THE STATE AGRICULTURAL COLLEGE

OF THE STATE OF COLORADO.

FIFTH ANNUAL REPORT

OF

The Agricultural Experiment Station,

FORT COLLINS, COLORADO,

For the Year 1892.

FORT COLLINS, COLO.
THE EXPRESS PUBLISHING COMPANY.
1894.

OFFICERS AND MEMBERS

OF

The State Board of Agriculture.

HON. GEORGE WYMAN, ... PRESIDENT.
HON. FRANK J. ANNIS, ... SECRETARY.
HON. FRANKLIN C. AVERY, ... TREASURER.

		TERM EXPIRES.
HON. GEORGE WYMAN,	Longmont,	1893
HON. R. A. SOUTHWORTH,	Denver,	1893
HON. CHARLES H. SMALL,	Pueblo,	1895
HON. FRANK J. ANNIS,	Fort Collins,	1895
HON. JOHN J. RYAN,	Loveland,	1897
HON. A. L. EMIGH,	Fort Collins,	1897
HON. J. E. DuBOIS,	Fort Collins,	1899
HON. B. S. LAGRANGE,	Greeley,	1899
GOVERNOR JOHN L. ROUTT,	*ex officio.*	
PRESIDENT ALSTON ELLIS,	*ex officio.*	

THE STATE EXPERIMENT STATION.

BOARD OF CONTROL.

THE STATE BOARD OF AGRICULTURE.

EXECUTIVE COMMITTEE IN CHARGE.

HON. JOHN J. RYAN, HON. B. S. LAGRANGE

HON. GEORGE WYMAN.

THE PRESIDENT OF THE COLLEGE, AND THE SECRETARY OF THE BOARD AND FACULTY.

STATION COUNCIL.

ALSTON ELLIS, A. M., PH. D., LL. D., - - PRESIDENT
WALTER J. QUICK, B. S., - DIRECTOR AND AGRICULTURIST
FRANK J. ANNIS, M. S., - - - - - - - SECRETARY
C. S. CRANDALL, M. S., - - HORTICULTURIST AND BOTANIST
DAVID O'BRINE, E. M., D. Sc., M. D., - - - CHEMIST
L. G. CARPENTER, M. S., METEOROLOGIST AND IRRIGATION ENG.
C. P. GILLETTE, M. S., - - - - - - ENTOMOLOGIST

ASSISTANTS.

FRANK L. WATROUS, - - - - - - AGRICULTURE
C. M. BROSE, - - - - - - - - - HORTICULTURE
R. E. TRIMBLE, B. S., - - - - - - METEOROLOGY
CHARLES F. BAKER, B. S., - - - - - - ENTOMOLOGY

SUB-STATIONS.

F. A. HUNTLEY, B. S. A., - - - - - SUPERINTENDENT
Arkansas Valley Station, Rocky Ford, Colorado.
GEORGE F. BRENINGER, - - - - - SUPERINTENDENT
Divide Station, Table Rock, Colorado.
FRANK BEACH, B. S., - - - - - - SUPERINTENDENT
San Luis Valley Station, Monte Vista, Colorado.

The State Agricultural College.

TREASURER'S FINANCIAL STATEMENT

FOR THE FISCAL YEAR ENDING JUNE 30, 1892.

EXPERIMENT STATION FUND.

RECEIPTS.

From United States Treasurer	$15,000 00	
From Arkansas Valley Experiment Sta. sales.	1,197 60	
From San Luis Valley Experiment Sta. sales.	75 00	
From Agricultural Section sales	7 00	
		$16,279 60

EXPENDITURES.

Salaries, Station Staff, Officers, and Assistants	$ 9,324 77	
Agricultural Section, labor and supplies	307 79	
Stationery and postage	83 00	
Horticultural Section, labor and supplies	297 46	
Divide Experiment Station	566 00	
Chemical Section, chemicals and apparatus	300 00	
Printing Bulletins	735 68	
Meteorology and Irrigation Engineering	350 00	
San Luis Valley Experiment Station	955 00	
Arkansas Valley Experiment Station	1,876 23	
Entomological Section	200 23	
Buildings at Station (United States fund)	729 55	
Buildings at Arkansas Valley Station (out of Station sales)	261 37	
Printing Annual Reports	292 52	
		$16,279 60

Experiment Station Inventory,

1892.

SUMMARY.

Agricultural Section, Fort Collins	$ 595	85
Horticultural Section, Fort Collins	163	16
Irrigation Section, Fort Collins	1,073	16
Entomological Section, Fort Collins	633	50
Total Home Station	$ 2,466	40
Arkansas Valley Station, Rocky Ford	14,610	14
San Luis Valley Station, Monte Vista	3,631	32
Divide Station, Table Rock	1,661	50
Total of Experiment Station Property	$22,369	36

Letter of Transmittal.

HON. JOHN. L. ROUTT,

Governor of Colorado:

SIR:—I have the honor to transmit herewith the Fifth Annual Report of the Agricultural Experiment Station, conducted in connection with The State Agricultural College, as required by law.

Respectfully submitted,

FRANK J. ANNIS,

Secretary of The State Board of Agriculture.

THE STATE AGRICULTURAL COLLEGE,
FORT COLLINS, COLORADO,
December, 30th, 1892.

DIRECTOR'S ANNUAL REPORT.*

To the Executive Committee of The State Board of Agriculture:

GENTLEMEN—I am able to present herewith a much fuller report than that of 1891. Last year my report was written after but one month's connection with the office.

Every year permits us to report the addition of more facilities for reliable, accurate, and satisfactory work. Less time is occupied in making preparation for work and more time is given to actual labor. It is expected that in each section more or less work will be done that is of no money value, since the object of the Station is to *experiment*—to find the unsuccessful as well as successful, and in so doing to ascertain those things that have proven worthy of adoption. Numerous problems must be worked upon, many of which at the outset promise little. However, from the less promising, or from what may have seemed the least advisable method, perhaps, is derived the greatest success. The effort and expense attending the numerous experi-

* By action of the Executive Committee of The State Board of Agriculture, this report and some of the subjoined reports have been revised so as to bring them within narrower limits. Matter not deemed very important has been omitted and some statements have been condensed. No attempt has been made to change any statement of a fact or to modify any opinion advanced or thought expressed.—[A. E.

ments undertaken are not fully understood or appreciated by the general public.

CROP SEASON.

For two years past the large number of animals running at large and trespassing on the grounds has had no small deteriorating effect on the results of experiments in the Horticultural and Agricultural Sections. The weather the past year has been abnormal in many respects. The spring was cold and very backward, retarding the work of seeding. In May a heavy and continued rain fell, which again placed a check on work. Later in the season, when autumn rains are expected, no rain came to help ripen the late crops. At this time very few crops are so well located that they can mature properly without irrigation. These vicissitudes of the weather are, of course, unavoidable. They are mentioned here to show under what trying conditions many experiments are conducted.

The Station has frequently been criticised for not issuing bulletins on certain experiments which were known to be under way. As soon as an experiment is instituted, those interested are in waiting for its completion, and expect a bulletin at once, reporting results and drawing conclusions. We should give any creditable data bulletin notice as soon as possible.

Cereal crops, owing to the cold weather late in the spring, followed by excessive rainfall after sowing, were grown the past year under conditions very different from those of former years; and any variety or other tests could not be reported upon reliable information from which the farmer might select the kind of seed he would purchase for his own seeding. The conditions of the year were un-

questionably most excellent for those varieties of seed received from Canada and other countries where the season is shorter than ours, accompanied by earlier and greater precipitation. Such varieties naturally did exceptionally well this year, but, in consequence, should our farmers select these another year, under the normal climatic conditions of Colorado, they might prove a failure, entailing heavy loss. The weather, then, has much to do with necessary repetition of experiments.

PUBLICATIONS.

We are issuing, annually, from four to six bulletins and one report. These bulletins are creditable and usually elaborate; but in a comparatively new country the farmers want enlightenment badly and want it often; they expect it from us. It is my belief that the Station would accomplish greater good by making more frequent issues.covering more subjects less elaborately treated. These publications would be more acceptable to, and more frequently and carefully perused by, the farming class, for which they are principally intended. The farmer wants short, pithy matter. The long bulletin is not read. More money could be used to great advantage in publishing bulletins and in binding those files that have been completed. We have a number of completed volumes of some the leading stations of the United States which are quite valuable for frequent reference, being superior to many books upon our Library shelves. A complete volume of the bulletins of this Station has been bound for the Library.

I am making an effort to have complete files of all Station literature kept at each sub-station and to that end have instructed the Superintendents to keep all bulletins received. I believe it advisable

to procure a rubber hand-stamp for each sub-station and require all publications received, many of which are nicely bound, to be stamped, and thereafter filed for the use of those who may be in charge. Many duplicates can be sent from this office. If every Superintendent would give some attention to this sort of literature, he would be more accurate and become better prepared for the particular labor of conducting experiments.

During the year there have been printed and distributed the following publications:

Fourth Annual Report, 1892.

Bulletin No. 17, dated October, 1891—A preliminary Report on the Fruit Interests of the State, with a list of the fruits grown in Colorado.

Bulletin No. 18, dated December, 1891—An Index to the First Seventeen Bulletins of the Station.

Special Bulletin "A," dated January, 1892—Concerning Subjects Investigated by the Experiment Station.

Bulletin No. 19, dated May, 1892—Observations on Injurious Insects, Season of 1891.

Bulletin No. 20, dated August, 1892—I. The Best Milk-Tester for the Practical Use of the Farmer and Dairyman. II. The Influence of Food upon the Pure Fat Present in Milk.

Many of these publications were distributed at farmers' institutes, farmers' clubs, granges, and fairs. At these places a directory was kept of all farmers desiring the publications regularly. The Colorado mailing list has been increased about 1,700 names. This, more than anything else I can name, exhibits the growing interest and confidence of the people of Colorado in the Station work. Exhibits were made at six fairs, which were at-

tended by some of the Station Staff. At each a crowd was constantly examining our exhibit and carrying away our publications. I deem this one of the best means of advertising and selling surplus stock. The interest of the people in our work is also exhibited by the numerous letters of inquiry we receive.

OFFICE WORK.

I have found the labor in the Director's office constantly increasing. Since my last report, the office has mailed to our complete mailing list five editions of our own bulletins, numbering about 21,000; the Fourth Annual Report of the Station, 2,000; about 3,000 Government bulletins; and about 1,300 miscellaneous bulletins. Our Station is not supplied with a mailing machine, consequently all addressing has to be done with pen and ink, except bulletins addressed to the Stations—about 1,200—for which work we are supplied with printed sheets from the Office of Experiment Stations, Washington, D. C. To facilitate mailing I had two books made, one marked "Reference Mailing List," and the other "Working Mailing List." The former is indexed in accordance with the Graves Index Vowel Mailing List, with changes to suit our needs. The book when open exhibits at the top of the two pages, "Colorado Agricultural Experiment Station Mailing List." Below this the page of the book is ruled and columns are designated, Surname, Given Name, Remarks, Page, Listed, Postoffice. The "Page" column is for reference to the "Working List." This book is for speedy reference and entry, and contains the names of all recipients of our publications arranged alphabetically. The "Working Mailing List" is indexed in four parts.

namely, "Periodicals," "Colorado," "Experiment Stations," and "Foreign." The name of this book indicates its use. For instance, in mailing bulletins, the law establishing Experiment Stations requires that copies of publications shall be forwarded first to periodicals. By turning to the index marked "Periodicals," the clerk finds properly indexed, under their respective letters, a complete list of newspapers, journals, etc., to which we forward bulletins. Under the index marked "Colorado," which, according to law, is required to receive secondary consideration, the towns and cities are indexed, and under such headings are the names of all the recipients of bulletins. Under "Experiment Stations," which is the third in importance, the States are indexed, and under these headings the names of the Stations and those to whom we send publications. The last to receive consideration is the "Foreign" list, which comprises the rest of those to whom bulletins are sent. The back of these books is appropriately lettered as follows: "Reference Mailing List, 1892 Agricultural Experiment Station, Colorado," "Working Mailing List—Agricultural Experiment Station, Colorado, 1892." The cost of both, made to order, was $15.00.

