made satisfactory growth during the season, was well covered during the winter no portion being exposed for comparison in wintering. Thus protected it stood our cold winter very well. Last season the growth was good, the drouth not affecting it perceptibly. This variety does not make as large a growth as the common red clover. It is again completely covered with snow.

**College Lawn.**—In the spring of 1887 we seeded four acres of the college campus for a lawn. This piece of ground was pretty well subdued, although it had produced but two crops, the first wheat and the second potatoes. The soil was first thoroughly prepared, being made very fine and smooth with the harrow, clod-crusher, rake and hoe. Having but little faith in commercial lawn mixtures, we made our own, selecting for that purpose the following seed: Kentucky Blue Grass, Red Top and White Clover. On the four acres we sowed thirteen bushels of Blue Grass and Red Top in nearly equal quantities, to which was added one-half bushel of White Clover, for the purpose of
producing a quick lawn. For want of a roller, the last and most important step in the process was omitted. The drouth affected the early growth somewhat, but after the rains it came on very well and by fall was in fairly good shape. We found it necessary to run over the ground twice during the summer with the mower, cutting the weeds above the grass.

SMALL GRAINS.

These are principally in eighth-acre plats. Some were sown broad-cast, others drilled and cultivated, and still others were put in with the press drill.

The following are the varieties sown:

WHEAT.—Blount's Hybrid No. 10, Blount's Hybrid No. 15, Blount's Hybrid No. 17, Blount's Colorado or Seven Headed, Blount's Rust Proof, Peerless, Pringle's Grandee, White Russian, French Imperial, French Imperial No. 2, Pure Scotch Fife, Wellman's Saskatchewan, Russian Fife, Velvet Chaff, Champlain, China Tea, Ladoga, Saxonka, Golden Drop, Kubauka.

OATS.—White Surprise, Brunswick, Black Tartarian, No Name, Dakota Chieftan, Golden Russian, White Victoria, Victoria, White Bonanza, Holstein, Welcome, Improved Welcome, Hargett's White, Black Norway, New Black Russian, Egyptian, American Banner, Pringle's Progress, White Belgian, Race Horse, Badger Queen, Wide Awake, Dakota Gray.

BARLEY.—Manshury, Wisconsin Manshury, Imperial Hybrid, Highland Chief, Black Hulless, White Hulless, Chevalier, Melon, Four Rowed, No. 3, Two Rowed, Danish, Imperial.

BUCKWHEAT.—Common, Silverhull, New Japan.

RYE.—Spring.

GROWTH OF GRAINS TABULATED.

The results of the first grain growing experiments of the Station, undertaken during the year 1887, are given herewith.

The land used for the experimental grain plats is a sandy loam, with a clay subsoil. It had produced but one
crop, the plats being so arranged that the north half followed wheat, the south portion flax and the rest oats. I may here note that in this instance there was no proof of the common theory that no crop will do well following a first crop of flax. There was no perceptible difference in the growth and general appearance of the grain plats that followed the three crops, and in pieces of several acres of wheat and oats, each following the same three crops, there was not the slightest observable difference in color, growth or appearance, to indicate where one previous crop had ended and another had begun.

The grains represented in the following tables, as will be noticed, were not all subjected to the same conditions at planting or during the time of growth. The soil was in all cases thoroughly prepared. A number of the plats were sown broadcast by hand and covered with a harrow. The rest were drilled in rows ten inches apart. Our manner of drilling was similar to that of the press drill. We drilled by hand, making the feet answer the purpose of the rollers for firming after the grain was covered. In soil like ours firming is of great importance. All seeds planted by hand are pressed down into moist soil at the bottom of the furrow with the ball of the foot, and the covering afterward firmed. This method insures moisture and immediate germination even in very dry weather.

The drilled plats were all hoed twice and some of them a third time—often enough to keep them entirely free from weeds. Some varieties of wheat and oats from Russia were received too late for a fair trial, and are not included in the report.

