3-1898

Moisture Investigations for 1897

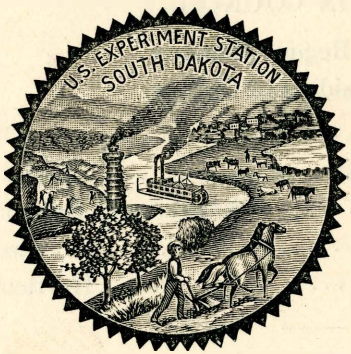
E.C. Chilcott
South Dakota Agricultural College

A.B. Holm
South Dakota Agricultural College

(So. Dak. Bul. No. 58.)

March, 1898. **Bulletin 58**

U. S.
EXPERIMENT STATION,
SOUTH DAKOTA.



IN CONNECTION WITH THE

SOUTH DAKOTA AGRICULTURAL COLLEGE.

Moisture Investigations for 1897.

Department of Agriculture and Soil Physics.

BROOKINGS, SOUTH DAKOTA.

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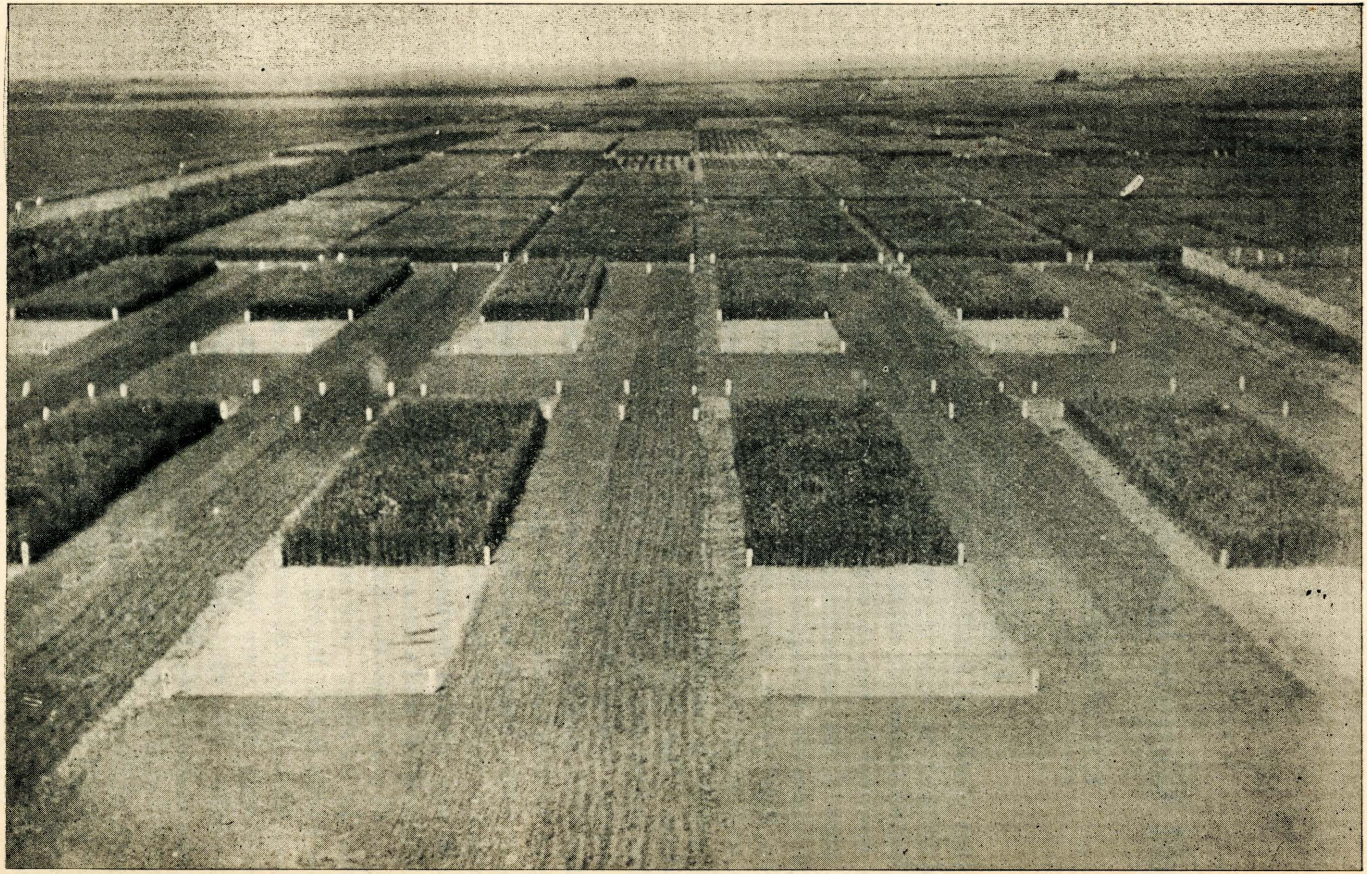
Soil Moisture Investigations for 1897.

E. C. CHILCOTT. A. B. HOLM.

INTRODUCTION.

All that portion of South Dakota lying east of the Missouri river is covered by what is known as drift or boulder clay, except a few small isolated areas. This formation varies in depth from a few feet to two or three hundred feet, and when the entire mass of the deposit is considered it is of a remarkably uniform character throughout the state. Its chief characteristic is a light yellow color with numerous small, calcareous masses and more or less boulders, stones and pebbles in the subsoil, gradually merging into a dark brown or black loam on the surface. This dark color is due to the presence of decaying vegetable matter and the action of the elements.

The sorting powers of running water, moving ice and blowing winds have caused quite a variation in the appearance of the surface in various localities throughout the state. This difference is, however, largely superficial and, in most instances, does not extend to any considerable depth. Wherever the surface soil shows any marked deviation from the normal of the state, it is not difficult to find a cause for that deviation in forces that have been at work since the time when the whole area was covered with the ice sheet. For instance, that portion of the state included within Spink, Brown, and portions of Beadle counties was once, since the glacial period, occupied by a shallow lake bed. Into this lake were brought the washings of the surrounding hills. The wave action in the lake affected a separation of the coarser from the finer particles, depositing the fine clay and silt over the bottom of the lake in a nearly level, uniform layer, while much of the larger, heavier portion remained near the margin and formed sandy beaches. The remains of these beaches are easily seen in the character of the soil in the western part of Brown county, the central portion of Beadle



GENERAL VIEW OF PLATS.

county, and along the foot of the hills, both on the east and on the west side of this old lake bed.

When the ice sheet receded from this territory, it left irregular ranges of boulder-covered hills, known as terminal moraines, on the divides between the Missouri and the James and between the James and the Sioux rivers. These hills are composed of substantially the same materials as the rolling and the level prairies, only that some of the rocks had not yet been pulverized when the ice sheet left them where we now find them.

Throughout the entire area under consideration there are many river and creek bottoms and beds of dried up lakes, composed of rich alluvial deposits which have been brought down from the surrounding higher land. The decay of rank vegetation which has flourished in these favored localities for untold ages has added large stores of organic materials.

The wind has also been quite an active soil builder. Along the bluffs of the Missouri river may be found deposits, several feet in thickness, composed almost entirely of fine dust blown from the sand bars along the river. Scattered over the state may be found the remains of small glacial lakelets, many of which have been filled to a considerable extent with a fine dust blown from the surrounding prairies. This action has gone on much more rapidly since the prairies were broken, and it seems likely that many of our lakes are destined to be entirely filled up in this manner, at no distant date. The soil so formed closely resembles, if it is not identical with, the loess formation.

Many other instances of differentiation that have been brought about by the action of well known causes may be called to mind by any observing person who will give the matter a few minutes' consideration; but, nevertheless, the material which was brought down from the north and spread over the entire portion of the state east of the Missouri river was of a remarkably uniform character. It is also a fact that this material was of wonderful fertility, and that it was ground to a state of fineness by the action of the ice which reduced it to the very best mechanical condition for the retention of moisture and the production of plants.

It is not the intention at this time to enter into any lengthy discussion of the soils of the state either from a mechanical or

a chemical standpoint. We have, however, a systematic examination of these soils well under way, and will publish the results at some future time. The accompanying mechanical analyses have been selected from a considerable number already made, simply to show that the soils are, as above stated, of quite a uniform character over a large area.

MECHANICAL ANALYSIS OF SOILS.

From Station Plats.