COUNCIL MEETINGS—STATION STAFF.

The regular meetings of the Council occur the last Monday evening of each month before the meeting of the Executive Committee. Last spring a full schedule of experiments was made by the committee of the Council which was approved by your Committee, and instituted by those in charge of the sections. In some instances it has been faithfully carried out at the sub-stations. The Council as a body, believes most earnestly that the

sub-stations should be supplementary in their work to the sections of the Agricultural Experiment Station and not *vice versa*, as our Superintendents in some instances seem to think.

As Director, I have, the past year, made two trips to the sub-stations; the first in March, to institute the plans for experiments recommended by the Station Council; the second in August and September, after some harvesting had been done, and at the time other crops were being harvested. The last visit enabled me to observe with what care the work was being accomplished. It convinced me that a trip should have been made in mid-summer, when crops are at their greatest growth and when cultivation is most requisite. The details of each trip of inspection were reported to you promptly on my return.

As your delegate, representing the Agricultural Experiment Station, to the National Convention of Agricultural Colleges and Experiment Stations, at New Orleans, I had a very instructive and satisfactory trip generally.

SECTIONS AND SUB-STATIONS.

The reports of the Section officers and the Superintendents of the sub-stations are herewith submitted. They will be found quite full and comprehensive. The needs of the various officers are fully outlined. A personal inspection leads me to believe that for economical, accurate, and more satisfactory work, many additions could be advantageously made to the Station equipment. Some are almost an absolute necessity.

BOTANICAL—HORTICULTURAL.

Outside of damage to experiments by roving stock and from insufficient water for irrigation, the

results of the work in this Section this year have been excellent. The schedule of work was principally a continuation of the plans of two years ago. The continuous and proper application to, and gathering information from, carefully-planned work are evidence of thorough scientific investigation. The notation on trees and shrubs will be of great interest in the West.

The work of the Section on native grasses under cultivation is destined to be of immense value, since there certainly exist species native to the arid and semi-arid regions that excel the cultivated varieties of the East in many respects. Probably no publication of our Station has received more widespread attention, or been more appreciated by both farmers and scientists, than Bulletin No 12, on Colorado Grasses, by Professors Cassidy and O'Brine. The work of collecting grasses and plants has progressed surprisingly, considering the immense amount of other work in hand.

CHEMICAL SECTION.

The analyses made by the Section consist of a number of samples of sugar beets from each of the sub-stations, and several samples grown this year; and over one hundred mother beets from the Agricultural Section, more explicitly mentioned in appended reports. These and some samples from farmers were all duplicated to the U. S. Chemist for comparison.

Nearly 400 samples of milk were also analyzed for the Agricultural Section.

IRRIGATION ENGINEERING—METEOROLOGY.

The irrigation work of the year has been an investigation of the duty of water, with self-recording instruments. These experiments were con-

ducted on a ditch covering 24,000 acres and had to do directly with fields of wheat, alfalfa, clover, and native grass, and the measurement of all the water employed in the Cache la Poudre Valley of 135,000 acres. The return waters, known as seepage, of this valley have been measured. This section has located fifteen or twenty observers of rainfall. Observations on evaporation are made.

In meteorology, the observations have been essentially as heretofore and embrace the recording, by instruments, of the humidity, pressure, and temperature of the atmosphere, the amount of precipitation and sunshine, and the wind velocity. The temperature of the soil at various depths has been taken.

ENTOMOLOGY.

From this Section one bulletin upon "Injurious Insects" appeared in 1892, which was much appreciated by farmers, gardeners, and fruit-growers. Judging from inquiries for this kind of literature, I believe those interested are clamoring for the results of such investigations. In addition to the valuable work with insects generally, some special work has been done in connection with the Agricultural Section on the removal of ticks and scab of sheep by means of kerosene emulsion. "Grub in the head" has also received the attention of the entomologist. The experiments of the Section consist mainly in testing insecticides and in work in the apiary.

ARKANSAS VALLEY SUB-STATION.

This Station, located at Rocky Ford, is the oldest and most important of the sub-stations. It is in a part of the State that has been long under cultivation and where the population is large; hence its results are more extensively applied.

I think it advisable to set out two or three small areas of forest trees. A small tract, across the main ditch, occupying a corner, the seventeen acres across the railroad tracks and some part of the forty-acre tract, where are located the buildings, could be used.

An extensive experiment with sugar beets was planned, which you will find reported. This Station has demonstrated to the people of the vicinity that Irish potatoes can be profitably grown. A bulletin is soon to appear by the former Superintendent on this and other subjects with which his labors at that point closed.

The attention of the entomologist is needed at this Station on a few very injurious insects, the most annoying being the corn worm.

DIVIDE SUB-STATION.

This Station, located in El Paso County, has an altitude of 7,200 feet. The season is very short and the experiments there consist mainly in a test of crops and varieties, that we may ascertain what the farmer may grow with safety. Crops that may mature in the short seasons often are not hardy enough to withstand the vigors of their late and and early frosts, with an occasional hailstorm. Some crops are found unsuitable, but from each experiment something is learned of value; and experimentation for a series of years will prove of immense financial benefit to the people of the Divide country, which in years past has principally been used for grazing. The entire Station, forty acres, is now under cultivation and is well equipped for almost all work required.

SAN LUIS VALLEY SUB-STATION.

This Station was visited in February and September. The first trip was made at the time I was attending the Monte Vista Farmers' Institute, in which the Superintendent of this Station took an important and active part. My last visit was at a busier season of the year. I regret that I did not visit this Station in the mid-summer. This being the first year of the Station at this site, the Superintendent needed all the assistance and advice he could secure.

The Station at Monte Vista is a peculiar one in many respects and not only the work but the valley and its needs must be studied. This has been done by the present Superintendent, who has the work required well in mind.

UNITED STATES GRASS STATION.

The coming season, we shall have no financial support from the Department of Agriculture at Washington, as will be seen from the following quotation from Assistant Secretary Willitts's letter on file in this office :

"I regret very much the necessity I have of informing you that in consequence of the great reduction in the appropriation made for the Department for the present fiscal year, it will be impossible for us to continue the assistance which we have for several years given your Station for the prosecution of experiments in grasses and forage plants. I hope you will be able to continue to some extent these experiments at your own expense, and I hope that the next Congress may enable us again to resume our assistance in the work."

AGRICULTURAL SECTION.

If the results of the labors of this Section last year were satisfactory, those for the year 1892 are not less so. This is true, despite the fact that our plans were very materially interfered with by numerous unavoidable circumstances. In the midst

of the dairy experiment, the herdsman, with a better opening in view, left us and another had to be instructed. The Assistant Agriculturist was changed for another in the middle of the season of experiments. The foreman who had charge of some experiments in irrigating, resigned for a better offer from the Nevada Agricultural College. A new man was employed who proved first-class in every particular, requiring very little extra attention, until he was taken from his duties by illness. The water supply has been insufficient since August 1st, Notwithstanding these drawbacks, there were some advantages, and the success of the Section has been flattering indeed.

EXPERIMENT GROUNDS.

While all farm crops are grown experimentally, we have always had the area nearest College Avenue set apart exclusively for specific experiments. It has been found insufficient and I deem it advisable to consider all the ground east of the north and south drives as the "Experiment Grounds of the Agricultural Section." These grounds are and will be employed as follows: Plot "A," sub-divided into fifty plats, aggregating 5½ acres, next the Avenue and south of the Agricultural Hall, has for years been employed principally in soil variation experiments with corn, wheat, oats, and rye. The yield is getting so small that I think it advisable, at least in the case of the corn, to discontinue the experiment, and if we add anything to information regarding corn culture, to do so by cultivating another area. Some tests of varieties of barley, buckwheat, and flax were made on this plot. Plot "B," west of "A," sub-divided into thirty-three plats is employed in root tests, stock peas and

beans, and some cereals. Plot "C," west of "B," consists of one-fourth and one-half acre plats where are conducted the clover, cane, and cereal experiments. "D" is the dwelling-house plot, in lawn. "E" and "F" are clover and grass gardens, west of the Agricultural Hall. "G" is intended for a grass garden east of the Hall. "H" is a fenced pasture plot seeded to mixed grasses for sheep and calves, north of dwelling. "I" is that piece of ground between the pasture plot, "H," and the Horticultural grounds. The latter will be sub-divided into half-acre plats for experimenting with crops suitable for that soil, such as okra, ramie, hemp, flax, etc. The finest flax we have ever seen grew the past year on this plot.

In the grass and clover gardens mentioned will be grown the numerous cultivated varieties.

The sugar beet experiments were quite satisfactory despite the failure of water mentioned.

Cereal crops were grown experimentally on a much larger scale than heretofore. Two hundred and thirteen varieties of wheat were grown, a report of many of which will be found in tables herewith given.

Sheep-feeding experiments, with alfalfa as a basis, are under way but not yet completed. The outcome cannot be surmised, and the experiments may require duplicating before reported.

Considerable information is of record in this office regarding the breeding and management of sheep, sheep-sheds, barns, and folds; ticks, scab, and grub annoying sheep; and the tests of several commercial dips, in comparison with kerosene emulsion, with reference to their cost and potency.

I am grateful for the past consideration shown me by your honorable body.

Respectfully asking your careful attention to the needs I have herein mentioned, I remain.

Very cordially yours,

WALTER J. QUICK,

Director and Agriculturist.

FORT COLLINS, Colorado, December 15, 1892.

YIELD OF

Experiment Crops for the Season of 1892.

HOME STATION, FORT COLLINS.

BARLEY.

Plot.	Variety.	Date of Harvesting.	Yield of Plot in Bu.	Yield per Acre in Bu.
A 7	Purple	July 28	1	20
A 8	Guy Malye	July 29	1.5	30
A 9	Smooth Hulless	Aug. 2	1.3	25
A 10	Trick's	Aug. 8	6	30
A 11	Smooth Hulless	Aug. 2	2	40
A 12	Winnipeg	Aug. 8	5	33.3
B 3	Sonora	Aug. 2	2.5	9.5

RYE.

A 14 21	Winter	July 28	9.5	11.2

CORN.

A 42 50	Pride of the North	Sept. 12	15.5	14.8

WHEAT.