Two plats of spring rye were sown—one the ordinary small kind, the other the mammoth. The latter was put in very late. It made good growth but it rusted and was very poorly filled. The former did fairly well. We hope to give them both another trial the coming season.
## WHEAT.

<table>
<thead>
<tr>
<th>NAME OF VARIETY.</th>
<th>Sown.</th>
<th>Harvested.</th>
<th>Length of straw.</th>
<th>QUALITY OF STRAW.</th>
<th>Length of head.</th>
<th>FILLED.</th>
<th>SIZE OF GRAIN.</th>
<th>Degree of Rust.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blount's Colorado or Seven-headed</td>
<td>April 30</td>
<td>Aug. 16</td>
<td>3 ft. 1 in.</td>
<td>Rather large, stout</td>
<td>3 in.</td>
<td>Very poorly Extra</td>
<td>Small and slightly shriveled</td>
<td>Medium.</td>
</tr>
<tr>
<td>Wellman's Saskatchewan Fife</td>
<td>July 30</td>
<td>July 9</td>
<td>3 ft. 1 in.</td>
<td>Medium size, strong and well glazed</td>
<td>3 in.</td>
<td>Extra well</td>
<td>Medium and plump</td>
<td>Slight.</td>
</tr>
<tr>
<td>Saskatchewan Fife</td>
<td>July 25</td>
<td>July 3</td>
<td>3 ft. 3 in.</td>
<td>Large, stiff, extra well glazed, light foliage</td>
<td>3 ft.</td>
<td>Very well</td>
<td>Medium, short and very plump</td>
<td>None.</td>
</tr>
<tr>
<td>Pure Scotch Fife</td>
<td>July 30</td>
<td>July 6</td>
<td>3 ft. 3 in.</td>
<td>Size medium but well glazed, strong</td>
<td>3 ft.</td>
<td>Well</td>
<td>Medium and fairly full</td>
<td>None.</td>
</tr>
<tr>
<td>Russian Fife</td>
<td>May 3</td>
<td>May 11</td>
<td>3 ft. 7 in.</td>
<td>Excellent in all respects</td>
<td>3 ft.</td>
<td>Well</td>
<td>Medium, very plump and full</td>
<td>None.</td>
</tr>
<tr>
<td>China Tea</td>
<td>May 3</td>
<td>May 11</td>
<td>3 ft. 5 in.</td>
<td>Good</td>
<td>3 ft.</td>
<td>Medium Extra</td>
<td>Large, long, not plump</td>
<td>Medium.</td>
</tr>
<tr>
<td>Velvet Chaff or Blue Stem</td>
<td>July 3</td>
<td>July 29</td>
<td>3 ft. 3 in.</td>
<td>Large, strong and extra well glazed</td>
<td>3 ft.</td>
<td>Extra well</td>
<td>Large and full</td>
<td>None.</td>
</tr>
<tr>
<td>Blount's Hybrid No. 15</td>
<td>April 30</td>
<td>Aug. 9</td>
<td>3 ft. 5 in.</td>
<td>Stiff, well glazed and little foliage</td>
<td>3 ft.</td>
<td>Extra well</td>
<td>Little above medium, full, plump</td>
<td>None.</td>
</tr>
<tr>
<td>Blount's Hybrid No. 17</td>
<td>May 3</td>
<td>May 6</td>
<td>3 ft. 4 in.</td>
<td>Fairly good</td>
<td>3 ft.</td>
<td>Medium</td>
<td>Large, long and medium full</td>
<td>Slight.</td>
</tr>
<tr>
<td>Champlain</td>
<td>July 3</td>
<td>July 8</td>
<td>3 ft. 2 in.</td>
<td>Only medium in good qualities</td>
<td>3 ft.</td>
<td>Extra Well</td>
<td>Very small, not full</td>
<td>Medium.</td>
</tr>
<tr>
<td>Golden Drop</td>
<td>July 3</td>
<td>July 4</td>
<td>3 ft. 3 1/2 in.</td>
<td>Rather small, but extra strong for size</td>
<td>3 ft.</td>
<td>Well Extra</td>
<td>Slight below medium, fairly plump</td>
<td>None.</td>
</tr>
<tr>
<td>Blount's Rust Proof</td>
<td>July 3</td>
<td>July 8</td>
<td>3 ft. 6 in.</td>
<td>Below medium in general qualities</td>
<td>3 ft.</td>
<td>Well</td>
<td>Medium, long and lank</td>
<td>Medium.</td>
</tr>
<tr>
<td>Peerless or Black Bearded</td>
<td>July 3</td>
<td>July 20</td>
<td>3 ft. 4 in.</td>
<td>Very large, coarse and strong</td>
<td>3 ft.</td>
<td>Very Poorly Extra</td>
<td>Large, long and shriveled</td>
<td>Much.</td>
</tr>
<tr>
<td>Pringle's Grandee</td>
<td>July 3</td>
<td>July 12</td>
<td>3 ft. 3 in.</td>
<td>Small, stiff and well glazed</td>
<td>3 ft.</td>
<td>Well</td>
<td>Large, medium in plumpness</td>
<td>Slight.</td>
</tr>
<tr>
<td>French Imperial</td>
<td>April 25</td>
<td>July 29</td>
<td>3 ft. 3 in.</td>
<td>Very good</td>
<td>4 ft.</td>
<td>Well</td>
<td>Very long, medium full</td>
<td>None.</td>
</tr>
</tbody>
</table>