Number.	Designation of particles.	Diameter in mm.	Hydraulic value in mm.	Surface soil per cent.	Intermediate soil per cent.	Sub-soil per cent.
1	Coarse grits	1-3	?	1.54	5.18	3.91
2	Fine grits	.5-1	?	6.88	2.82	2.70
3	Coarse sand	.50	64	7.36	8.57	5.28
4	Medium sand	.30	32	.35	2.38	2.60
5	Fine sand	.16	16	4.64	9.81	12.89
6	Finest sand	.12	8	7.36	5.47	4.07
7	Coarse silt	.072	4	4.87	5.09	5.88
8	Large silt	.047	2	6.06	5.99	9.04
8	Medium silt	.036	1	5.68	4.46	3.08
10	Fine silt	.025	.5	10.53	3.58	7.29
11	Finest silt, separated by elutriator	.016	.25	18.08	17.42	16.74
12	Finest silt, separated by sedimentation	.010	.25	.39	1.62	2.09
13	Clay	.0001	.0023	13.39	20.84	16.11
	Organic matter			9.64	4.95	7.66
	Total			96.77	98.18	99.34
	Water free sample			100	100	100
	Loss			3.23	1.82	.66

The accompanying table gives analyses of the surface, intermediate and sub-soil of the experimental plats. Summarizing the above results and those obtained from analyses of soils from Arlington, De Smet and Highmore, and treating the three samples taken from each of these localities as one composite sample, we have the following:

Locality.	Designation of Particles.				
	Grits .5-3.	Sand .12-.50.	Silt .016-.072.	Clay .0001-.01.	Organic matter.
Brookings	7.68	23.59	41.26	18.15	7.47
Arlington	2.06	6.46	38.83	35.55	8.33
De Smet	3.97	17.89	41.14	24.75	6.93
Highmore	3.60	14.70	46.75	26.75	6.00

The soils were selected from the above localities for comparison for the reason that these places have a much greater altitude, and are popularly supposed to have a soil quite different from that of the Sloux Valley. Such, however, does not appear to be the case, for an examination of the above table will show that all of these soils approach the typical South Dakota soil, which contains about 4 per cent grits, 16 per cent sand, 41 per cent silt, 27 per cent clay and finest silt and 12 per cent organic and soluble matter.

In order to show how far some soils of fair fertility depart from this tppe we give below a summary of the analyses of two soils, one from ½ mile north of the city of Huron, and one from the high table land in the northern part of the city of Pierre. In the Huron sample sand predominates. This is probably due to the fact that this soil was formed near the edge of a shallow lake which occupied the northern central part of the state after the ice sheet had receded, and that the clay has been washed out and deposited farther north in northern Spink or southern Brown counties. The Pierre sample contains nearly 70 per cent of silt. This is due to the fact that it is an aeolian formation and consists largely of those fine particles which are easily transported by the wind.

Locality.	Designation of Particles.				
	Grits .5-3.	Sand .12-.50.	Silt .016-.072.	Clay .0001-.01.	Organic matter.
Huron	3.49	56.22	27.73	8.47	2.30
Pierre	1.55	1.52	69.74	15.99	5.57

There are, of course, soils to be found in almost any part of the state that, owing to some such causes as the above, depart widely from the ordinary type, but in the main our soils are reasonably uniform.

Probably less then one-tenth of the land surface of the whole globe is covered with glacial drift, and a large portion of that is unfit for agricultural purposes owing to the latitude or to the mountainous character of the surface, but within this area are

found the richest agricultural states of the union, including, as it does, all of that portion lying east of the Missouri river and north of the Ohio river, the state of New York and the New England states.

Everywhere drift soils are recognized as containing practically inexhaustable quantities of the elements of fertility, but in most glacial areas the ice sheet in its movement from the north encountered so many exposed ledges of rock that the material it deposited was composed largely of boulders that had not yet been reduced to soil; so that while drift soils are universally recognized as fertile soils they are usually so stony as to be difficult to till. Fortunately for this state, the character of the country, to the north of us for hundreds of miles, was such that little raw material in the form of rocks was added to the moving mass of ice and soil, but the material which it did bring had been so thoroughly mixed up, and ground down by the time that it reached its present location, that it is composed almost entirely of thoroughly disintegrated soil material. Thus we have all the advantages of a drift formation with far less stones than are usually found in drift or boulder clay.

In addition to the foregoing there have been other very potent factors in producing a soil of great uniformity and remarkable fertility throughout this region. Most important of these is the fact that this has been a region of light rainfall for a great length of time. We have become accustomed to associate the ideas of humidity and fertility, on account of the very luxuriant growth of vegetation which is found in those countries having a heavy annual rain fall. But the very same causes that produced the heavy growth of forest and underbrush will, as soon as that forest growth is removed, begin to carry away, not only those elements of stored-up plant food in the soil, but in many instances the soil itself; so that in many of the humid districts the luxuriant forest areas of one generation become the washed and worthless hillsides of the next. No such wasting effects have been experienced upon our open prairies, although they have been unprotected by forest growth for ages; but, on the contrary, there has been a steady increase in the store of available plant food as a direct result of those chemical and physical changes which are constantly going on in the soil. Had this been a region of heavy rainfall, the salts which result

from these changes would have been washed off or leached out as fast as formed, and no such store of available plant food would have been possible.

The influence of temperature in soil formation is also an important one. It has an effect upon both the chemical and the physical changes which take place in the soil. Other conditions being equal, all chemical changes taking place in soil formation are accelerated by high, and retarded by low soil temperatures. The very high soil temperatures which have been observed in this region during the summer and fall months have contributed in no small measure to the reduction of the soil to its present condition. The effect that temperature has upon the physical changes that take place in soil formation is largely due to expansion and contraction. There are but few regions that have experienced such frequent, sudden and violent changes as this. So it seems probable that the temperature conditions of this climate have had a beneficial effect upon the physical, as well as the chemical changes which are necessary for the production of fertile soil.

Having established the facts that the soils lying east of the Missouri river, in this state, are of a reasonably uniform general character, that they contain all the essential elements of plant growth in practical inexhaustible quantities, and that their mechanical nature is calculated to retain moisture and to facilitate the transference of plant food from the soil to the growing plant in quantities sufficient for the production of bountiful crops for an indefinite period, provided a proper system of tillage and rotation is practiced, the next, and the all important question to be considered is, how to till the soil so as to place it in the best possible physical condition for plant growth.

The object of all tillage is to secure the proper arrangement of the soil particles with relation to each other. It is true that tillage has a very beneficial effect in the destruction of weeds, but any system of tillage that will keep the soil in the best physical condition will also keep the weeds down, so that destruction of weeds does not need to be considered in this connection.

The objects that may be attained by a proper arrangement of soil particles may be summarized as follows:

1. The soil can be placed in such condition of fineness and looseness as will allow of a perfect root development, extending to a greater or less depth according to the nature and the needs of the crop.

2. A free access of air can be secured in sufficient quantities to supply the oxygen necessary for the direct needs of the crop, the development of the various ferments so essential to a fertile condition of the soil, and the purely chemical changes which are constantly going on in all soils.

3. The temperature of the soil can be considerably influenced by its physical condition.

4. The water holding capacity of the soil, the facility with which this water can move through the soil, and, consequently, the supply of plant food which may be carried to the roots of the crop, and the amount of water which may be carried to the surface of the soil and evaporated, are governed largely by the arrangement of the soil particles.

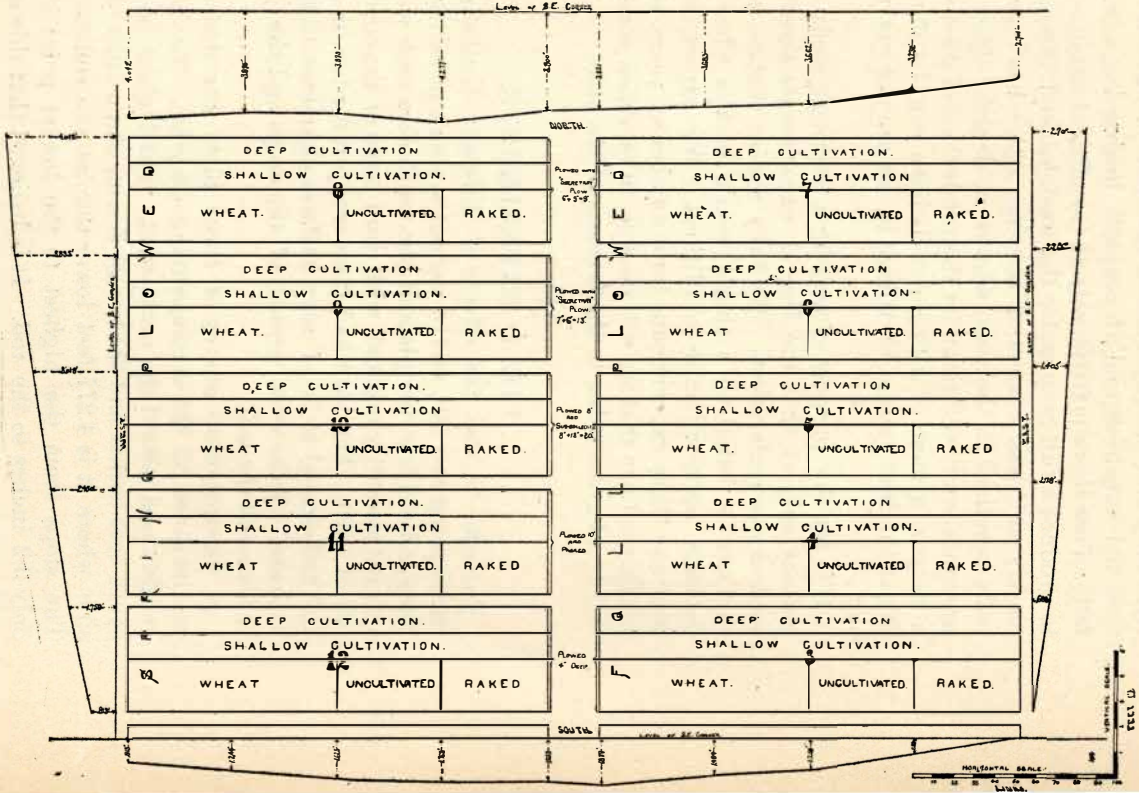
It is a matter of great economic importance that the soils of this state are of such a physical nature that the first three of these objects can be attained with a remarkably small amount of labor. The importance of this fact can hardly be overestimated, for it not only enables the farmers of this state to produce crops at a less cost for labor in fitting the ground than almost anywhere else in the union, but it also enables them to adopt that system of tillage which will attain the fourth object, that is the conservation of soil moisture, without reference to any other object.