A 32 41	Amethyst	Aug. 13	33	30
B 4 6	Chili	Aug. 2	2	40
B 7	Chili	Aug. 9	3.5	35
B 9	Improved Fife	Aug. 2	4	40
B 11	Improved Fife	Aug. 9	1.5	25
B 16	Egyptian Flint	Aug. 9	4	20
W. F.	India No. 1	Aug. 9	1.5	37
"	India No. 2	Aug. 9	1.3	41
"	India No. 4	Aug. 9	1.5	34.5
"	India No. 5	Aug. 9	1.5	35.8
"	India No. 6	Aug. 9	1.5	35.3
"	India No. 7	Aug. 9	1.5	35
"	India No. 9	Aug. 9	1.5	35.3
"	India No. 10	Aug. 9	1	32.3
"	India No. 11	Aug. 9	1.3	38.1
"	Saxon Fife	Aug. 11	.75	39.8
"	Velvet Chaff	Aug. 11	1	38.8
"	New York Flint	Aug. 11	1	34
"	China Spring	Aug. 11	1.5	45.4
"	Prussian	Aug. 11	1.5	45
"	Golden Drop	Aug. 11	1	30
"	Canadian Club	Aug. 11	1.5	42.9
"	Brooks	Aug. 15	1	28.8

"	Sonora	Aug. 15	1	25.8
"	Hedge Row	Aug. 15	1.3	37.5
"	Winter Australian	Aug. 15	1	29.1
"	Pringle's No. 4	Aug. 11	1	29.6
"	Judkin	Aug. 11	1	28
"	Dominion	Aug. 11	1.5	28
"	Pringle's No. 5	Aug. 17	1.5	40.5
"	Midge Proof	Aug. 17	1.3	40.8
"	Northcote's Amber	Aug. 17	1.3	30.5
"	Wales 160	Aug. 17	2.5	51.3
"	Nox No. 1	Aug. 17	2.8	56.3
"	Nox No. 2	Aug. 17	2.3	56.5
"	Nox No. 3	Aug. 17	2.3	56.5
"	Granite 42	Aug. 17	2.5	67.5
"	Beryl	Aug. 17	2.5	67.5
"	Crimean	Aug. 6	1.3	32
"	Whittington	Aug. 6	1	25.5
"	Eldorado	Aug. 6	1.5	38
"	Hoover	Aug. 6	2.5	63
"	Chili Rhodi	Aug. 6	1.8	43
"	Hornblend	Aug. 6	2	51
"	Oregon Club	Aug. 6	1.5	38
"	Ward's Prolific	Aug. 6	1.5	38
"	Winnipeg Russian	Aug. 6	2	51
"	Rattling Tom	Aug. 6	1.5	37.5
"	Hallet's Pedigree	Aug. 6	2.3	57
"	Neuces	Aug. 6	1.3	30
"	Rust Proof Hard	Aug. 6	1	26
"	Four Spar	Aug. 6	1.3	32.3
"	Indian	Aug. 6	1.5	39.9
"	Farmer's Friend	Aug. 6	1	26.3
"	Pringel's No. 7	Aug. 6	1	29
"	Davis	Aug. 6	1	29.5
"	Sibley's No. 1	Aug. 17	1.3	34
"	Rye	Aug. 18	1.5	38
"	Ontario	Aug. 18	1.5	38
"	Australian Purple Straw	Aug. 18	1.8	43
"	Genoese	Aug. 18	1	26.3
"	Egenhart	Aug. 18	0.8	22
"	Black Chaft	Aug. 18	0.6	17
"	Frankstein	Aug. 18	0.8	22
"	India No. 12	Aug. 18	1	21.5
"	Gypsum	Aug. 18	4	17
"	Defiance	Aug. 18	2.8	38
"	India No. 10	Aug. 18	1.5	22.5
"	India No. 9	Aug. 18	1.5	17.5
"	India No. 8	Aug. 18	1.5	7.5
"	India No. 7	Aug. 7	2	31.3
"	India No. 6	Aug. 18	2.8	31.3
"	India No. 5	Aug. 18	1.3	34.5
"	India No. 4	Aug. 18	1.5	21.1
"	India No. 3	Aug. 18	0.5	20.1
"	India No. 2	Aug. 18	1	8
"	India No. 1	Aug. 18	1	9
"	Gneiss No. 35	Aug. 18	0.3	8.5

"	Mediterranean Red	Aug. 18	0.5		16.9
"	Silica No. 43	Aug. 19	1		32
"	Agate	Aug. 19	0.3		15.7
"	Seven-Headed Red	Aug. 19	0.3		8
"	Basalt	Aug. 19	0.1		30
"	Silver	Aug. 19	1		30.3
"	Prussian White	Aug. 19	1		29.5
"	Rural	Aug. 19	0.8		18
"	Casaca	Aug. 19	0.8		18.3
"	Russian	Aug. 19	1		22.5
"	Rochester	Aug. 19	0.5		11.3
"	Mammoth	Aug. 19	1		22.5
"	Edenton Fife	Aug. 19	1		22.5
"	White Chaff	Aug. 19	0.8		17
"	Dan Rhan	Aug. 19	0.8		17
"	Vermillion	Aug. 19	1.3		28.1
"	Feldspar	Aug. 19	1		22.5
"	Early Oakley	Aug. 19	8		22
"	Campbell's White Chaff	Aug. 19	0.5		14.5
"	Clauver	Aug. 19	0.8		16.9
"	Tommaline	Aug. 19	0.5		15
"	White Fife	Aug. 19	0.8		25.5
"	Uxbridge	Aug. 19	1		29
"	Mica	Aug. 24	1		28.4
"	Topaz	Aug. 24	0.5		14.5
"	Garnet	Aug. 24	0.5		14.3
"	Emerald	Aug. 24	0.5		14.5
"	Sardonyx	Aug. 24	0.5		15
"	Opal	Aug. 24	0.5		15
"	Wheat Austrian	Aug. 24	0.5		17.1
"	Rust Proof	Aug. 24	0.5		16.5
"	Snow Flake	Aug. 24	0.5		18.5
"	Pringle's No. 18	Aug. 24	0.5		18
"	White Michigan	Aug. 24	0.5		19
"	Dager	Aug. 24	0.5		19.5
"	Sardins	Aug. 24	0.4		16.6
"	Northcote's White	Aug. 24	0.5		21.3
"	Porcelain	Aug. 24	0.5		22
"	Royal 346	Aug. 24	0.5		32.5
"	Pringle's No. 6	Aug. 24	0.4		16.1
"	Perfection	Aug. 24	0.3		24.3
"	Dallas	Aug. 30	0.8		34.1

OATS.

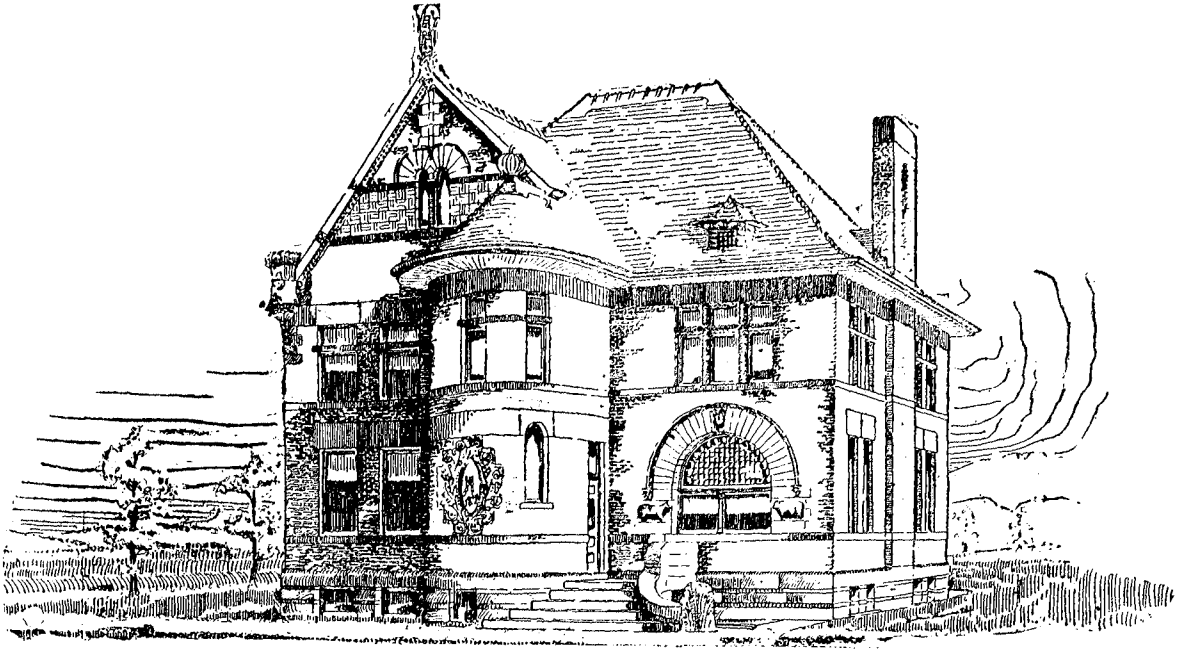
A—3	New Zealand	Aug. 9	10.5		52.5
A—5	Silesian	Aug. 6	6.5		32.5
A—22-31	Excelsior	Aug. 9	37.5		34.0
	Canadian	Aug. 30	1.3		19.8
	Swiss Black	Aug. 30	1		18.3
	Austrian No. 2	Aug. 31	1.3		22.5

FLAX.

A—1	Belgian	Aug. 31	0.3		5
A—4	European	Aug. 31	0.6		10.7
A—6	Common	Aug. 31	0.2		4.4
	European	Sept. 26	4.5		19.8
	Belgian	Sept. 26	0.4		16

SUGAR BEETS FOR THE SEASON OF 1892.

Plat.	VARIETY.	Date of Planting.	Date of Harvesting.	Yield per Acre in Tons	Per Cent. Sugar.	Coefficient of Purity.
B—14	Vilmorin.....	May 19	Sept. 27	7.6	16.2	79.0
B—22	Vilmorin.....	May 18	Sept. 27	10.4	15.6	79.7
B—24	Vilmorin.....	May 18	Sept. 27	9.2	17.5	80.0
B—11	Vilmorin Imperial.....	May 28	Oct. 6	8.2	17.0	84.5
B—11	Silesian.....	May 28	Oct. 6	18.3	15.2	83.9
B—11	Lane's Imperial.....	May 28	Oct. 6	18.5	17.4	86.9
B—11	Neise's Imperial.....	May 28	Oct. 6	15.2	20.4	90.6
B—11	Vilmorin White.....	May 28	Oct. 6	11.1	19.6	89.0
B—11	Red-Skinned.....	May 28	Oct. 6	21.3	16.0	81.4



AGRICULTURAL HALL—THE STATE AGRICULTURAL COLLEGE, FORT COLLINS, COLORADO.

REPORT OF THE SECTION OF

BOTANY AND HORTICULTURE.

To the Executive Committee of The State Board of Agriculture:

GENTLEMEN—I have the honor to submit the following report of Experiment Station work done by the Department of Botany and Horticulture. The schedule of work as outlined for the year was in most particulars similar to the schedule for 1891; many lines of work pursued are intended to be continued from year to year. The records of a single season from which to generalize are of small value, but the accumulated records of a series of years become of great value, in that they form a solid basis from which to draw correct conclusions. Under this category come notes on the leafage and rate of growth of trees and shrubs; experiments in grafting and cross-fertilization. These lines of experiment have received attention this year as in preceding years.

The study of the flora of the State has also been continued. The collection of plants made during the summer was large, adding many new species to the herbarium. Two visits were made to the high mountain region of the State and extensive collections made of the plants between timber line and the crest of the range.

In prosecuting the work of collecting for the World's Fair, advantage was taken of every opportunity to add to the general collection of plants and the addition for the season has been satisfactory. Only a portion of the collection has been classified; much material remains that will receive attention as opportunity offers during the winter. Large additions have been made to our collection of grasses. The list is now quite representative, although there are a number of species recorded as growing within the State that have not been found. The non-appearance of these species may be accounted for in the fact that many portions of the State have not been visited. Wherever it has been possible, fascicles have been obtained in addition to herbarium specimens, and these will form a portion of the grass exhibit; about one hundred species are thus represented. The grasses grown in plats in the garden have done well; two crops were cut from nearly all; each was weighed—green and dry—and record has been kept of rate of growth and general characters of the plants.