*Sown broadcast and had no cultivation.*
## OATS

<table>
<thead>
<tr>
<th>NAME OF VARIETY</th>
<th>Sowed.</th>
<th>Harvested.</th>
<th>Length of Straw.</th>
<th>QUALITY OF STRAW.</th>
<th>Length of head</th>
<th>FILLED.</th>
<th>SIZE OF GRAIN.</th>
<th>Degree of Rest.</th>
</tr>
</thead>
<tbody>
<tr>
<td>White Victoria</td>
<td>May</td>
<td>Aug. 5</td>
<td>3</td>
<td>Large, extra stiff</td>
<td>9</td>
<td>Well</td>
<td>Small and plump, thin hull</td>
<td>None.</td>
</tr>
<tr>
<td>Black Norway</td>
<td>&quot; 5 &quot;</td>
<td>&quot; 8 &quot;</td>
<td>3</td>
<td>Medium in size and strength</td>
<td>9</td>
<td>Extra</td>
<td>Large, awn light, thick hull</td>
<td>None.</td>
</tr>
<tr>
<td>Black Tartarian</td>
<td>&quot; 5 &quot;</td>
<td>&quot; 8 &quot;</td>
<td>3</td>
<td>Good size, fairly stiff</td>
<td>9</td>
<td>well</td>
<td>Large, awn long and heavy</td>
<td>Slight.</td>
</tr>
<tr>
<td>Dakota Chieftain</td>
<td>&quot; 5 &quot;</td>
<td>&quot; 1 &quot;</td>
<td>3</td>
<td>Large and strong</td>
<td>10%</td>
<td>Medium</td>
<td>Small, very plump, light hull</td>
<td>None.</td>
</tr>
<tr>
<td>No Name</td>
<td>&quot; 5 &quot;</td>
<td>&quot; 1 &quot;</td>
<td>3</td>
<td>Slightly inclined to lodge</td>
<td>10%</td>
<td>Well</td>
<td>Small and plump, thin hull</td>
<td>Slight.</td>
</tr>
<tr>
<td>Golden Russian</td>
<td>&quot; 5 &quot;</td>
<td>July 28</td>
<td>3</td>
<td>Rather weak, inclined to lodge</td>
<td>10%</td>
<td>Very well</td>
<td>Size, thickness of hull and</td>
<td>None,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>plumpness medium</td>
<td></td>
</tr>
<tr>
<td>White Surprise</td>
<td>&quot; 5 &quot;</td>
<td>Aug. 1</td>
<td>3</td>
<td>Size Medium, strength good</td>
<td>10%</td>
<td>Very well</td>
<td>Small, plump, hull rather</td>
<td>Slight.</td>
</tr>
<tr>
<td>Holstein</td>
<td>&quot; 5 &quot;</td>
<td>&quot; 1 &quot;</td>
<td>3</td>
<td>Slightly lodged</td>
<td>10%</td>
<td>Medium</td>
<td>Medium in size &amp; plumpness</td>
<td>Slight.</td>
</tr>
<tr>
<td>Probstier*</td>
<td>April 23</td>
<td>July 29</td>
<td>3</td>
<td>Stiff and strong</td>
<td>9</td>
<td>Well</td>
<td>Size, plumpness of grain and</td>
<td>None.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>thickness of hull medium</td>
<td></td>
</tr>
<tr>
<td>Welcome</td>
<td>&quot; 25 &quot;</td>
<td>&quot; 29 &quot;</td>
<td>3</td>
<td>Med. in size and strength, not lodged</td>
<td>9</td>
<td>Well</td>
<td>Small, very plump, light, thin</td>
<td>None.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>hull</td>
<td></td>
</tr>
<tr>
<td>White Belgium</td>
<td>&quot; 25 &quot;</td>
<td>&quot; 1 &quot;</td>
<td>3</td>
<td>Quite stiff, very good</td>
<td>8½</td>
<td>Medium</td>
<td>Large, plump grain, heavy</td>
<td>None.</td>
</tr>
<tr>
<td>Wide Awake</td>
<td>&quot; 25 &quot;</td>
<td>&quot; 3 &quot;</td>
<td>3</td>
<td>Medium size, weak, much lodged</td>
<td>8½</td>
<td>Very well</td>
<td>Med. in size and plumpness</td>
<td>Slight.</td>
</tr>
<tr>
<td>White Bonanza</td>
<td>&quot; 26 &quot;</td>
<td>&quot; 1 &quot;</td>
<td>3</td>
<td>Extra good in all respects</td>
<td>9½</td>
<td>Very well</td>
<td>Small, extra plump grain and</td>
<td>None.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>light hull</td>
<td></td>
</tr>
<tr>
<td>Hargett's White Seizure</td>
<td>&quot; 26 &quot;</td>
<td>July 22</td>
<td>3</td>
<td>Good, stiff and strong</td>
<td>9½</td>
<td>Extra</td>
<td>Small, extra plump, hull very</td>
<td>None.</td>
</tr>
</tbody>
</table>