Any system of tillage that will most completely utilize the rainfall of this region for crop production will insure the best yields on an average for a term of years.

While plant physiologists have long recognized that a proper supply of water is the most important factor of plant growth, it is only within comparatively recent times that practical farmers have begun to realize, that even in those localities where any addition to the water supply by artificial means—irrigation—is impracticable, much may be accomplished by improved methods of tillage in making the most of such natural supplies as do occur.

There is probably no locality where this question of tillage needs more careful study, nor where it promises greater re-

DIAGRAM OF SOIL MOISTURE EXPERIMENT PLATS.



wards. We have everything that is needed for a rich, prosperous agricultural state, a soil of practically inexhaustible fertility, easily and cheaply worked, favorable conditions of temperature and sunshine, and, if properly husbanded, sufficient rainfall. That there is frequently an insufficient supply of moisture to produce a full crop under the wasteful and oftentimes thoroughly shiftless system of farming, which has been so extensively practiced in the past, admits no denial. That the normal precipitation is sufficient for the production of good crops under a proper system of tillage, we believe can be demonstrated. What the best system of tillage is, we are not yet prepared to say.

It is for the purpose of making a thorough study of this important subject that the line of experiments about to be described was undertaken. We fully realize that no safe conclusion can be based on a single year's results where so much depends upon climatic conditions. We expect, however, to continue these experiments for a number of years, and we confidently believe that we will be able to establish some facts that will be of great value to the farmers of the state.

FIELD EXPERIMENTS.

In order to test the effects of different depths of plowing, both spring and fall, and of various systems of cultivation, both deep and shallow, ten plats of one-tenth acre each were laid out and permanently marked with iron posts at the corners, in the fall of 1896. The land had been cropped for ten or more years and had proved to be of very uniform character throughout, as indicated by the even growth of the crops and the general appearance of the soil.

A topographical survey of these plots was made with the results given on the accompanying diagram. The plats have a gentle slope toward the north-west. The highest point is at the south-east corner and the lowest is near the middle of the north side where it is 4.277 feet lower than at the south-east corner. The slope from the highest to the lowest point is therefore only 3.2 inches to the rod. It is believed that this slope is not sufficient to cause any perceptible difference in the moisture contents of the several plats. We have, however, carefully

guarded against washing during heavy rains by a system of ditches, embankments, and grading of alleys and drives, calculated to conduct all excess of storm-waters along alleys and drives instead of allowing them to flow across the plats.

The division of the plats and also the time and methods of plowing and the after-cultivation is shown on the accompanying diagram.

Plats 3, 4, 5, 6 and 7 were plowed in the fall—Sept. 15, 1896.

Plats 8, 9, 10, 11 and 12 were plowed in the spring—April 22nd, 1897.

Plats 3 and 12 were plowed 4 inches deep with a common stubble plow.

Plats 4 and 11 were plowed 10 in. deep with a common stubble plow, followed immediately with a "Campbell Sub surface Packer" weighted to 1950 pounds.

Plats 5 and 10 were plowed 8 inches deep with a common stubble plow followed by a subsoil plow which stirred the soil to a depth of 12 inches more, a total depth of 20 inches.

Plats 6 and 9 were plowed with a John Deere "Secretary" plow with disc set so as to turn a furrow 7 inches deep and subsoiling attachment set to stir the soil 6 inches deeper, a total of 13 inches.

Plats 7 and 8 were plowed with a John Deere "Secretary" plow with disc set so as to turn a furrow 6 inches deep and the subsoiling attachment set to stir the soil 3 inches deeper, a total of 9 inches.

On April 24th, 1897, these plats were all dragged three times over, which put them in good tilth. The south-east quarter of each plat was then sown to wheat with a "Little Hoosier" drill set to sow one and a quarter bushels per acre. The remainder of each plat was subdivided into four parts, as shown on accompanying diagram. None of these subdivisions were sown to crop but were left bare all the season.

The subdivisions marked "uncultivated" were left undisturbed during the season with the exception of cutting off the weeds with a sharp hoe at the surface of the ground whenever they appeared.

The subdivisions marked "raked" were gone over with a common hand garden rake once a week during the season. This

raking was as light as possible and it did not average more than an inch in depth.

The subdivisions marked "shallow cultivation" were cultivated once a week with a "Breed Weeder" which stirred the soil very thoroughly to a depth not exceeding two inches.

The subdivisions marked "deep cultivation" were cultivated once a week with a spring-tooth cultivator to a depth of four inches.

Wherever cultivation was practiced at all it was done as soon after a rain as the soil was in suitable condition.

The first cultivation took place on May 8th, the last on Oct. 16th.

TAKING SAMPLES.

SAMPLING.—Samples of soil for moisture determinations were taken once a week during the season, for which purpose the following instruments were used:

The soil sampler consists essentially of a steel tube three feet

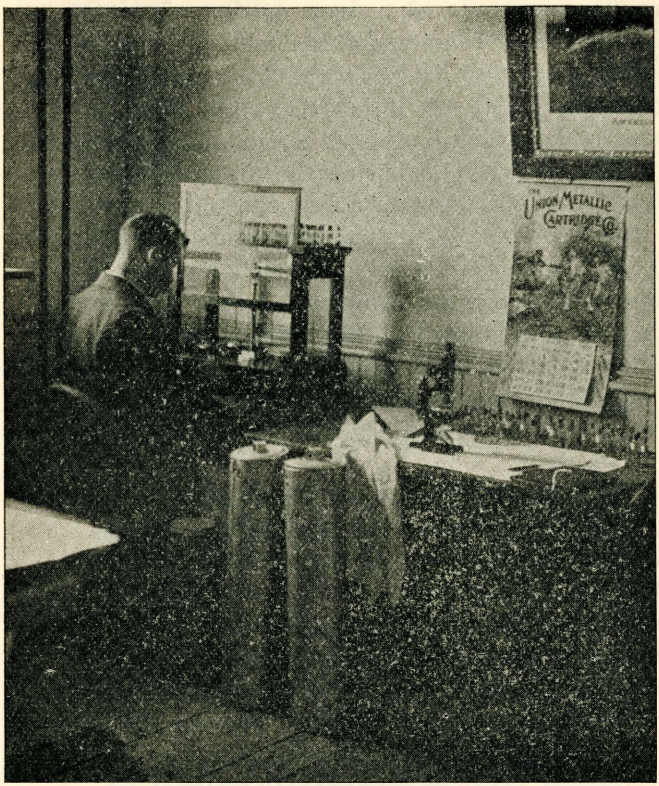
long and one inch inside diameter, with a heavy collar brazed on the upper end, to which strong iron handles are attached, and a hard steel collar provided with a sharp cutting edge and having an inside diameter of seven-eighths and an outside diameter of one and one-eighth inches at the lower end. The handles, eight inches in length, are inserted at right angles to the tube, on opposite sides, and are used for forcing the sampler into the ground. The hard steel collar at the lower end provides the cutting edge and relieves both the inside and the outside of the tube from friction. With this arrangement the soil will not stick to the outside of the tube, nor will the core of earth cling to the inside when the sampler is forced into the ground. The sampler is graduated on the outside, as follows, beginning at the lower end: 6, 15, 21 and 30 inches.