Additional data have been secured concerning the weeds of the State, and the Department will soon be able to offer a preliminary bulletin on this subject.* Further observations in the agricultural regions in the eastern and southern portions of the State will be necessary to a complete treatment of the subject.

Our tests of varieties of garden vegetables were much interfered with by the shortage of water. Early cabbage, peas, and such vegetables as matured early in August were not affected; onions were sufficiently advanced to mature and yielded

* See Bulletin No. 23.

well, but all other later maturing varieties were practical failures from want of water. The garden is nearly all watered from The Town Ditch, and no water was obtainable from this ditch between the 14th day of August and the last week in October. This last run was too late to be of any use to the crops of the season. We earnestly hope that some provision may be made that will insure against a like loss next season.

As directed by your Committee, and arranged for in the schedule of work, a plat of tobacco was grown this season. The land available was a little less than one acre, but sufficient for a fair test. The plants, which were raised from seed kindly furnished by the U. S. Department of Agriculture, were given clean culture, and were properly suckered and topped. Harvesting was commenced on the 5th of September and finished on the 7th; not a day too soon, as killing frosts came on the 8th. The plants were in good condition, although it is believed that an additional week for further maturity would have made them still better; as the plants were cut, they were, after a few hours wilting, weighed, and hung in the tobacco house. This structure was completed September 1st and seems to answer the purpose for which it was designed. About the last of October the leaves were pronounced ready to strip, and we were discussing means of stripping and bulking when Mr. Brose, under whose care the crop had been grown, was taken sick. Since then I have had no opportunity to proceed further with the process of curing. The tobacco will not be injured if it is necessary to allow it to hang in the house all winter; but I desire, if we can, to strip and bulk it during the winter, in

order to complete the process of curing and to be able to report results as early as possible.*

Although I have taken pains to accumulate data regarding the fruit interests of the State, there is yet much information to be desired before attempting a further report. The advancement in planting has been so rapid that reports received a year ago must be materially modified. During August, I visited the fruit districts of Mesa, Delta, and Montrose counties and secured fairly complete information concerning the fruit grown and the methods adopted. From other portions of the State my information is incomplete. The information wanted, I am trying to obtain through correspondence, but thus far the returns are few and unsatisfactory.

Respectfully submitted,

C. S. CRANDALL,

Botanist and Horticulturist.

* By action of the Executive Committee, experiments in tobacco growing have been discontinued.

REPORT OF THE SECTION OF

Meteorology and Irrigation Engineering

To the Executive Committee of The State Board of Agriculture:

GENTLEMEN—I have the honor to present the following report, as Meteorologist and Irrigation Engineer, for the past year.

The general operations of the Section have been carried on as outlined in the plan submitted in the spring, and have been essentially a continuation of the plans of the previous year. The work of the year has been more satisfactory than that of previous years; the needed equipment being on hand at the beginning of the season, the operations of the year have been better in hand. The experience from other years has also aided us in making the work of the year more effective.

In field experiments my attention has been directed principally to measurements of the duty of water, which has seemed to me an important fact to determine. A clear knowledge of the present conditions will give the basis for the study of improvements in existing practice. I have had constructed, by the celebrated constructors of self-registering instruments at Paris, Messrs. Richard

Bros., a number of registers for keeping a continuous record of the amount of water applied to the various crops and fields under observation. One of these instruments was placed in the Poudre river at its exit from the foothills, and served to measure all the water which reached the valley of the Poudre from that source. The record is complete from April when the instrument was put in place, and before the rise of the water, until September, when the river had become so low that the float ceased to be actuated in the well. The Water Commissioner, Mr. J. L. Armstrong, has kept a daily gauge height for the remainder of the period.

A second instrument was placed in the Cache la Poudre Canal No. 2, and has furnished a complete record for the whole year. The amount of water applied by the users of water under this ditch seems to be approximately the same from year to year, and the data regarding the amount of water used for irrigation in this and adjoining states agree fairly well in assigning thirty inches as the depth, including rainfall. A fuller consideration of this will be given in a bulletin now being prepared on the Duty of Water.*

Other instruments were placed so as to measure the amount of water applied to a field of wheat; of native hay; of alfalfa.

It was intended to determine with some degree of exactness the loss of water by seepage from a canal, and measuring weirs were prepared and placed for this purpose. Owing to the washing out of the measuring boxes, the observations have not been successful this year. I hope to repeat the

* See Bulletin No. 23.

experiment under more favorable conditions during the coming season.

The meteorological work is completed up to date, owing to the industry of my assistant, Mr. R. E. Trimble, upon whom the immediate duty of taking the observations and their reduction has fallen. The records are becoming of considerable value, and are now of period long enough in duration to furnish the basis of special studies in the climatology of Colorado.

I have added several self-recording instruments during the year to our equipment, among others a psychrometer for recording the amount of moisture present; a luviometer, of the Ferguson pattern; an evaporometer, of Richard's construction; and a statoscope. This last instrument I obtained to furnish data regarding the changes in pressure in our thunderstorms and hailstorms which are common in the afternoons of our summer months. This was received later in the summer than we had planned, so that its use this year has been principally in giving data regarding the changes in our chinooks and wind storms.

A new anemometer displaces the old one which has become practically worn out. Through the kindness of Professors Harrington and Marvin of the Weather Bureau, this was tested at Washington in comparison with the standard anemometers of the Weather Bureau, and declared closely correct.

Many of the records of the self-registering instruments have been reduced.

The study of our records reveals many interesting features in our meteorology which are due to our nearness to the high mountain ranges.

A number of observers have co-operated with us as in previous years, and have furnished records principally of precipitation. This service, begun as a means of studying the distribution of the rainfall in the valley of the Poudre in connection with our experiments on duty of water and other field experiments, has been of other value, and has interested many in keeping exact records. I am greatly indebted to all these observers, who have given freely of their time and energy. We need some in the higher altitudes. Mr. Peery has for several years furnished reports near Manhattan from an elevation of 8,500 feet. During this season Mr. Carlyle Lamb has sent us reports from the foot of Long's Peak. These reports are very valuable. It would be desirable to increase the list of our mountain observers. It was noted in last year's report that a comparison of the observations showed that the temperature at Manhattan was warmer during January than at Fort Collins, though it was 3,500 feet higher. Corresponding differences have been pointed out by Loomis between the temperature of Pike's Peak and Denver at certain periods. A closer study of the cause of the reversal of the ordinary conditions of the air is desirable.

The rainfall varies from one place to another, there being, as a rule, an increase whether we go east or west from Fort Collins.

The other records of the Meteorological Section—the amount of sunshine, the temperature, the temperature of the soil at different depths, dew point, humidity, evaporation, wind movement—have been kept as usual and are complete to date.

Respectfully submitted,

L. G. CARPENTER,
Meteorologist and Irrigation Engineer.

REPORT OF THE

SECTION OF ENTOMOLOGY.

To the Executive Committee of The State Board of Agriculture:

GENTLEMEN—I have the honor to submit herewith my second annual report of the Entomological Section of The Agricultural Experiment Station.

One bulletin, No. 19, treating of the injurious insects that attracted special attention during 1891 at the Station, was issued from this Section in the month of May. The insects treated in this bulletin are: The Fruit-Tree Leaf-Roller (*Cacœcia argyrospila*, Walk.), the Box-Elder Leaf-Roller (*Cacœcia semiferana*, Walk.), the Grapevine Leaf-Hopper (*Typhlocyba vitifex*, Fitch), the Gooseberry Fruit-Fly (*Trypeta canadensis*, Loew.), the Imported Currant-Borer (*Sesia tipuliformis*, Linn.), the Western Currant and Gooseberry Span-Worm (*Thamnonoma flavicaria* and *T. 4-linaria*, Pack.), the Spotted Bean-Beetle (*Epilachna corrupta*, Muls.), the Squash Maggot (*Crytonema stabulans*, Fabr.), and the Pea Weevil (*Bruchus pisi*, Linn.).

The two Leaf-Rollers have been nearly or quite as bad this year as last upon trees not sprayed with the arsenites. They have been very little troubled by predaceous or parasitic insects and will

undoubtedly continue to be serious pests where the necessary steps for their destruction are not taken.

Our experiments the past summer confirm what was stated in Bulletin 19 in regard to the use of kerosene emulsion for the destruction of the Grapevine Leaf-Hopper. If applied in the middle of the day and in ordinary strength, it will be of little use in destroying the mature hoppers but, if applied before sunrise in the morning, nearly all of the hoppers may be destroyed.

The Gooseberry Fruit-Fly, the two Span Worms, and the Pea Weevil, though common, have seemed to do less injury in this vicinity the past summer than they did in 1891.

The Imported Currant-Borer, the Bean-Beetle, and the Squash Root-Maggot have continued abundant and are destructive to the plants they attack.

Of the other insects attracting special attention the past summer, I will mention the following:

The Sheep Gadfly or Grub in the Head, (*Œstris ovis*, Linn.) has, during the past summer and fall, caused the sudden death of four sheep out of the small flock on the College Farm. The sheep were seen every day, but showed no signs of being sick until they were found dead with blood running from the nose. Farmers have also complained to me of having sheep drop dead that were bleeding at the nose when found, in which cases the cause of death was probably the Gadfly. Lambs have been most attacked on the College Farm. Mature grubs were found in the head of one lamb only four months old, which proves that the time required for the development of this insect is much less than has formerly been supposed.

The Onion Thrip (*Thrips striata*, Osb.*), was extremely abundant on the College grounds the past summer and fall, and has been reported as a pest at Greeley, Colorado. Thousands of these Thrips were present on single onion tops in the College Garden. An ordinary kerosene emulsion was found very effective in destroying these pests in the immature stages, but when mature they are very active and fly readily and many escape.

The Western Tent Caterpillar, so abundant in the early part of the summer in this State, and which I mentioned in last year's report, is undoubtedly *Clisiocampa fragilis*, Str., a truly western species. In the vicinity of Georgetown last summer I saw a large number of poplar trees, as well as many bushes of different kinds, that had their foliage completely removed by the larvæ of this insect. Where this insect is abundant it should be destroyed by the use of the arsenites. Mr. G. T. Breninger, Superintendent of the Divide Station, reports serious injuries to the potato crop in that section of the State from what is there known as the potato scab. Mr. Breninger reports the injuries to be the result of the burrowing of a small larva into the flesh of the tuber. He has lately sent me potatoes for examination which have a rough, more or less cracked, surface and there are small, dark streaks running into them from the roughened surface to the depth of about one-eighth of an inch. What the insect is has not yet been determined.

A large amount of work has been done the past summer in breeding and collecting insects and a large amount of informaton has been obtained

* Determined for me by T. H. Pergande, Washington, D. C.

concerning habits and life histories of many species occurring in the State. Over 300 breeding cages have been under observation the past summer.

We have lately begun work on a list of Colorado insects in which it is intended to incorporate such facts as we have gathered concerning each species and also to give reference to all published accounts appearing in literature at our command. The list is now being prepared as a card catalogue and, when complete, will be of great service to the Section and will probably be presented to the Council, at some future time, as matter for a special bulletin.

Numerous experiments testing the value of insecticides for the destruction of insects have been carried on and the effects of the insecticides on foliage also noted.

The Section is preparing six boxes, 15 x 19 inches, of biological material to be shown along with the Experiment Station's exhibit at the World's Columbian Exposition.