* The first eight varieties were drilled and cultivated while the remainder were sown broadcast.
# BARLEY

<table>
<thead>
<tr>
<th>NAME OF VARIETY</th>
<th>Sowed</th>
<th>Harvested</th>
<th>Length of Straw</th>
<th>QUALITY OF STRAW</th>
<th>Length of head</th>
<th>FILLED</th>
<th>SIZE OF GRAIN</th>
<th>Degree of Rust</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two Rowed</td>
<td>&quot;</td>
<td>&quot; 22</td>
<td>2 6</td>
<td>Stout and stiff</td>
<td>4</td>
<td>Extra well</td>
<td>Medium size, plump</td>
<td>Very Slight.</td>
</tr>
<tr>
<td>Melon</td>
<td>&quot;</td>
<td>&quot; 20</td>
<td>2 6</td>
<td>Stout and stiff</td>
<td>3 1/2</td>
<td>Well</td>
<td>Extra large and full</td>
<td>None.</td>
</tr>
<tr>
<td>Imperial</td>
<td>&quot;</td>
<td>&quot; 25</td>
<td>2 4</td>
<td>Medium in stiffness</td>
<td>2 1/2</td>
<td>Well</td>
<td>Small and lank</td>
<td>Slight.</td>
</tr>
<tr>
<td>Four Rowed</td>
<td>&quot;</td>
<td>&quot; 25</td>
<td>2 7</td>
<td>Stiff and stout</td>
<td>2 1/2</td>
<td>Medium</td>
<td>Size and fullness medium</td>
<td>None.</td>
</tr>
<tr>
<td>Barley No 3</td>
<td>&quot;</td>
<td>&quot; 20</td>
<td>2 6</td>
<td>Very good</td>
<td>2 1/2</td>
<td>Medium</td>
<td>Large and full</td>
<td>None.</td>
</tr>
<tr>
<td>Black Hulless</td>
<td>&quot;</td>
<td>&quot; 28</td>
<td>2 7</td>
<td>Rather weak and inclined to lodge</td>
<td>2 1/2</td>
<td>EXTRA well</td>
<td>Extra large and plump</td>
<td>None.</td>
</tr>
<tr>
<td>Scotch*</td>
<td>April</td>
<td>25</td>
<td>3</td>
<td>Very large and stiff</td>
<td>2 1/2</td>
<td>Well</td>
<td>Size above med., quite plump</td>
<td>None.</td>
</tr>
<tr>
<td>Chevalier</td>
<td>&quot;</td>
<td>23</td>
<td>2 5</td>
<td>Stout and stiff</td>
<td>4</td>
<td>EXTRA well</td>
<td>Med. size, fairly full &amp; plump</td>
<td>None.</td>
</tr>
<tr>
<td>Wisconsin Manshury</td>
<td>&quot;</td>
<td>18</td>
<td>2 5</td>
<td>Extra stout and stiff</td>
<td>3</td>
<td>Well</td>
<td>Small, medium full</td>
<td>None.</td>
</tr>
<tr>
<td>Imperial Hybrid</td>
<td>&quot;</td>
<td>25</td>
<td>2 2 1/2 ft. in.</td>
<td>Extra stout and stiff</td>
<td>2 1/2</td>
<td>Well</td>
<td>Very small, fairly plump</td>