The covered evaporating cans are of copper, 6 inches in diameter and one inch deep with screw cover of zinc 5 inches in diameter.

Tin cans, 24 inches deep and 6½ inches in diameter, provided with covers and bales, for carrying the evaporating cans between the field and the laboratory, were used. Each of these cans holds twenty of the evaporating cans.

The method of taking the samples is as follows: The spot selected for taking the samples is cleared of any rubbish, stones or loose lumps of soil that would be likely to fall into the hole after the sampler was taken from the ground. The sampler is then forced into the ground up to the first mark—6 inches; it is then withdrawn together with the core of earth which it contains. The sampler is then inverted and the core is allowed to fall into one of the evaporating cans which an assistant holds ready for that purpose, the cover is quickly applied, screwed down, and the evaporating can placed in one of the large cans provided for that purpose. The sampler is then again inserted in the same hole from which the first sample was taken, forced down to the second mark—15 inches, and a second sample is taken and disposed of in the same manner as the first. In this way four samples are taken from the same place, but representing four different depths, as follows: A, surface, 6 inches; B, 6 to 15 inches; C, 15 to 21 inches; D, 21 to 30 inches.

The first samples were taken on May 1st, the second on May 8th, the third on May 17th, and the fourth on May 22nd. There



WEIGHING SAMPLES.

were eighty samples taken at each of these four dates, eight samples from two places representing four depths being taken from each of the ten plats.

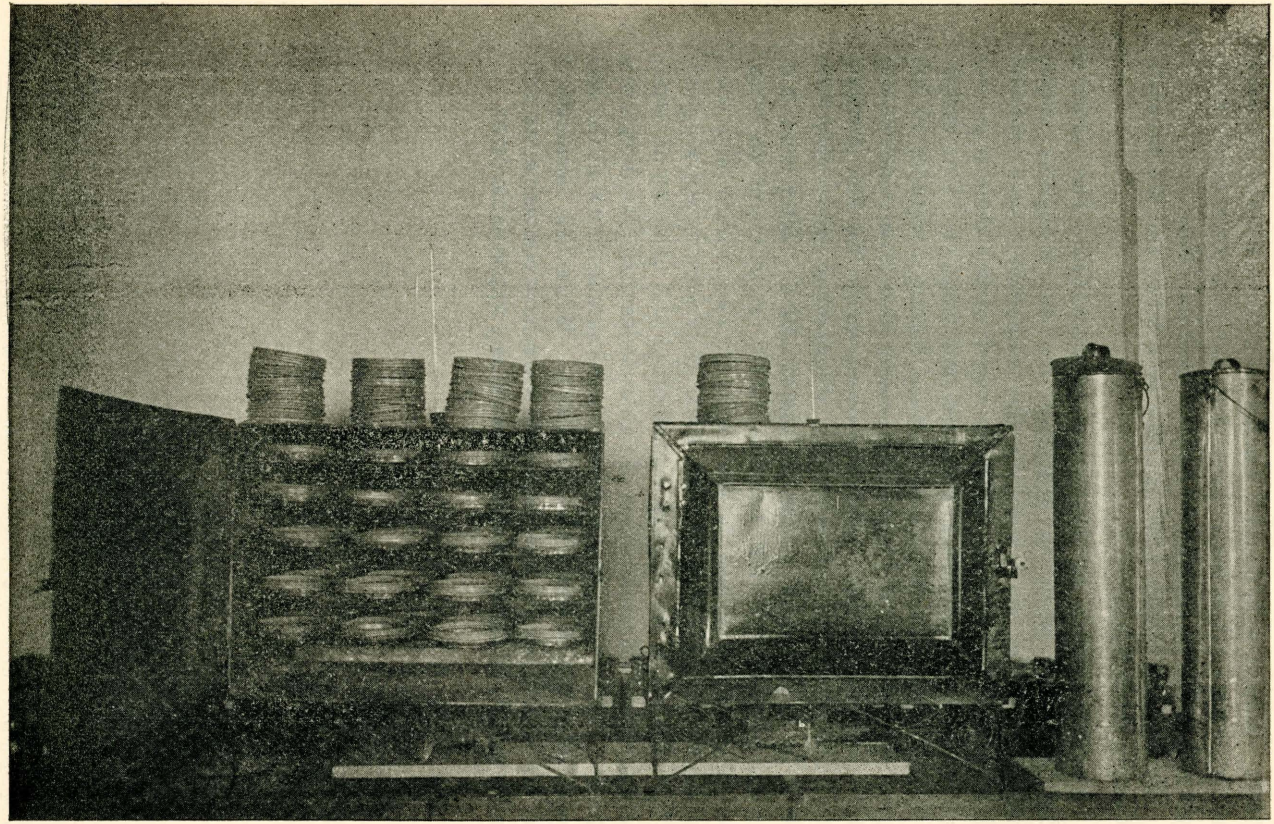
On May 29th, the various methods of cultivation adopted for the several subdivisions having proceeded for nearly a month, four samples representing four depths A, B, C and D, were taken from each subdivision of each plat. This amounts to 200 samples which is the number taken at each date of sampling up to October 23rd.

Samples were taken on the following dates: May 29th; June 5th, 12th 19th, 26th; July 3rd, 10th, 17th, 24th, 31st; August 14th, 21st, 28th; September 6th, 18th, 25th; October 2nd, 9th,

16th. Plats 3, 4, 5, 6 and 7 having now been plowed, no more samples were taken from them; but samples were taken from plats 8, 9, 10, 11 and 12 on October 23rd and 30th.

During the season 4,360 samples were taken and the moisture therein determined.

DETERMINATION OF MOISTURE IN SAMPLES.—The samples having been taken as described in the foregoing pages, were carried to the laboratory, the evaporating cans removed from the large tin cans, carefully wiped to free them from any adhering soil particles or moisture, and weighed. This weighing was done on a Troemner balance having a capacity of 500 gm. and sensitive to 1 mg. The covers were then removed and the evaporating cans placed in ovens made for the purpose, and shown in the accompanying illustration, where they were kept for ten hours at a temperature of 110°C. They were then removed and, while still hot, the covers applied, and the evaporating cans returned to the large tin cans, where they were covered and allowed to cool, when they were again weighed. The difference in weight representing the amount of water evaporated, the per centage of moisture was calculated on a dry basis. This calculation is based on the assumption that the soil was reduced to a water-free condition. While this assumption is not absolutely correct repeated trials have convinced us that not enough moisure remains to cause any appreciable error.



DRYING OVENS.

RESULTS.

As before stated there were 4,360 separate samples taken and moisture determinations made. But instead of giving the results of each of these determinations it has been considered best to give the averages for periods of about one month each, as follows: May 1st to 22nd, May 22nd to June 26th, June 26th to July 31st, July 31st to Aug. 28th, Aug. 28th to Sept. 25th, Sept. 25th to Oct. 30th.

In order to facilitate the comparison of the water content of the soil during the different periods, and for the entire season, of the several plats and subdivisions of plats, we have made two groupings of the averages for periods in the accompanying tables.

In the table entitled "Average per cent of Moisture in Soil by Plats and Periods" the aim has been to afford an easy comparison of the plats, one with another, by periods and for the entire season. As all the plats received exactly the same treatment during the season but each plat was plowed at a different time or in a different manner from any other plat, it is fair to assume that whatever difference of moisture may appear between any of the plats is due to either the time or the manner of plowing. The plats are in pairs as follows: 3 and 12, 4 and 11, 5 and 10, 6 and 9, 7 and 8. The two plats in each pair having been plowed in the same manner, but Plats 3, 4, 5, 6 and 7 having been plowed in the fall, and Plats 8, 9, 10, 11 and 12 in the spring, it will not be difficult in any particular instance to determine whether the difference in moisture is due to the *time* or the *manner* of plowing.

The table entitled "Average per cent of Moisture in Soil by Subdivisions and Depths" is arranged to show the effect upon the water content of the soil of the several methods of cultivation during the season, and of no cultivation both with and without a crop. As it is quite as important to know how the several systems of plowing and cultivation effect the *distribution* of the moisture through the soil, as it is to know the total water content of the soil to any given depth an opportunity for ready comparison of the moisture at the several depths, is also afforded by this arrangement.

AVERAGE PER CENT OF MOISTURE IN SOIL BY PLATS AND PERIODS.