The experiments in the Apiary have been a partial failure on account of the small amount of honey gathered the past season. The two colonies of Carniolan bees that I have had in comparison with Italians for the past two summers have equalled the best Italians in the amount of honey produced. The honey capped by them has been the whitest of any in the apiary; they have been rather milder in disposition and more easily shaken from the frames. Three Punic queens introduced into colonies died soon after and left the colonies queenless.

A fuller report upon experiments is reserved for future bulletins.

Very respectfully submitted.

C. P. GILLETTE,
Entomologist.

REPORT OF THE

CHEMICAL SECTION.

To the Executive Committee of The State Board of Agriculture:

GENTLEMEN—I have the honor to submit the following report of the Station's work:

About 400 samples of milk have been analyzed by the Adam's method (paper coil) for the Agricultural Section, and the results have been published in a milk bulletin.

One hundred and ten samples of sugar beets were analyzed for the Farm Department. During the summer two analyses of spring waters were made, one for J. E. Standley, of Denver and the other for Mr. Charles Andrews, of Fort Collins. Considerable time was spent on the analysis of manures, wheat straw, clover hay, oat straw, and bean straw.

It has been shown during the last few years that alfalfa has the power of accumulating nitrogen in the soil, and this would make it one of the best crops to turn under for wheat.

During the fall and up to the present date, fifty-four samples of sugar beets have been analyzed.

I have written about three hundred letters to obtain samples of soil from the different counties

of the State. I have yet thirteen counties to hear from. I shall try to secure samples of soil from these counties. My letters were written to the County Clerks, County Commissioners, County Superintendents of Schools, and Sheriffs; as well as to private individuals that I happened to know.

The directions for collecting samples of soil were as follows:

1. Select soil that has never been cropped.

2. Select a 10-inch cube from five places; mix thoroughly.

3. Select about one gallon of the mixture and send by express to the College.

I wanted virgin soil, as nothing could be told about cultivated soil, as it might be rich or poor. We have eighteen samples pretty well under way in regard to their chemical analysis. The method of analysis is that recommended by Drs. Peter and Hilgard, who have examined the soils of fifteen States of the Union. The chemical analyses of soils make long operations, and it will take all the winter to complete them in duplicate. An analysis of the soil of the garden where the tobacco was grown was made, and an analysis of the nicotine of the tobacco before it was cured. It is expected to make another analysis of the tobacco for nicotine after it is cured, to see what per cent. is expelled by curing it.

I have spent a great deal of time on the analysis of the loco plants, and have material for a progress bulletin on that subject.*

Some work was done for the Association of Official Agricultural Chemists on the analysis of but-

* Matter that can be found in Bulletin No. 25—Progress Bulletin on the Loco and Larkspur—is omitted.

ter and wine. The whole number analyses to date is 1,882.

Since last June I have been ably assisted in the laboratories by Mr. Charles Ryan, and I want to testify to the care and interest he has taken in the work. He will prove a useful assistant.

Respectfully submitted,

DAVID O'BRINE,

FORT COLLINS, Colorado, December 15, 1892.

REPORT OF THE

Arkansas Valley Experiment Station.

To the Executive Committee of The State Board of Agriculture:

GENTLEMEN—I have the honor to submit to you herewith the following annual report of the Arkansas Valley Experiment Station:

My appointment to the superintendency of this Station, on the first of July of the present year, was made at a time when the labors of the season were necessarily divided between Mr. Frank L. Watrous, my worthy predecessor, and myself; and to him belongs the credit of a large share of what appears in the following record.

FERTILIZING FOR WHEAT.

Three plots of ground similarly situated, and aggregating eleven and one-half acres, were sown with drill to Clawson wheat, September 11th and 12th of last year. They were irrigated October 25th and 26th, and a good growth established before winter. For a final cultivation the plots were run over with a straight toothed harrow the middle of April. Plot 1 had produced alfalfa hay for two seasons. Grain was harvested July 7th, and thrashed August 20th, yielding 98 bushels, or 24½ bushels to the acre, machine measure. Plot 2 had

produced oats the last season and wheat the previous one, and comprised three acres. This was harvested July 5th, and thrashed August 20th, yielding 48 bushels, or 16 bushels per acre. Plot 3 had produced corn in 1890, and in 1891 a crop of buckwheat which was plowed under while green. This was harvested July 6th, thrashed August 20th, yielding 128 bushels, or 28 4-9 bushels per acre. Plot 3 produced heaviest straw and Plot 2 the lightest. The quality of grain was uniform and very much shrunken.

VARIETY TESTS.

Several small plats, each measuring 130 feet long by eight feet in width, were sown to the following grains for the purpose of testing their comparative adaptability to this locality.

Ruby (beardless) winter wheat made a good appearance in straw and heads, but grain shriveled.

Red Russian (bearded) winter wheat gave excellent promise in every particular. Its habit of growth is short and slender in straw, with well-filled compact heads. Berry, medium in size, dark red in color, plump and bright.

Polish (bearded) spring wheat did not do well. Rust appeared upon the stems and blades and the grain shriveled.

Centennial (bearded) spring wheat rusted and shriveled slightly, but yielded well and is of good promise.

Rye (winter). Yield and quality were all that could be desired.

Black Barley. A two-rowed variety of good quality and yield.

Melon Barley. A two-rowed yellow variety of good quality and yield.

Phœnix Barley. A six-rowed hulless variety and very productive.

Smooth Hulless Barley. A six-rowed beardless and hulless variety of good promise.

Golden Giant Oats. This is a side variety of fair quality. Does not yield abundantly.

Monarch Oats produced well. An excellent plump variety.

Chinese Hulless Oats. The grain separates from the hull when thrashed. The yield in weight was very good but much less bulky than the hull varieties.

ACRE AND HALF-ACRE WHEAT PLATS.

They occupied a four-acre square plot of ground, upon which has been grown a crop of buckwheat the previous season, and the same plowed under to enrich the soil. Ninety pounds of seed were used on each of the acre plats, and thirty pounds on the half-acre plats. All the varieties proved to be of superior quality when thrashed.

One acre of Sonora, sown March 2nd, and harvested July 12th, produced 29 bushels.

One acre of Amethyst, sown and harvested same as Sonora, produced the same, 29 bushels.

The acre of Defiance was a mixture with a bearded variety. It was harvested on the 18th of July, and produced 34 bushels. Both varieties were of such excellent quality, that before harvesting the crop, I decided to gather four square rods of the bearded variety by hand, and to save the Defiance with the same care for use as seed. The result was 26 pounds of Defiance, 24 pounds of a most promising red wheat, and $\frac{1}{4}$ pound of inferior seed.

One-half acre of Australian Club, sown April 15th and harvested July 25th, thrashed $17\frac{1}{2}$ bushels.

One-half acre of Improved Fife, sown April 15th, and harvested July 25th, thrashed $13\frac{1}{2}$ bushels.

OATS.

Five acres of Excelsior oats and alfalfa, drilled both ways on corn stubble, March 3d, produced 151 bushels of excellent grain, and a good stand of alfalfa was secured and plowed under to enrich the soil for winter wheat. Grain was harvested the 26th of July.

CORN CULTURE.

General field work in corn culture furnished the best means for observation of this crop. From the 27th to the 30th of April, 57 acres were planted to Colorado White, in hills to a depth of four to six inches with horse planter. Distance between rows was 36 inches one way and 44 inches the other. A portion of the field had been plowed shallow in the

fall, but the main area, plowed in the spring, was turned to a depth of eight inches or more. At time of gathering, careful cubic measurements were taken of the grain in relation to an equal number of rows upon deep and shallow plowing. The results showed a yield of at least 30 per cent. in favor of deep tillage.

The seed had been treated with a solution of sulphate of copper, for a portion of the field, to test this means of preventing smut. After careful comparisons at intervals of two weeks until the crop had matured, no difference could be found between that treated and not treated, as to the per cent. of infection. Smut seldom attacks the grain, but is found generally upon some part of the stalk, and occasionally upon the tassel. About 17 acres remain ungathered at this date, December 7th, but it is safe to estimate the crop at 4,500 cubic feet of ears, or about 2,000 bushels from 57 acres.

Nearly one-quarter of an acre of Golden Beauty field corn now in the shock will give a large yield of choice grain for seed.

Sweet Corn—Small plats of Burpee's Extra Early and Stowell's Evergreen were much infested with the cotton boll worm which is a common pest in this locality. The extra early variety was rendered entirely unfit for use as an article of food or for seed by its ravages.

GRASSES AND FORAGE PLANTS.

Twelve plats, each containing 440 square feet, were all sown April 22d, to the following varieties, with the results noted:

Seed was sown with Planet Junior hand drill, in rows nine inches apart. All the plats had an equal share of labor bestowed upon them, in hoeing,

weeding, and irrigating, for the purpose of finding out, if possible, the particular treatment required for each variety in future.

Orchard Grass—Made a perfect stand in thickly matted rows, and attained an average height of ten inches. It produced no seed.

Hard Fescue—Made scattering bunches, and stubby growth. Had the appearance of having been eaten by grasshoppers, which was attributed to the intense heat of the sun through July and August, as but few grasshoppers were found.

Brome Grass—This made the best showing of any of the grass plats. The wide matted rows grew simply perfect and matured some seed. The blades grew to a general height of ten inches or over.

Meadow Fescue—Made a good stand, but had a tendency to grow in thick bunches above the surface of the ground. Its general height was about six inches.

Red Top—A good stand was secured, of rather short growth due to its natural adaptability to moist soils. The tendency to bunch, I think, is one indication of lack of moisture. Matured some seed.

Perennial Rye Grass—Gave a fairly good stand of short growth and produced no seed, but had a tendency to bloom late in the season. Leaves were narrow and tough, which is an indication that it should be cut early or fed down to preserve its succulency.

Italian Rye Grass—The wonderful growth of this plat was the admiration of visitors. A uniform stand of twelve inches was attained, in thickly matted rows. This, in my opinion, should be pastured close to preserve succulency.

Esparsette—This popular leguminous plant of European countries has shown itself worthy of more extended trial. It made excellent growth of thick matted rows and attained a height of eight inches. It blossomed early and matured seed a month before frost.

Alsike Clover—Gave an abundant crop and made seed. I doubt, however, its ability to produce more than one full cutting, which would render it less valuable than the Red variety.

White Clover—This was not tried in a plat but deserves to be mentioned here. It has made remarkably vigorous growth where sown along the irrigating ditch banks. It might be made to line the banks of our main ditches and thus do away with the tall weeds which mark the courses of our water supply and seed our farms.

Red Clover—Four good cuttings have been taken from the large plat which surrounds the residence. There is no better forage plant, and nothing so good for a quick rotation with other crops to restore fertility to the soil.

German and Golden Millets—Ten rows of each variety 130 feet long did fairly well, though evidently they did not receive sufficient watering. They were sown April 11th and harvested July 15th. Received two irrigations.

POTATOES.

This locality has never been considered by the farmers to be well adapted to potato culture. But during the last two years this Station has done a great deal to show that the crop can be grown here successfully, It has domonstrated that the soil lacks the proper kind of fertility; that the natural soil retains a too high temperature during

the hot months of summer to be conducive to the formation of tubers; that evaporation is too rapid from the surface of natural soil; that deep plowing is important; and that the best available fertilizers are well-rotted barnyard manure, thoroughly mixed with the soil. and the ashes of straw and litter plowed under.

HALF-ACRE PLATS.

Rose Seedling—An early variety, planted March 24th, and harvested August 8th to 10th.

Cost of seed, 480 pounds	$ 3 60
Plowing and harrowing	3 50
Fertilizing with straw ashes	12 00
Planting	4 00
After cultivation	1 25
Irrigating	50
Harvesting and marketing	7 10
Total expense	$31 95
Market value of crop, 1,771 lbs., @ $1.75 per 100	30 99
Loss	$ 0 96

Unmerchantable potatoes on hand, 180 pounds.