<td>None.</td>
</tr>
</tbody>
</table>

* The last four varieties sown broadcast, the rest drilled and cultivated.
In each of the preceding tables every one will find some few familiar varieties that will give a means of comparison. The varieties of wheat giving the best yield the past season are as follows: Pringle’s Grandee, French Imperial, Blount’s Rust Proof, Golden Drop, Velvet Chaff or Blue Stem, Blount’s Hybrid, No. 15, and Wellman’s Saskatchewan Fife.

The Harris Oats not mentioned in the table, ripened fully ten days in advance of the other varieties. Our trial for the past two seasons has not shown them to be of any value for cultivation here.

The Black Hulless Barley, as its name indicates, is entirely free from husk, like wheat, and with us gave an extra large yield. It will no doubt prove valuable for feeding purposes.

FORAGE PLANTS.

The following is a list of the early and late varieties under experimentation.

MILLETS.—Golden Wonder, German, Common, Hungarian, Pearl.

FODDER PLANTS.—Kaffir Corn, Brown Dhoura, Teosinte, Milo Maize, Brazilian Flour Corn.

FIELD PEAS.—White, Scotch, Canada, Prince Albert.

ROOTS.

The following is a list of the roots included in this season’s experiments. The sugar beets will be tested both in regard to their value for sugar making and stock feeding.


SUGAR BEETS.—Lane’s Imperial, Excelsior, Improved Imperial, Vilmorin’s Improved White, Lane’s Improved.

PARSNIPS.—Long Smooth, Improved Guernsey.

TURNIPS.—Large White Norfolk, Golden Ball, Yellow Stone, Cow Horn, White Flat Dutch, Yellow Aberdeen, Purple Top Globe.

RUTA BAGAS.—Westburry Swede, Sweet German, Dakota Gem, Skirvings, Large White, Laing's Swede, Prize Winner.

POTATOES.

All varieties of potatoes were planted within a few days of each other and none earlier than the twentieth of May.

Various methods of preparing the seed as well as a comparison of the profits of potato growing with that of other crops are included in this work.

Prof. Porter, Director of the Minn. Experiment Station, presented the college with his collection, consisting of three hundred varieties. Of these from three to ten tubers of a kind were planted.