	May 1st—22nd.				May 22nd—June 26th.				June 26th—July 31st.			
	A	B	C	D	A	B	C	D	A	B	C	D
PLAT 3.—Fall plowed, 4 in. deep.												
Wheat					19.91	16.18	11.95	9.78	17.90	12.71	9.31	8.84
Uncultivated					19.73	18.67	15.24	15.08	23.28	19 10	14 35	12.85
Raked					22.74	19.77	14.97	13.69	25.49	20.83	16.28	14.18
Shallow cultivation					22.78	18.88	15.06	13.56	24.38	20.24	16.27	13.80
Deep cultivation					22.65	18.60	15.16	13.62	24.60	18.41	14.74	13.57
Average for plats by periods and depths	19.09	18.28	15.50	12.83	21.56	18.42	14.48	13.15	23.13	18.26	14.19	12.65
to 30 inches				16.42				16.90				17.06
PLAT 4.—Fall plowed, 10 in. deep, packed.												
Wheat					18.73	16.08	13.10	10.78	18.56	13	10.83	8.16
Uncultivated					23.58	20.71	16.27	14.03	24.64	21.22	15.77	13.82
Raked					23.71	20.85	15.69	13.14	25.70	21.59	16.79	13.91
Shallow cultivation					23.23	19.10	15.20	12.87	24.57	19.95	14.18	13 79
Deep cultivation					23.05	17.82	13.88	13.07	25.31	20.30	16.04	13.05
Average for plats by periods and depths	19.95	19.91	15.56	12.98	22.46	18.91	14.83	12.78	23.76	19.21	14.72	12.55
to 30 inches				17 10				17.25				17.56
PLAT 5.—Fall plowed, 8 in. deep, subsoiled 12.												
Wheat					20.27	17.37	12.94	11.78	20.43	13.72	10.71	9.41
Uncultivated					22.43	20.94	17.26	13.55	24.59	21.09	16.03	13.74
Raked					23 45	21.51	16.23	13.49	24.75	22.32	16.84	14.52
Shallow cultivation					24.59	22.49	18.06	13.63	25.22	20.54	16.27	15.22
Deep cultivation					22.74	19.81	16.35	11.09	24.95	19.18	15.45	13
Average for plats by periods and depths	20.60	19.61	16.66	14.01	22.70	20.42	16.17	12.71	23.99	19.37	15.06	13.18
to 30 inches				17.72				18				17.90
PLAT 6.—Fall plowed, "Secretary" plow, 7 and 6—13 in.												
Wheat					18.97	16.81	14.41	11.31	17.11	13.27	9.81	8.14
Uncultivated					21.02	18.60	14.39	12.67	23.31	20.35	16.62	14.07
Raked					22.98	18.81	15.53	12.85	25.56	20.71	15.79	14.22
Shallow cultivation					21.06	19.70	16.10	16.63	24.07	20.04	15.95	13.99
Deep cultivation					23.62	17.32	13.84	13.94	25.60	20.62	15.62	13.60
Average for plats by periods and depths	19.17	18.65	16.32	15.68	21.53	18.25	14.85	13 48	23.13	19	14.76	12.80
to 30 inches				17.44				17.03				17.42

AVERAGE PER CENT OF MOISTURE IN SOIL BY PLATS AND PERIODS.—CONT'D.

	July 31st—Aug. 28th.				Aug. 28th—Sept. 25th.				Sept. 25th– Oct. 30th.				Seasonal Av of plats by subdivisi'n to 30 in. deep.
	A	B	C	D	A	B	C	D	A	B	C	D	
PLAT 3—Cont'd.—													
Wheat	23.36	16.98	9.25	12.34	19.03	17.05	10.17	11.60	20.60	18	11.12	9.88	14 30
Uncultivated	21 82	18 86	14.33	13.51	19.60	17.65	12.10	11.30	20.34	17.92	13.33	13.34	16.62
Raked	25 56	24.09	12.09	13.90	22.42	18.71	14.50	13 22	23.08	18.47	14.67	13.31	18.10
Shallow cultivation	24.36	21.12	15.99	13.72	22.17	19.10	14.51	12.72	22.06	19.61	14.55	9.76	17.78
Deep cultivation	24.48	18.39	15.03	13.41	22 24	17.57	14.76	14.44	22.78	17.63	12.98	13.08	17.41
Average for plats by periods and depthss	23 92	19 89	13.34	13 38	21.09	18.02	13.21	12.26	21.77	18.33	13 33	11 87	16.83
" " to 30 inches				17.63				16.15				16.33	
PLAT 4—Cont'd,—													
Wheat	23.86	19.08	9.63	7.45	23.30	19.91	14.08	10.93	21.29	19 79	15.30	11.71	15.28
Uncultivated	23	19.76	19.39	12.80	21.47	19.77	15.09	12.51	21.42	20.07	13.92	12.53	18.09
Raked	25 43	20.44	16.90	13.54	23.36	21.71	14.82	11.77	22.75	21.01	15.26	11.75	18.47
Shallow cultivation	23.57	22.33	16.26	14.13	22.45	19 19	14 33	13.92	21.70	19.85	14.52	12.	17.90
Deep cultivation	24.46	20.20	15.81	14.19	23.91	19.37	13.35	13.54	25	19.89	14.01	12.	17.93
Average for plats by periods and depths	24.06	20.36	15.60	12.42	22.90	19.99	14.33	12.53	22.43	20.12	14.60	12.12	17.53
" " to 30 inches				18.11				17 44				17.32	
PLAT 5—Cont'd.—													
Wheat	22.97	19.09	12.29	7.18	21.61	19.56	14.24	11.44	21.34	19.53	13.60	10.15	15.48
Uncultivated	22.78	19.66	15.22	14.05	21 60	19.52	15.82	14 29	21.74	19.80	15.55	13.65	18.21
Raked	24.91	21.05	17 26	13.89	23.68	21.04	15 50	14.48	22.30	20.93	15.51	12.96	18.83
Shallow cultivation	25.69	20.70	15.72	14 43	21.79	21.48	13.30	12.97	22 10	19.94	16.64	13.66	18.72
Deep cultivation	24 82	20.43	15.82	13.99	24.09	19.76	15.03	13.56	23.78	18.69	14.38	11.17	17.91
Average for plats by periods and depths	24.23	20.19	15.26	12.71	22.55	20.27	14.78	13.35	22.25	19.78	15.14	12 32	17.85
" " to 30 inches				18.10				17.99				17.37	
PLAT 6—Cont'd.—													
Wheat	21.61	18.14	9.59	7.43	21.43	19.56	12.48	12.68	18.43	16.71	14.02	10.03	14.60
Uncultivated	21.35	18 79	14.98	13.26	20.23	16 50	10.90	10.29	19.65	17.41	13 13	11.11	16.43
Raked	24.77	20.56	16.40	14.25	22.11	17.67	14 65	13.20	22.47	20.35	15.17	11.82	17.99
Shallow cultivation	22 11	20.92	13.28	14.85	21 99	20.97	16.83	13.81	21.23	20.31	15.36	13.63	18.14
Deep cultivation	24.53	21.17	12.08	11.11	22.92	19.21	14.19	13.96	22.57	19.33	15.39	14.61	17.76
Average for plats by periods and depths	22.87	19.92	13 27	12.18	21.74	18.98	13.81	12.75	20.87	18.82	14.61	12.24	16.99
" " to 30 inches				17.06				16.83				16.63	

AVERAGE PER CENT OF MOISTURE IN SOIL BY PLATS AND PERIODS.—CONT'D.

	May 1st—22nd.				May 22nd—June 26th.				June 26th—July 31st.			
	A	B	C	D	A	B	C	D	A	B	C	D
PLAT 7.—Fall plowed, "Secretary" plow, 6 and 3--9 in.												
Wheat					19.40	15.76	12.82	10.33	17.37	12.97	9.87	6.85
Uncultivated					22.19	20.45	14 93	13.72	23.76	20.15	15	14.05
Raked					23.56	17.68	13.35	13.87	22.32	20.16	15.43	14.13
Shallow cultivation					25 08	20.74	15.57	11.38	25.48	19.65	14.99	14.28
Deep cultivation					24.99	19.13	14.63	15.22	25.82	19.80	15.83	14.13
Average for plats by periods and depths	19.15	19 81	16.64	14.29	23.04	18.75	14 26	12.90	22.95	18.55	14.22	12.69
" " to 30 inches				17.47				17.24				17.10
PLAT 12.—Spring plowed, 4 in. deep.												
Wheat					18.26	14.79	12	11.12	17.43	11 83	9.16	8.46
Uncultivated					20 33	20 13	15 29	12.90	23.14	19.61	14.33	14.03
Raked					21.25	19.11	14.61	12.04	23.81	20.16	15.33	13.31
Shallow cultivation					22.62	18.64	14.71	14.26	24.42	19.92	14.37	12.96
Deep cultivation					21.80	15.16	15 89	14.05	23.74	15.79	12.21	13.07
Average for plats by periods and depths	19.73	17.36	13.88	13.28	20.85	17.57	14 50	12.87	22.51	17.46	13.08	12.37
" " to 30 inches				16.06				16.45				16.36
PLAT 11.—Spring plowed, 10 in. deep, packed.												
Wheat					15.76	13.72	11.84	11.34	14.69	11.03	11.27	8.26
Uncultivated					21.42	20.14	13.45	11.88	23.90	20.57	15 17	14.24
Raked					23.09	19.73	13.78	14.27	23.38	18.76	13 58	12.32
Shallow cultivation					21.54	18.29	13.98	14.60	23.84	15.88	15.75	15.87
Deep cultivation					21.79	17.10	12.13	13.59	24.51	18.76	14.87	14.14
Average for plats by periods and depths	20.07	16.32	14.28	13.49	20.72	17.80	13.04	13.14	22.06	17	14.13	12.97
" " to 30 inches				16.05				16.18				16.54
PLAT 10.—Spring plowed, 8 in. deep; subsoiled 12 in.												
Wheat					16.80	15.75	13.51	12.55	17.22	11.99	10.47	9.56
Uncultivated					22.16	15.21	14.69	13.86	19.42	19.60	14.56	14.04
Raked					21.91	19.53	15.41	12.63	24.81	21.07	15.89	13.17
Shallow cultivation					23.97	21.16	16.31	13.92	23.83	21.53	14.22	14.06
Deep cultivation					21.69	18.58	15 43	11.67	23.80	18.48	14.79	14.05
Average for plats by periods and depths	20.53	18.64	14 63	13.93	21.31	18.05	15.07	12.93	21.82	18.53	13.99	12.98
" " to 30 inches				16.93				16.84				16.83