Mammoth Pearl—A late variety planted June 11th, and harvested October 20th and 21st.

Cost of seed	$ 3 45
Plowing and harrowing	3 50
Fertilizing with straw ashes	12 00
Planting	4 00
After cultivation	1 75
Irrigating	1 25
Harvesting and marketing	16 30
Total expense	$42 25
Market value of crop, 7,456 lbs., @ $1.15 per 100	85 74
Gain	$43 49

The following received ordinary garden culture on unprepared soil. They were planted March 28th, and harvested October 19th, with results noted:

New Early Market—Yield 116 hills, 147 pounds.

Late Ohio—Yield 21 hills, 24 pounds.

Mammoth Pearl—Yield 34 hills, 32 pounds.

Rose Seedling—Yield 55 hills, 42 pounds.

Rural New Yorker Number 2—Yield 67 hills, 73 pounds.

SUGAR BEETS.

The Acre Plat—On account of dry weather early in the spring, some difficulty was experienced in getting a satisfactory stand. One-half the plat was first planted April 9th, in drills 20 inches apart, and seed deposited to a depth of three inches. In replanting May 14th, the double-row system was adopted, 12 and 24 inches between. The ground was irrigated May 16th, to germinate the seed. A good stand having been secured, the plants were thinned June 20th. The other division of the plat, first planted May 3d and replanted June 4th the same as the first division, received like treatment and was thinned July 7th. At that time there was an apparent difference between the two divisions, but as the season advanced it became less noticeable until maturity, when careful comparisons of harvested rows as they lay topped and exposed, showed neither one superior to the other in any respect. The yield of the plat considered as a whole is placed at 21 tons and 643 pounds, which is an average of three computed estimates furnished by the Chief Chemist of the United States Department of Agriculture, in his Report of Analyses of sample beets, taken according to his directions. The crop remains unsold at this date, December 7th; but the price at a sugar factory would be about $5.00 per ton.

Expenses have been as follows:

Plowing, harrowing, and planting	$8 15 00
Seed	4 00
Irrigating	2 00
Hoeing and thinning	17 50
Harvesting	13 75
Total expense	$8 52 25
Value of crop, (computed from estimate)	106 62
Profit	$8 54 35

Variety Plats—Six plats, each containing one one-hundredth of an acre, were sown in drills 18 inches apart, May 14th. The results will be found tabulated below, as reported by the Chief Chemist of the United States Department of Agriculture. The Vilmorin samples, not numbered, were grown in the acre plat:

No.	Variety.	Date of Harvest.	Per Cent. Sugar.	Coefficient of Purity.	Tons of Beets per Acre.	Pounds of Sugar per Acre.
3	Klein Wanzlebener	Oct. 4	13.09	76.9	24.8	4,256
1	Vilmorin	Oct. 10	15.88	85.4	24.4	5,673
2	Lane's Imperial	Oct. 10	9.66	76.0	26.8	4,629
4	Vilmorin, Brabant Improved	Oct. 10	14.24	80.5	34.4	6,785
5	Dipp's Imp. Richest Sugar	Oct. 10	14.73	81.1	27.4	5,642
6	Dipp's Imp. White Imperial	Oct. 10	13.32	79.3	23.3	4,213
3	Klein Wanzlebener	Oct. 20	14.07	81.0	33.7	6,879
1	Vilmorin	Nov. 3	15.18	83.4	25.0	5,435
2	Lane's Imperial	Nov. 3	8.54	70.0	20.3	4,125
3	Klein Wanzlebener	Nov. 3	13.33	80.8	34.2	6,209
4	Vilmorin, Brabant Improved	Nov. 3	15.72	83.6	30.1	6,769
5	Dipp's Imp. Richest Sugar	Nov. 3	14.12	78.5	27.9	5,598
6	Dipp's Imp. White Imperial	Nov. 3	13.88	81.2	32.9	6,354
	Vilmorin	Sept. 19	15.69	84.8	20.5	4,801
	Vilmorin	Oct. 20	18.87	85.0	18.7	5,151
	Vilmorin	Nov. 3	15.87	84.9	25.7	5,937

Planting Tests—Eight plats of one one-hundredth of an acre included in each, were planted

April 22d to the Vilmorin variety, for four comparative tests.

TEST A.—DEEP AND SHALLOW PLANTING.

Plat 1. Seed sown in drills one inch in depth, rows 16 inches apart. Harvested October 19th, 439 pounds, 193 beets.

Plat 2. Seed sown in drills four inches in depth, rows sixteen inches apart. Harvested October 19th, 340 pounds, 108 beets.

TEST B.—DISTANCE OF PLANTING SEED TO SECURE STAND.

Plat 1. Seed planted two inches deep, one good seed dropped every two inches in the row, and rows sixteen inches apart. Harvested October 19th, 516 pounds, 269 beets.

Plat 2. Seed planted two inches deep, two good seed every four inches in row, and rows sixteen inches apart. Harvested October 19th, 525 pounds, 262 beets.

TEST C.—HILL CULTIVATION.

Plat 1. Seed planted two inches deep in hills eight inches apart each way. Harvested October 19th, 499 pounds, 244 beets.

Plat 2. Seed planted two inches deep in hills twelve inches each way. Harvested October 19th, 528 pounds, 191 beets.

TEST D.—DEEP FURROW IRRIGATION.

Plat 1. Seed drilled two inches deep in rows twelve inches apart. Harvested October 19th, 497 pounds, 312 beets.

Plat 2. Seed drilled two inches deep in rows sixteen inches apart. Harvested October 19th, 505 pounds, 251 beets.

VEGETABLE GARDEN.

Cabbage—Blood red Erfurt can be recommended for earliness, combined with quality and productiveness, and All-head for a late sort. Savoy and World-Beater did not make solid heads. Transplanting to open ground was done May 19th.

Cauliflower—Early Snowball was very reliable in heading.

Egg Plant—Grasshoppers almost skeletonized the foliage, seeming to prefer this to any other garden plant. An abundance of fruit formed but did not thrive.

Melons—Two varieties of cantaloupe were planted May 3d, Early Market and Netted Gem. The latter came into use August 17th, and the for-

mer August 26th. Early Market is of superior quality.

Three varieties of watermelons were planted May 3d, Swink, or Rocky Ford, Seminole, and Dixie. The first named is superior in every respect. First in use, Swink, August 7th, Dixie and Seminole August 18th. Seed of both cantaloupe and watermelon were soaked in tepid water 18 hours before planting.

Onions—Seed sown in the spring failed to germinate. Sets of Baker and Yellow Danvers planted March 26th made onions of fair quality.

Peas—Twelve varieties were planted March 28th, and all proved satisfactory. Premium Gem and Earliest and Best for early use. Champion of England and Burpee's Quality, for late use, are recommended here. Varieties raised were: Premium Gem, Earliest and Best, Profusion, Telephone, Stratagem, Blue Imperial, Lander's Marrow, Champion of England, Burpee's Quality, Everbearing, Advancer, and Charmer.

Fordhook Squash—This most valuable squash still finds no superior with us.

Tomatoes—This has been an off year for tomatoes in this part of the State. The crop failed to ripen in time to escape frost.

The Stone proved a most excellent variety. It is large, smooth, and solid and of fine quality. Ripe September 5th. Peach and Golden Queen are superior for preserving.

Other vegetables were grown with success. They were turnips, beets, pumpkins, cucumbers, and lettuce.

THE ORCHARD.

The oldest division of the orchard is in the same thrifty condition as stated in last year's report. Five varieties bore some fruit the past season; they were Early Harvest, Whitney's No. 20, Wealthy, Salome, and Missouri Pippin. Of 38 apple trees planted last spring, three are dead; of six cherry trees, three are dead; of six North American Apricot Peach, one is dead; of 74 plums, 18 are dead; and of 33 prunes, 12 are dead. The trees of last spring's planting were received in a very damaged condition.

VINEYARD.

The vines all bore fruit the past season, 12 varieties. At least 75 per cent. of the bunches were picked off before ripening, by a large worm which Professor Gillette classified as *Philampelus achemon*. Mr. J. H. Crowley, our local nurseryman, has had a like experience with this insect.

SMALL FRUITS.

Strawberries—Last spring a new plat 12 by 100 feet was planted in six rows alternating Jesse and Manchester varieties. The plants are all in a most thrifty condition for winter, having made excellent growth.

Other varieties set out April 25th were: 12 Gandy, 12 Parker Earle, 12 Crimson Beauty, 12 McLain's Early, 12 Lady Rusk, and 50 Warfield. About 75 per cent. have not lived.

Raspberries, Blackberries, and Dewberries—A limited number of each was set out last spring. They have done well with the exception of two dozen blackberries, of which one plant is living.

OTHER FARM CROPS.

Fifty-two acres of alfalfa produced about 180 tons, of which 150 tons have been sold.

Five acres of Texas oats produced 168 bushels.

All trees and plants for continuous growth, including orchard, vineyard, small fruits and ornamental trees, alfalfa ground, and seven acres of winter grain, have been well irrigated for the winter.

Respectfully submitted,

FRED. A. HUNTLEY,

Superintendent.

INVENTORY OF PROPERTY.

40 acres of land	$ 4,000.00
135 " "	5,400.00
21 shares ditch stock	1,200.00
660 rods fence	132.00
House, cellar, and two cisterns	900.00
Barn, corn crib, and out-buildings	800.00
Well	60.00
	$12,492.00

LIVE STOCK AND IMPLEMENTS.

3 horses, $420; 2 harnesses and wagon, $80	$ 500.00
1 hayrack, $5; drill, $50; garden drill, $10	65.00
2 plows, $30; harrow, $7; leveler, $2; shovel-plow, $3	42.00
1 cultivator, $6; barrow, $5; garden plow, $5	16.00
1 spade, shovel, scoop, $3; mattock, $1; rake, 50 cents	4.50
3 hoes, $1.50; 5 forks, $3; 3 saws, $4.50; 2 planes, $4	13.00
1 hatchet, wrench, $1.25; wire stretcher, $1; axe, $1	3.25
1 steelyards, $3; scythe, sickle, corn knife, $2	5.00
2 lanterns, $1.50; mowing machine and rake, $70	71.50
1 fanning mill, $25; lawn mower, $6; corn sheller, $20	51.00
1 grindstone, $3; sickle grinder, $2	5.00
50 seamless sacks, $10; work bench and screw, $4	14.00
1 bucket pump (not in use)	3.00
	$ 793.25

GRAIN, HAY, AND SEEDS.

274 bushels Clawson wheat (shriveled) @ 70 cents per 100	$ 115.08
88 bushels Sonora wheat @ $1.00 per 100 pounds	52.81
29 bushels Amethyst wheat @ $1.00 per 100 pounds	17.40
34 bushels Defiance wheat @ $1.00 per 100 pounds	20.40
17 bushels Australian Club wheat @ $1.00 per 100 pounds	10.20
13½ bushels Improved Fife wheat @ $1.00 per 100 pounds	8.10
3 small plats wheat, barley, oats, and rye	3.00
151 bushels Excelsior oats @ 30 cents	45.30
168 bushels Texas oats @ 30 cents	50.40
2,000 bushels corn @ 45 cents	900.00
42 quarts seed peas @ 10 cents	4.20
40 quarts seed beans @ 10 cents	4.00
16 quarts melon seed @ 25 cents	4.00
18 tons sugar beets @ $2.00	36.00
400 pounds seed potatoes @ $1.00	4.00
	$ 1,274.89
	$14,560.14
20 tons alfalfa @ $2.50	50.00
Total	$14,610.14

REPORT OF THE

San Luis Valley Experiment Station.