In addition to this collection the following choice varieties, in quantities of one peck each, have been planted: Ohio Junior, Empire State, Early Maine, Beauty of Hebron, The Thorburn, Lady Finger, Lee's Favorite, Pearl Savoy, Early Ohio, Alexander's Prolific, Clark's No. 1, Chicago Market, White Star, Mammoth Pearl, Vick's Extra Early, Dakota Red, St. Patrick, Vanguard, Hall's Early Peach-blow, Early Harvest, Charles Downing, Burbank's Seedling, Early Telephone, Snowflake, Early Minnesota, Hughson's, Early Rose, Sunrise, O. K. Prolific, College Seedling, Dakota Mammoth Pearl.

METHODS OF PREPARING SEED.—One eye cuttings, two eye cuttings, halves cut lengthwise, halves cut crosswise, quarters, seed ends, whole potatoes, whole potatoes with two eyes.

POTATO CULTURE.

The ground in which the potatoes were planted in 1887 is a dry sandy loam. It has been cropped only one season, a small portion having been in corn and the rest in wheat. The soil was thoroughly prepared by deep plowing, harrow-
ing and clod-crushing. A part of the plowing was done in the fall and the rest in the spring, the final preparation being made just before planting. The crops on these different plowings did not differ materially, but the former gave us a little more work in cultivation.

The furrows for planting were made with a fourteen inch stubble plow, three and a half feet apart. An extra large single shovel plow would have been better, but we had none. With the exception of a small piece, the planting was done as fast as the furrows were made. On this small piece, where the planting was delayed a day or more, not over one-half of the seed ever germinated, and these were a long time in coming up.

The potatoes were cut to single eyes, as nearly as could be done and still have a good sized piece of the tuber with each eye. These were dropped in the row from ten to fourteen inches apart, and covered with hoes to the depth of three or four inches, the covering being well firmed.

The cultivation consisted of one harrowing before the potatoes came up and three plowings afterward. Those on the fall plowing received an extra harrowing, and were also, hoed. The plow used was a double shovel, and with this the hilling was done. A few rows were carefully hilled for the purpose of comparing results. The only difference observed was an occasional sunburnt potato where the double shovel was used, none being found where the work was done with the hoe. The stand was excellent and the growth of the vines very vigorous, but the yield was only medium, owing to extremely dry weather at the time when the tubers were setting and during the time of their growth.

Potato Bugs.—We were troubled some by both the black beetle and the striped Colorado beetle. The former did but little damage to the potatoes, leaving them after a few days for the Alfalfa, which they ate up pretty thoroughly. The damage done by the Colorado beetle was slight, but it required regular treatment throughout the season.

In the beginning the bugs and eggs were picked by hand, but we found this a very laborious and also expen-
sive method. We therefore abandoned it and resorted to the common remedy—Paris Green. This was applied with an ordinary hand sprinkler, using a table spoonful of the poison to two and a half gallons of water.

Quantity of Seed.—In order to determine the value of an extra amount of seed, rows of equal length side by side were planted with the same kind of seed, placing in one row single pieces containing a single eye fifteen inches apart, and in the other two such pieces every fifteen inches. The products of these rows did not differ in size or quantity of tubers. In this single experiment the extra seed was of no value.

Further experiments in seeding with whole potatoes and those cut to single eyes, also in drilling and hill planting will be necessary before anything like a complete report can be made on this subject.

Earliest Varieties.—The following were the earliest varieties raised on the College farm the past season. They were all excellent potatoes and gave a fair yield: Early Maine, Clark's No. 1, Pearl of Savoy and Early Sunrise. In addition to the above, last season showed the following varieties to be good: Chicago Market, Early Triumph, Early Harvest, Michigan Rose and Early Rose. All of the above varieties can be depended upon in this part of Dakota for a medium yield of good potatoes free from disease.

Late Varieties.—The following may be given as the best of the late varieties grown on our grounds—all of them are good: White Star, Empire State, Burbank's Seedling, Late Favorite, Alexander's Prolific, Dakota Bed, Iron Clad and O. K. Prolific.