AVERAGE PER CENT OF MOISTURE IN SOIL BY PLATS AND PERIODS.—CONT'D.

	July 31st—Aug. 28th.				Aug. 28th—Sept. 25th.				Sept. 25th—Oct. 30th.				Seasonal Av. of plats by subdivisi n to 30 in. deep.
	A	B	C	D	A	B	C	D	A	B	C	D	
PLAT 7—Cont'd.—													
Wheat	21.61	17.57	12.41	9.42	18.37	17.04	9.90	8.80	17.35	15.28	10.96	7.99	13.60
Uncultivated	20.12	19.14	14.86	13.39	22.76	15.36	13.55	13.30	22.50	15.91	13.70	13.29	17.11
Raked	25.12	18.73	14.46	13.67	23.60	18.77	15.93	15.90	22.75	16.68	13.56	14.80	17.72
Shallow cultivation	24.16	21.24	16.03	14.21	21.10	19.85	15.24	15.31	21 88	19.34	16.09	13.28	18.24
Deep cultivation	25.97	19.73	15.36	13.83	24.50	20.75	16.12	12.60	24.35	19.76	16.40	12.49	18.57
Average for plats by periods and depthss	23.40	19.28	14.62	12.90	22.07	18.35	14.15	13.18	21.77	17.39	14.14	12.37	17.05
" " to 30 inches				17.54				16.94				16.42	
PLAT 12—Cont'd,—													
Wheat	18.81	13.06	7.80	7.58	19.58	15.89	9.60	7 84	18.79	14.51	11.87	14.19	13.13
Uncultivated	22.59	21.74	13.01	14.01	22.90	18.11	11.74	11.72	21.78	16 27	14.10	13.63	17.07
Raked	24.04	19.66	14.59	13.24	23.08	19.80	13.54	13.48	22.76	17.77	14.48	13.99	17.50
Shallow cultivation	24.27	19.33	15.79	12.18	21.80	18.99	13.98	13.31	21.90	17.35	13.58	13.53	17.39
Deep cultivation	23.56	17.85	13 06	10.33	21.94	15.28	13.96	11.59	21.99	16.15	13.52	14.51	16.27
Average for plats by periods and depths	22.65	18.33	12.85	11.47	21.86	17.61	12.56	11.59	21.44	16.41	13.51	13.97	16.27
" " to 30 inches				16.32				15.91				16.33	
PLAT 11—Cont'd.—													
Wheat	22.99	16.02	10.26	7.67	19.79	14.72	11.47	7 25	22.87	15.44	12.58	9.26	13.41
Uncultivated	23.81	19.54	14.53	13.61	22.50	19.18	13.76	12.85	21.53	18.81	13.71	14.10	17.43
Raked	23.31	18.86	12.72	13.11	22.13	20.18	15.24	13.98	21 58	18.56	15.63	13.98	17.41
Shallow cultivation	22.53	19.05	16.35	15.55	21.67	19.23	15.95	12.50	20.89	18.07	13.68	11.72	17.35
Deep cultivation	23.16	19	14.71	14.57	23 06	17.73	16.25	13.33	22.75	16.21	13.29	13.50	17.22
Average for plats by periods and depths	23.16	18.49	13.71	12.90	21.83	18.21	14.53	11.98	21.92	17.42	13.78	12.51	16.57
" " to 30 inches				17.07				16.64				16.41	
PLAT 10—Cont'd.—													
Wheat	20 83	16.15	9.01	8.84	20.29	17.09	10.45	7.75	20.38	14.66	12.47	10.45	13.81
Uncultivated	20.89	16.93	14.31	14.17	21 82	20.84	15.26	11.68	20.80	18.81	12.87	11.77	16.68
Raked	23.81	19.24	15.08	15.05	21.64	18.31	13.30	13 79	21.53	19.72	14.34	15.82	17.80
Shallow cultivation	23.80	23.20	15.84	13.86	22.77	21.91	16.68	14.09	21.92	20.21	13.61	13.15	18.50
Deep cultivation	24.88	19.33	14.49	12.92	24.12	20.15	14.30	13.90	22.89	19.53	14.20	14.30	17.67
Average for plats by periods and depths	22.84	18.97	13.75	12.97	22.13	19.66	14	12.24	21.50	18.59	13.50	13.10	16.89
" " to 30 inches				17.13				17.01				16.67	

AVERAGE PER CENT OF MOISTURE IN SOIL BY PLATS AND PERIODS.—CONT'D.

	May 1st—22nd.				May 22nd—June 26th.				June 26th—July 31st.			
	A	B	C	D	A	B	C	D	A	B	C	D
PLAT 9.—Spring plowed, "Secretary" plow, 7 and 6—13.												
Wheat					18.38	16.41	13.39	15.32	17.83	12.16	10.29	9.84
Uncultivated					21.48	19.86	13.64	13.34	24.29	20 28	12 69	12.71
Raked					23.20	23.70	15.12	12.67	24.58	21.86	14.71	11.12
Shallow cultivation					25.31	21.27	13.81	14.76	24.18	21.31	14.72	15.65
Deep cultivation					23.66	17.72	14.99	11.29	25.98	20.26	14.33	14.42
Average for plats by periods and depths	20.51	18.19	14.01	13.58	22.41	19.79	14.19	13.48	23.37	19.17	13.35	12.75
" " to 30 inches				16.57				17 47				17.16
PLAT 8.—Spring plowed, "Secretary" plow, 6 and 3—9.												
Wheat					19 62	14.97	14.11	11.97	16.47	11.32	8.44	9.02
Uncultivated					21 59	19.48	14.26	13 60	24.13	19.80	16.67	12.68
Raked					22.93	18 56	14.12	14.47	25.10	21.33	15.35	11.85
Shallow cultivation					22.62	18.90	14.39	11.89	24.14	21.04	16.29	12.02
Deep cultivation					23.18	20.57	16 13	14.14	25.64	22.31	16.43	13.60
Average for plats by periods and depths	19.33	18.30	15.13	13	21.99	18 50	14 60	13.21	23.10	19.16	14.65	11.83
" " to 30 inches				16.44				18.08				17.18

AVERAGE PER CENT OF MOISTURE IN SOIL BY PLATS AND PERIODS.—CONT'D.

	July 31st—Aug. 28th.				Aug. 28th—Sept. 25th.				Sept. 25th—Oct. 30th.				Seasonal Av. of plats by subdivis'n to 30 in. deep.
	A	B	C	D	A	B	C	D	A	B	C	D	
PLAT 9—Cont'd.—													
Wheat	21.83	17 33	9.67	8.94	19.78	16.96	12.36	8.32	19.74	16.90	14.66	11.30	14.57
Uncultivated	21.84	19 03	12.12	13.31	21.13	19.93	14 14	14.10	20.88	19.35	14.40	13.57	17.10
Raked	23.83	22 87	16.75	12 12	22.66	20.70	13.67	14.40	23.23	21.51	14 67	11 50	18.29
Shallow cultivation	23.93	21.77	15.93	13.79	23.10	18.77	14.40	12.31	22.82	21.29	13.22	11.83	18.21
Deep cultivation	25.52	18.69	14.59	13.44	23.96	18.67	15.31	14 39	24.14	18.43	14.14	14 12	17.90
Average for plats by periods and depths	23.39	19.94	13.81	12.32	22.13	19.01	13.98	12.70	22.16	19.50	14.22	12.46	17.21
to 30 inches				17.37				16.98				17.08	
PLAT 8—Cont'd.—													
Wheat	22.04	14.14	10 33	10 86	19.27	16.14	11.42	9.52	16 62	14.12	11.31	9.76	13.57
Uncultivated	23.70	19.15	14.72	13.63	22.09	19.04	14 23	12.20	22.72	18.86	13 35	13.99	17.49
Raked	24.81	18.78	11.53	13.55	23.76	18.28	12.49	12.51	22.22	16.29	10.36	11.02	16.96
Shallow cultivation	25.39	21.81	15.74	11.32	23.26	20.40	16.48	13.81	20.82	20.25	13.37	13	17.85
Deep cultivation	25.05	21.68	15.27	10.89	24.07	19.78	15.99	13.96	23.96	20.26	14.72	12.93	18.53
Average for plats by periods and depths	24.20	19.11	13 52	12.05	22.49	18.73	14.12	12.40	21.27	17.96	12 62	12.14	16.88
to 30 inches				17.22				16 94				16	

AVERAGE PER CENT OF MOISTURE IN SOIL BY SUBDIVISIONS AND DEPTHS.