GENTLEMEN—I herewith submit a report of work done at the San Luis Valley Experiment Station:

The location was made June 24, 1891. Operations began in September, of the same year. The remainder of the fall of 1891 was devoted to the erection of necessary buildings, preparing ditches, and breaking land. The past year has been one of preparation rather than thorough experimental work.

Shade Trees—During the year, I received from the College farm the following shade trees: 10 Privet, or ornamental hedge, 10 Green Ash, 20 Black Walnut, 20 Rock Elm, and 4 Red Elm. They came in fine condition, and were planted April 23d and 24th. They have made a splendid growth the past summer, and will go into the winter in good condition without any loss.

Apple Trees—Packed in the same consignment were the following trees: 5 Mann, 5 McIntosh, 8 Northwestern Greening, 10 Red Beitigheimer, 5 McMahan, 10 Yellow Transparent. These were planted at the same time as the shade trees, and were compelled to stand about ten days without water. Then they were well watered and there-

after watered regularly twice per week during the summer. They have made a surprisingly vigorous growth.

Small Fruits—Gooseberries grew rapidly, but strawberries did not do well. Twelve grapes of the Concord variety were planted. Three-fourths of these are in a healthy condition. Raspberries died down but made a rapid growth from the roots. The work with the small fruits the past season has convinced me that they can be grown successfully with proper preparation and treatment.

Grains and Grasses—The following grains were sown, with results as stated in bushels, per acre: Wheat, the Saskatchewan Fife, 24.2; Niagara, 26.2; Gypsum, 26; New York Flint, 20.4; Polish, 29; Nox, 21; Eldorado, 26.4. The Gypsum and Niagara can be recommended for both quantity and quality. They were irrigated four times. The Polish yields well and might mature without irrigation.

Barley—The following will show the result of the barley grown: All but one kind were sown April 14th. Guy Malye, harvested Aug. 1st, yielded 24.2 bushels. Trick's and Palestine were harvested Aug. 26th, and yielded each per acre 28 bushels. The Sonora was sown late in May, and the yield, Sept. 10th, was 11 bushels. The Guy Malye is very early and might be recommended for an early feed crop.

Oats—The Monarch was grown with success, but could not be recommended for all parts of the Valley owing to its lateness in maturing. On sandy, warm soil it will mature with a heavy yield, but on cold alkali soil, an earlier variety is preferable. The Chinese Hulless was grown and made a

nice showing. The White Zealand proved a good variety, much earlier than the Monarch, with lighter straw, but a better yield.

Rye—Ordinary spring rye can be recommended for early crops on new farms.

Flax—Two varieties, the common and the Algerian, were grown. The common proved the better for both fiber and seed. The flax crop will some day be a valuable one for the San Luis Valley.

Sorghum—This was planted the middle of May in two plats; one for fodder, the other to note the saccharine value of the plant. For fodder, it was a success, and can be so recommended, but the other was without any saccharine qualities, caused, no doubt, by the dry condition of the soil. The yield was 4.2 tons to the acre of dry fodder, which proves a valuable feed for stock.

Golden Millet—A yield of a little over two tons to the acre was obtained.

Alfalfa—The sowing of the seed with grain of any kind, on sandy or warm soil, will prove a mistake. It should be sown alone with from 20 to 35 pounds per acre, and cut early the first year in order that a second crop may grow to protect the plant for the winter.

Red Top proved a failure for the past year. Timothy, Meadow Fescue, Orchard grass, Large Canary grass, Red Clover, have been grown with more than ordinary success, and there is but little doubt after this year mixed grasses for hay and pasture will prove a success on the Station Farm.

Corn—Three varieties of corn were planted. Pride of the North, Cory's Early, and a variety from the Manhattan Agricultural College. Pride

of the North did not mature. It was harvested for fodder, yielded two and a half tons per acre. The Cory made only one and three-fourths tons, partly matured. At this altitude, with frosts late in June and early in September, corn can be grown only for roasting ears and fodder.

Vegetables—These were grown with some degree of success the past year, and, no doubt, will be cultivated more successfully as the soil grows older.

Squashes did exceedingly well. The varieties were the Summer and Winter Crooknecks, Mammoth Chili, and the Hubbard. The Hubbard proved the best for yield and quality, and can be recommended.

Beans did well. The Red Valentine was earliest; Golden proved best for late string bean.

Cabbage was grown with but little success, on account of the soil. With sub-irrigation it will very likely prove a success.

Tomatoes—Livingston's Beauty, Livingston's Perfection, and Lee's Wonderful were grown. The Perfection proved the best variety, producing a more healthy, rapid growth, and ripening well before frost.

Onions would prove a good crop were it not for the rabbits. It being the green plant which comes out about the earliest in the spring, it is kept down the same as all early grown vegetables. Early peas, beets, carrots, and turnips are destroyed by these animals as fast as they come above ground and are kept down until grains and grasses appear.

Potatoes—The following table will show the varieties and yield:

Name.	Yield in Bu. per acre.	Name.	Yield in Bu. per acre.
Burbank	168	Yankee Nation	146
Green Mountain	138.2	White Elephant	179.4
Barclay Prolific	182.6	Dunmore	169.3
Ohio Fancy	130	Vermont Champion	196.2
Late Ohio	170	Granger	124.6
Farina	120	White Wisconsin	119
Salt Lake Rose	125.4	Polaris	142.6
Compton Surprise	162	Wisconsin Blue	96
Pride of Japan	112	Strawberry	96.2
People's Potato	80	Seedling, 58	100
Hoag's Seedling	134	Seedling, 33	110.6
Seedling, 102	184	Seedling, 37	124.6
		Seedling 15	184.2

Sugar Beet Seed—During the spring of 1892, I was presented with 13 beets of the Vilmorin Improved variety by Mr. Gardom, of Monte Vista, who informed me that the beets were grown from seed direct from France. They were planted in the orchard in a row, two feet apart. Ten of these bore seed. From the ten beets were produced three pounds and fourteen ounces of mature seed. Beets will be grown from this seed next year, and the analysis made of the sugar quality of the beet.

The experiment with peas the past season was successful enough to indicate that the pea crop will be one of the most valuable raised. They grow rapidly, make early feed for a hay crop, and produced wonderfully. Those grown consisted of seven varieties, sown in rows through the orchard for the purpose of enriching the soil. They were cultivated the same as other plats. They consisted of the following: The Bliss Ever Bearing, G. F. Wilson, Quantity, Sander's Marrow, First and Best, McLean's Little Gem, and the American Wonder. The last three named proved a garden pea of quick growth, small vine. The G. F. Wilson, Sander's Marrow, and Bliss' Ever Bearing grew to an immense size, producing wonderfully.

Winter Wheat—On September 21, 1892, I sowed four plats to winter wheat. The varieties consisted of Strayer's Early Egyptian, the Currell, Extra Early Oakly, and the Red May. These were presented to the Station by the Kansas Agricultural College, Manhattan. Each plat contains one-twelfth of an acre.

The foregoing report covers work on this Station up to date. In looking over this report one must bear in mind that the land is new, having had no previous preparation until late in the fall of 1891. Thirty acres of the stubble land have been plowed this fall, and about fifteen acres of sod. Ten acres will be leveled and manured and platted for experimental work in 1893. This, together with subirrigation during the coming year, will guarantee the future success of the San Luis Valley Experiment Station.

Respectfully submitted,

M. E. BASHOR,

Superintendent.

MONTE VISTA, Colorado, December 15th, 1892.

REPORT OF THE

DIVIDE EXPERIMENT STATION.

To the Executive Committee of The State Board of Agriculture:

GENTLEMEN—I have the honor to transmit herewith my second Annual Report.

The season has been one of unusual meteorological conditions. Cold and frosty weather continued well into May, with snows in June. When the day temperature ran up to 90 degrees F., the night temperature would lower to 50 degrees, showing a daily range of 40 degrees. High destructive winds prevailed all through May and June. A hail storm, which did some damage, crossed this section of the Divide on June 23d. During the last of June and fore part of July the rainfall was excessive and in August vegetation was at a standstill from insufficient moisture—the drought continuing well into the fall. Owing to the cold and dry weather, many of the experiments have been cut short. Since the altitude of this Station is 7,200 feet, and experiments are conducted wholly without irrigation, our crops need the full length of the season to mature at all. Two inches of snow fell on the 4th day of June. This was followed by killing frosts on the nights of June 11th, 12th, and 13th. The first autumn frost occurred early in Septem-

ber. After the frost a few kinds of vegetation renewed life and ripened their fruit. Many varieties of corn that ripened last season scarcely formed ears this year.

Plans were made to conduct experiments with fodder-producing plants, cereals, and potatoes. These plans were fully carried out.

Wheat—Ten varieties of wheat were grown, six of these in half-acre fields and the others in small plats. In the tables are given the results, calculated in acres, with other important data. I regret very much that I am unable to give the yield of threshed grain with the kinds grown in larger areas, as the grain is still in stack.

Variety.	Sown.	Ripened.	Days Maturing	Height of Straw in Inch's.	Yield per Acre Bushels.
Eldorado	April 28	Sept. 15	140	37	16
Centennial	April 28	Sept. 20	145	42	14
Ruby	April 28	Sept. 16	141	24	12
Blount's No. 10	April 28	Sept. 16	141	30	10
Amethyst	April 12	Sept. 6	127	38	.....
Chili	April 12	Aug. 6	116	36	.....
Australian Club	April 12	Sept. 6	115	42	.....
Improved Fife	April 12	Sept. 31	121	36	.....
Niagara	April 12	Sept. 31	121	32	.....
Polish	April 12	Sept. 31	121	40	.....

Rye—One acre of common winter rye was sown April 12th. It attained a height with fair grain.

Oats—Acre tests were made with Excelsior oats, in which different amounts of seed were used, ranging from 1½ to 2½ bushels per acre. Thick seeding tends to shorten the time required to ripen, while thin seeding prolongs the growth.

Buckwheat—Two varieties, the Japanese and Silver Hull, were sown broadcast upon a small tract of soddy ground near the barn. A severe hail storm on June 23d beat the plants to the ground, after which they soon revived and made a vigorous growth. The yield of seed was very good.

Millet—Seeds of three kinds were sown on the last day of May. Broom corn millet made a good growth and ripened seed.

Grasses and Forage Plants—Alsike Clover, Mammoth Red Clover, and Meadow Fescue made good growths. Red Top and Timothy were not grown successfully. Brome Grass, a native grass, stood the drought well. Italian Rye Grass and Yellow Oat Grass made a good growth; Esparsette and Sanfoin made a fair growth; Yellow Lupin (1-10 acre sown) had a good growth; Perennial Vetch (1-10 acre sown) is a very promising forage plant, and remains green long after all others have succumbed to freezing weather. The seed was allowed to ripen and fall upon the ground, in the hope of thickening the stand.

Four acres of ground in the northwest corner of the farm, formerly sown to alfalfa, upon which the stand was very poor, were used in trying a series of experiments with mixed grasses.

Canada Field Peas—The object of sowing field peas was to determine whether they could be grown as a profitable hay crop or not. Two acres were sown, half to peas and oats, the other to peas alone. The most satisfactory results were obtained from the mixture, using a quantity of oats with the peas. The advantage gained is two-fold the oats hold the peas up in their growth and serve to make the hay more acceptable to stock.