Wheat.

	Surface (A).						6 to 15 inches (B).					
	May 22—June 26.	June 26—July 31.	July 31—Aug. 28.	Aug. 28—Sept. 25.	Sept. 25—Oct. 30.	Average.	May 22—June 26.	June 26—July 31.	July 31—Aug. 28.	Aug. 28—Sept. 25.	Sept. 25—Oct. 30.	Average.
Plat 3	19.91	17.90	23.36	19.03	20.60	20.16	16.18	12.71	16.98	17.05	18	16.18
" 4	18.73	18.56	23.86	23.30	21.29	21.15	16.08	13	19.08	19.91	19.79	17.57
" 5	20.27	20.43	22.97	21.61	21.34	21.34	17.37	13.72	19.09	19.56	19.53	17.85
" 6	18.97	17.11	21.61	21.43	18.43	19.51	16.81	13.27	18.14	19.56	16.71	16.90
" 7	19.40	17.37	21.61	18.37	17.35	18.82	15.76	12.97	17.57	17.04	15.28	15.72
" 12	18.26	17.43	18.81	19.58	18.79	18.57	14.79	11.83	13.06	15.89	14.51	14.02
" 11	15.76	14.69	22.99	19.79	22.87	19.22	13.72	11.03	16.02	14.72	15.44	14.19
" 10	16.80	17.22	20.83	20.29	20.38	19.10	15.75	11.99	16.15	17.09	14.66	15.13
" 9	18.38	17.83	21.83	19.78	19.74	19.51	16.41	12.16	17.33	16.96	16.90	15.95
" 8	19.62	16.47	22.04	19.27	16.62	18.80	14.97	11.32	14.14	16.14	14.12	14.14
Average	18.61	17.50	21.99	20.25	19.74	19.62	15.78	12.40	16.75	17.39	16.49	15.76

	15 to 21 inches (C).						21 to 30 inches (D).					
Plat 3	11.95	9.31	9.25	10.17	11.12	10.36	9.78	8.84	12.34	11.60	9.88	10.43
" 4	13.10	10.83	9.63	14.08	15.30	12.59	10.78	8	7.45	10.93	11.71	9.81
" 5	12.94	10.71	12.29	14.24	13.60	12.76	11.78	9.41	7.18	11.44	10.15	9.99
" 6	14.41	9.81	9.59	12.48	14.02	12.06	11.31	8.14	7.43	12.68	10.03	9.92
" 7	12.82	9.87	12.41	9.90	10.96	11.19	10.33	6.85	9.42	8.80	7.99	8.68
" 12	12	9.16	7.80	9.60	11.87	10.09	11.12	8.46	7.58	7.84	14.19	9.84
" 11	11.84	11.27	10.26	14.72	12.58	12.13	11.34	8.26	7.67	7.25	9.26	8.76
" 10	13.51	10.47	9.01	10.45	12.47	11.18	12.55	9.56	8.84	7.75	10.45	9.83
" 9	13.39	10.29	9.67	12.36	14.66	12.07	15.32	9.84	8.94	8.32	11.30	10.74
" 8	14.11	8.44	10.33	11.42	11.31	11.12	11.97	9.02	10.86	9.52	9.76	10.23
Average	13.01	10.02	10.02	11.94	12.79	11.55	11.63	8.65	8.77	9.59	10.47	9.82

AVERAGE PER CENT OF MOISTURE IN SOIL BY SUBDIVISIONS AND DEPTHS.—CONT'D.

Uncultivated.

	Surface (A).						6 to 15 inches (B).					
	May 22—June 26.	June 26—July 31.	July 31—Aug. 28.	Aug. 28—Sept. 25.	Sept. 25 - Oct. 30.	Average.	May 22—June 26.	June 26—July 31.	July 31—Aug. 28.	Aug. 28—Sept. 25.	Sept. 25—Oct. 30.	Average.
Plat 3	19.73	23.28	21.82	19.60	20.34	20.95	18.67	19.10	18.86	17.65	17.92	18.44
" 4	23.58	24.64	23	21.47	21.42	22.82	20.71	21.22	19.76	19.77	20.07	20.31
" 5	22.43	24.59	22.78	21.60	21.74	22.63	20.94	21.09	19.66	19.52	19.80	20.20
" 6	21.02	23.31	21.35	20.23	19.65	21.11	18.60	20.35	18.79	16.50	17.41	18.33
" 7	22.19	23.76	20.12	22.76	22.50	22.27	20.45	20.15	19.14	15.36	15.91	18.20
" 12	20.33	23.14	22.59	22.90	21.78	22.15	20.13	19.61	21.74	18.11	16.27	19.17
" 11	21.42	23.90	23.81	22.50	21.53	22.63	20.14	20.57	19.54	19.18	18.81	19.65
" 10	22.16	19.42	20.89	21.82	20.80	21.02	15.21	19.60	16.93	20.84	18.81	18.28
" 9	21.48	24.29	24.84	21.13	20.88	21.92	19.86	20.28	19.03	19.93	19.35	19.69
" 8	21.59	24.13	23.70	22.09	22.72	22.85	19.48	19.80	19.15	19.04	18.86	19.27
Average	21.59	23.45	22.19	21.61	21.34	22.03	19.42	20.18	19.26	18.50	18.32	19.15

	15 to 21 inches (C).						21 to 30 inches (D).					
Plat 3	15.24	14.35	14.33	12.10	13.33	13.87	15.08	12.85	13.51	11.30	13.34	13.22
" 4	16.27	15.77	19.39	15.09	13.92	16.09	14.03	13.82	12.80	12.51	12.56	13.14
" 5	17.26	16.03	15.22	15.82	15.55	15.98	13.55	13.74	14.05	14.29	13.65	13.86
" 6	14.39	16.62	14.98	10.90	13.13	14	12.67	14.07	13.26	10.29	11.11	12.28
" 7	14.93	15	14.86	13.55	13.70	14.41	13.72	14.05	13.39	13.30	13.29	13.55
" 12	15.29	14.33	13.01	11.74	14.10	13.69	12.90	14.03	14.01	11.72	13.63	13.26
" 11	13.45	15.17	14.53	13.76	13.71	14.12	11.88	14.24	13.61	12.85	14.10	13.34
" 10	14.69	14.56	14.31	15.26	12.87	14.34	13.86	14.04	14.17	11.68	11.77	13.10
" 9	13.64	12.69	12.12	14.14	14.40	13.40	13.34	12.71	13.31	14.10	13.57	13.41
" 8	14.26	16.67	14.72	14.23	13.35	14.65	13.60	12.68	13.63	12.20	13.99	13.22
Average	14.94	15.12	14.75	13.66	13.81	14.45	13.46	13.62	13.57	12.42	13.10	13.24

AVERAGE PER CENT OF MOISTURE IN SOIL BY SUBDIVISIONS AND DEPTHS.—CONT'D.

Raked.