Corn--Three acres were devoted to growing corn, two to variety tests and one to Pride of the North, check-rowed. Pride of the North or South Dakota corn, planted in drills, cultivation one way, and without detasseling, produces the most dry feed. The only advisable sweet corn to plant, one that will succeed and ripen ears one year with another, is the Cory. Other kinds are sweeter and better adapted for table use, but may fail now and then at this altitude.

Sugar Beets—One-fifth of an acre was devoted to growing sugar beets, the Improved Vilmorin and Klein Wanzelbener. The plants appeared much thinner over the ground than last year, and for this reason a much better yield was realized. The average weight of a root was two pounds. This made less labor in the harvesting and gave the best size of root for sugar. The yield appended in the table of analyses is taken from the weight of beets gathered form a given distance of row, as the major portion of beets is still under cover of snow. All were analyzed by the U. S. Department of Agriculture.

Name.	Date.	Sugar.	Purity	Yield.
Vilmorin	Oct. 3d	14.66	77.6	12.19
Klein Wanzelbener	Oct. 3d	15.07	78.0	11.76
Vilmorin	Oct. 24	13.18	73.4	

Potatoes—One hundred and forty-one varieties of potatoes were grown. Many varieties were grown in duplicate, in which seed was used from different and widely separated portions of the United States. A fine lot was secured through exchange from the Oregon Agricultural Experiment Station and another lot from the Nevada Station. Thirty-six varieties were received from the Horticultural Department of the College.

Fifty feet of row of each variety were grown. The rows were three feet apart and the tubers were cut to single eye pieces and dropped 16 inches apart in the row. Just after the tubers were set a long and continued drought set in, which decreased the yield to a great extent.

SOME RESULTS.

Variety.	*Yield in Bu. per Acre.*
American Wonder	145.0
Albino	150.0
Arizona	135.0
Blue Victor	122.0
Burbank	125.6
Clark's No. 1	126.5
Chicago Market	125.6
Early Sunrise	130.0
Early Puritan	126.5
Early Northern	130.0
Everette	130.1
Fearnaught	120.8
Green Mountain	125.5
Koshknong	126.5
Late Puritan	169.3
Lee's Favorite	125.6
Martin's Seedling	130.0
New Brunswick Belle	130.0
Negro	130.0
Oxford	169.1
Ohio Fancy	129.0
Polaris	130.8
Prince Edward Island Rose	130.0
Pearl of Savoy	147.0
Pearl Prolific	141.1
Perfect Peach Blow	120.8
Rubicund	135.0
Rose's Beauty of Beauties	120.8
Reed's Eighty-Six	130.1
State of Maine	130.0
Summit	120.8
Seedling No. 15	135.3
Seedling No. 37	135.3
Vick's Perfection	135.3
Vick's Champion	120.8
Vanguard	135.3
White Prize	132.5
White Peach Blow	130.8
White Rose	174.0
White Meschannock	150.0

To demonstrate how far apart potato eyes should be dropped in the row to secure the best re-

sults, an experiment was undertaken in which the Late Ohio potato was used. Whole tubers were used in one test, and single eye pieces in another, gradually increasing the distance between the pieces dropped. The following table shows results:

	Yield per acre in Bu.
Small whole tubers, 16 inches	93.2
Single eyes, 16 inches	106.3
Single eyes, 20 inches	72.3
Single eyes, 24 inches	53.0
Single eyes, 30 inches	39.6
Single eyes, 36 inches	38 0
Two eye pieces, 16 inches	91.8

It is seen that, as the distance is increased, the yield is decreased, the best results being obtained from good single eye pieces dropped 16 inches apart in the row.

Peas—The following varieties were planted in drill rows, three feet apart, May 10th: their earliness, and other notes are tabulated below.

Variety.	First Blossom.	Edible Size.	Av'ge No. of Pods.	Height of Vine in Inches
Yorkshire Gem	July 7	Aug. 1	16	42
Champion of England	July 7	Aug. 3	23	18
Daniel O'Rourke	June 23	July 12	10	18
Alaska	June 22	July 10	5	16
Bliss Ever Bearing	July 7	Aug. 1	20	22
McLain's Blue	July 7	July 28	15	26
Laxton's Alpha	June 23	July 15	10	32
Yorkshire Hero	July 1	Aug. 5	12	28
Fill Basket	July 5	Aug. 3	24	28
Forty Fold	July 9	Aug. 1	30	36
Laxton's First	June 23	July 14	8	24
Stratagem	July 9	Aug. 1	19	17
Tall Gray-Sugar	July 8	Aug. 5	24	36

Beans—Twelve varieties were planted on May 23d. The frosts in June killed the major portion of the plants, which were just in their first pair of true leaves. All varieties ripened seed.

Melons—Four varieties of watermelon, six of muskmelon, and three of cucumber were planted. None set fruit.

Pumpkins and Squashes—Seven varieties were grown, resulting as follows: Connecticut Field Pumpkin and Cushaw set fruit, but it was very small. Mammoth Chili squash ripened fruit, largest 15 pounds. Hubbard ripened fruit, size medium. Of the Sibley no fruit set. Summer Crookneck and White Bush Scallop ripened fruit in abundance.

Cabbage—Seed was sown in hot-bed early in April and plants were transplanted in open ground June 3rd. All headed well.

Mammoth Rock Red—weight largest head 10 lbs.

Late Flat Dutch—weight largest head, 11 lbs.

Early York—weight largest head, 6 lbs.

Winningstadt—weight largest head, 8 lbs.

Onions of five varieties were grown from seed, and three varieties from bottom sets. At this altitude, onions do not attain much size the first year from seed. By planting the bulb early in the spring onions of good size may be grown.

HORTICULTURE—ORCHARDING.

One hundred and thirty-two apple trees were received from the State Agricultural College, the Arkansas Valley Station, and from the Pennock nurseries of Bellvue, Colo. These were planted as soon after receipt as possible. Through the growing season all necessary attention was given

them. All but four trees go into winter in a good, healthy condition.

Forest Trees—The following deciduous trees were received from the main Station and the Pennock Nurseries: 20 Rock Elm; 10 Camperdown Elm; 20 Black Walnut; 10 Privet; 10 Green Ash; 5 Norway Maple; 20 Box Elder; and 20 Cottonwood. All lived but two each of Maple, Ash, and Cottonwood.

Small Fruits—A number of varieties each of currants, raspberries, blackberries, and strawberries was set out with the results of a good percentage of living plants.

BUILDING.

A barn 18 x 28 feet was built in the spring, under contract. The plans, specifications, etc., were furnished by this Station. The arrangement is convenient. There is space for a team, larger farm implements, a quantity of hay, and a storage room for seeds and exhibits of Station products.

Hot-beds were constructed and fitted with sash. The remaining native sod was plowed up, thus bringing all the tillable land under cultivation.

Exhibitions—An exhibit was made at the Elbert County Fair, held at Elizabeth, September 23d and 24th, in which were shown twenty-two varieties of wheat, oats, and barley, both in straw and grain; and seventy-five species of native and introduced grasses. These were shown in folding cases made for the occasion. Fifty kinds of potatoes and numerous vegetables were also shown.

A similar exhibit was made at Monument, El Paso County, October 5th, 1892, and at Castle Rock, Douglas County, October 6th and 7th, 1892. In each case the fair officials placed at our disposal

the most suitable space in which to show the Station exhibit.

These exhibits attracted much attention and made scores of people acquainted with the Station and its work.

A collection of grains, grasses, and forage plants was prepared for the Columbian Exposition. Another collection of grains was turned over to Mr. J. W. Foster, of Colorado Springs, agent for this county at the Columbian Exposition. A duplicate collection of native grasses was sent to the Agricultural Museum at the College.

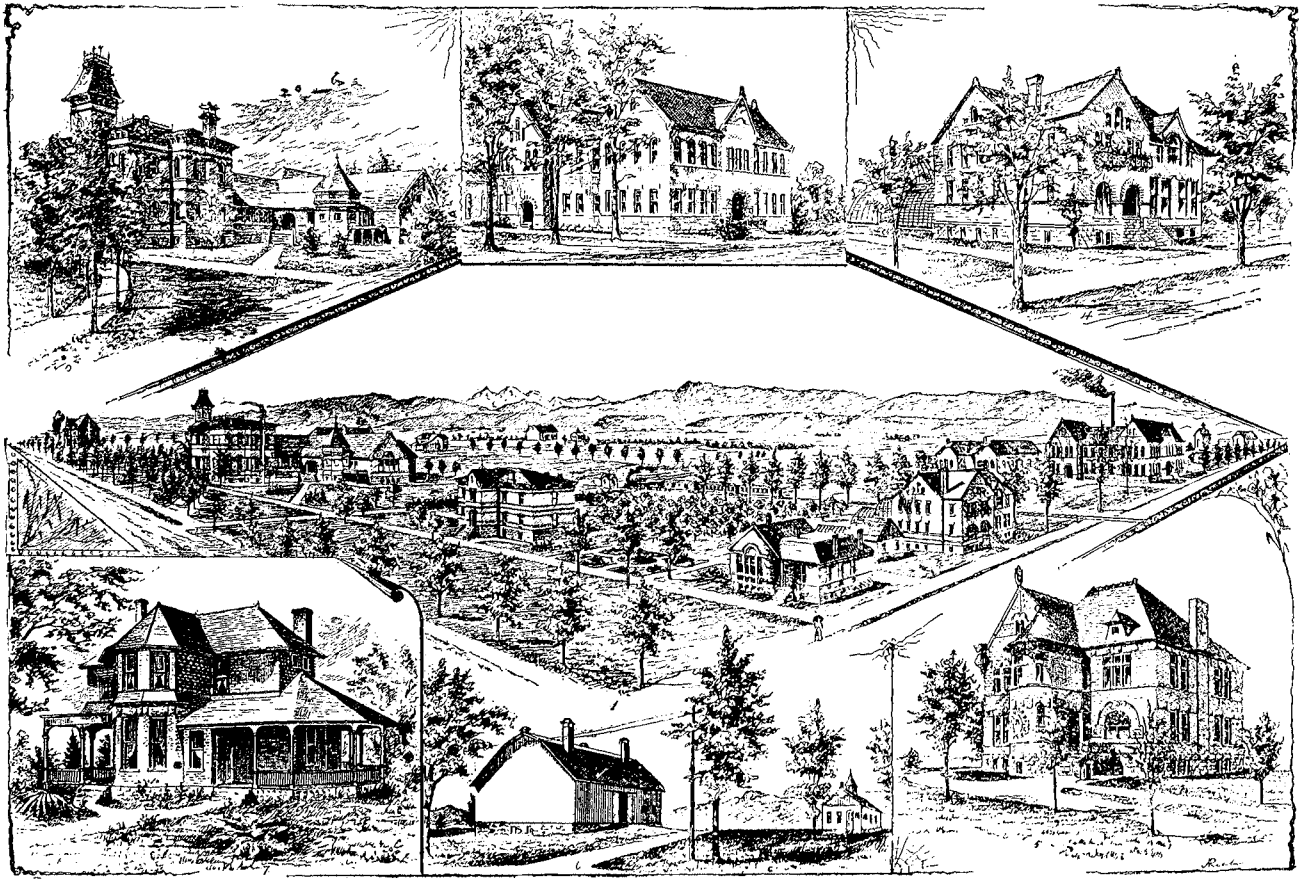
Respectfully submitted,

G. F. BRENINGER

Superintendent.

TABLE ROCK, Colorado, December 1st, 1892.

TABLE OF CONTENTS.



THE STATE AGRICULTURAL COLLEGE BUILDINGS, FORT COLLINS, COLORADO.