	Surface (A).						6 to 15 inches (B).					
	May 22—June 26.	June 26—July 31.	July 31—Aug. 28.	Aug. 28—Sept. 25.	Sept. 25 - Oct. 30.	Average.	May 22—June 26.	June 26—July 31.	July 31—Aug. 28.	Aug. 23—Sept. 25.	Sept. 25—Oct. 30.	Average.
Plat 3	22.74	25.49	25.56	22:42	23.08	23.86	19.77	20.83	24.09	18 71	18.47	20.37
" 4	23.71	25.70	25.43	23.36	22.75	24.19	20 85	21 59	20 44	21.71	21.01	21 12
" 5	23.45	24.75	24 91	23.68	22.30	23.82	21.51	22 32	21.05	21.04	20.93	21.37
" 6	22.98	25.56	24.77	22.11	22.47	23.58	18.81	20.71	20 56	17.67	20.35	19 62
" 7	23.56	22.32	25.12	23.60	22.75	23.47	17.68	20.16	18.73	18.77	16.68	18.40
" 12	21.25	23.81	24.04	23.08	22.76	22.99	19.11	20.16	19.66	19 80	17.77	19.30
" 11	23.09	23.38	23.31	22.13	21.58	22.70	19.73	18.76	18.86	20.18	18.56	19.22
" 10	21.91	24.81	23.81	21.64	21.53	22.74	19.53	21.07	19.24	18.31	19.72	19.57
" 9	23.20	24.58	23.83	22.66	23.23	23.50	23 70	21.86	22.87	20 70	21.51	22.13
" 8	22.93	25.10	24.81	23.76	22.22	23.76	18.56	21.33	18.78	18 28	16.29	18.65
Average	22.88	24.55	24.56	22.84	22.47	23.45	19.25	20.87	20.43	19.52	19.13	19.97

	15 to 21 inches (C).						21 to 30 inches (D).					
Plat 3	14.97	16.28	12.09	14.50	14.67	14 50	13.69	14.18	13.90	13.22	13 31	13.66
" 4	15 69	16.79	16.90	14.82	15.26	15.89	13.14	13 91	13.54	11.77	11.05	12.68
" 5	16 23	16.84	17.26	15.50	15 51	16.27	13.49	14.52	13.89	14.48	12 96	13.87
" 6	15.53	15.79	16.40	14.65	15.17	15 51	12 85	14.22	14 25	13.20	11.82	13.27
" 7	13.35	15.43	14.46	15.93	13.56	14.55	13.87	14.13	13.67	15.90	14 80	14.47
" 12	14.61	15.33	14.59	13.54	14.48	14 51	12.04	13.31	13.24	13 48	13.99	13.21
" 11	13.78	13.58	12.72	15.24	15.63	14.19	14.27	12.32	13.11	13.98	13.98	13 53
" 10	15.41	15.89	15.08	13.30	14.34	14.80	12.63	13.17	15 05	13.79	15.82	14.09
" 9	15.12	14.71	16.75	13.67	14.67	14.98	12.67	11.12	12.12	14.40	11.50	12.36
" 8	14.12	15.35	11.53	12.49	10.36	12.77	14.47	11.85	13.55	12.51	11 02	12 68
Average	14.88	15 60	14.78	14.36	14.36	14.80	13.31	13.27	13.63	13.67	13.02	13.38

AVERAGE PER CENT OF MOISTURE IN SOIL BY SUBDIVISIONS AND DEPTHS.—CONT'D.

Shallow Cultivation.

	(Surface (A)						6 to 15 inches (B).					
	May 22—June 26.	June 26—July 31.	July 31—Aug. 28.	Aug. 28—Sept. 25.	Sept. 25—Oct. 30.	Average.	May 22—June 26.	June 26—July 31.	July 31—Aug. 28.	Aug. 28—Sept. 25.	Sept. 25—Oct. 30.	Average.
Plat 3	22.78	24.38	24.36	22.17	22.06	23.15	18.88	20.24	21.12	19.10	19.61	19.79
" 4	23.23	24.57	23.57	22.45	21.70	23.10	19.10	19.95	22.33	19.19	19.35	20.08
" 5	24.59	25.22	25.69	21.79	22.10	23.88	22.49	20.54	20.70	21.49	19.94	21.03
" 6	21.06	24.07	22.11	21.99	21.23	22.09	19.70	20.04	20.92	20.97	20.31	20.39
" 7	25.08	25.48	24.16	21.10	21.88	23.54	20.74	19.65	21.24	19.85	19.34	20.16
" 12	22.62	24.42	24.27	21.80	21.90	23	18.64	19.92	19.33	18.99	17.35	18.85
" 11	21.54	23.84	22.53	21.67	20.89	22.09	18.29	15.88	19.05	19.23	18.07	18.10
" 10	23.97	23.83	23.80	22.77	21.92	23.26	21.16	21.53	23.20	21.91	20.21	21.60
" 9	25.31	24.18	23.93	23.10	22.82	23.87	21.27	21.31	21.77	18.77	21.29	20.88
" 8	22.62	24.14	25.39	23.26	20.82	23.25	18.90	21.04	21.81	20.40	20.25	20.48
Average	23.28	24.41	23.98	22.21	21.73	23.12	19.93	20.01	21.15	20.09	19.62	20.14

	15 to 21 inches (C).						21 to 30 inches (D).					
Plat 3	15.06	16.27	15.99	14.51	14.55	15.28	13.56	13.80	13.72	12.72	9.76	12.71
" 4	15.20	14.18	16.26	14.33	14.52	14.90	12.87	13.79	14.13	13.92	12.80	13.50
" 5	18.06	16.27	15.72	13.30	16.64	16	13.63	15.22	14.43	12.97	13.66	13.98
" 6	16.10	15.95	13.28	16.83	15.36	15.50	16.63	13.99	14.85	13.81	13.63	14.58
" 7	15.57	14.99	16.03	15.24	16.09	15.58	11.38	14.28	14.21	15.31	13.28	13.69
" 12	14.71	14.37	15.79	13.98	13.58	14.49	14.26	12.96	12.18	13.31	13.53	13.25
" 11	13.98	15.75	16.35	15.95	13.68	15.14	14.60	15.87	15.55	12.50	11.72	14.05
" 10	16.31	14.22	15.84	16.68	13.61	15.33	13.92	14.06	13.86	14.09	13.15	13.82
" 9	13.81	14.72	15.93	14.40	13.22	14.42	14.76	15.65	13.79	12.31	11.83	13.67
" 8	14.39	16.29	15.74	16.48	13.37	15.25	11.89	12.02	11.32	13.81	13	12.41
Average	15.32	15.30	15.69	15.17	14.46	15.19	13.75	14.16	13.80	13.47	12.64	13.57

AVERAGE PER CENT OF MOISTURE IN SOIL BY SUBDIVISIONS AND DEPTHS.—CONT'D.

Deep Cultivation.

	(Surface (A)						6 to 15 inches (B).					
	May 22—June 26.	June 26—July 31.	July 31—Aug. 28.	Aug. 28—Sept. 25.	Sept. 25—Oct. 30.	Average.	May 22—June 26.	June 26—July 31.	July 31—Aug. 28.	Aug. 28—Sept. 25.	Sept. 25—Oct. 30.	Average.
Plat 3	22.65	24.60	24.48	22.24	22.78	23.35	18.60	18.41	18.39	17.57	17.63	18.12
" 4	23.05	25.31	24.46	23.91	25	24.35	17.82	20.30	20.20	19.37	19.89	19.52
" 5	22.74	24.95	24.82	24.09	23.78	24.08	19.81	19.18	20.43	19.76	18.69	19.57
" 6	23.62	25.60	24.53	22.92	22.57	23.85	17.32	20.62	21.17	19.21	19.33	19.53
" 7	24.99	25.82	25.97	24.50	24.35	25.13	19.13	18.80	19.73	20.75	19.76	19.83
" 12	21.80	23.74	23.56	21.94	21.99	22.61	15.16	15.79	17.85	15.28	16.15	16.05
" 11	21.79	24.51	23.16	23.06	22.75	23.05	17.10	18.76	19	17.73	16.21	17.76
" 10	21.69	23.80	24.88	24.12	22.89	23.48	18.58	18.48	19.33	20.15	19.53	19.21
" 9	23.66	25.98	25.52	23.96	24.14	24.65	17.72	20.26	18.69	18.67	18.43	18.75
" 8	23.18	25.64	25.05	24.07	23.96	24.38	20.57	22.31	21.68	19.78	20.26	20.92
Average	22.92	25	24.64	23.48	23.42	23.89	18.81	19.29	19.65	18.83	18.69	18.93

	15 to 21 inches (C).						21 to 30 inches (D).					
Plat 3	15.16	14.74	15.03	14.76	12.98	14.53	13.62	13.57	13.41	14.44	13.08	13.62
" 4	13.88	16.04	15.81	13.35	14.01	14.62	13.07	13.05	14.19	13.54	12.46	13.26
" 5	16.35	15.45	15.82	15.03	14.38	15.41	11.09	13	13.99	13.56	11.17	12.56
" 6	13.84	15.62	12.08	14.19	15.39	14.22	13.94	13.60	11.11	13.96	14.61	13.44
" 7	14.63	15.83	15.36	16.12	16.40	15.67	15.22	14.13	13.83	12.60	12.49	13.65
" 12	15.89	12.21	13.06	13.96	13.52	13.73	14.05	13.07	10.33	11.59	14.51	12.71
" 11	12.13	14.87	14.71	16.25	13.29	14.25	13.59	14.14	14.57	13.33	13.50	13.83
" 10	15.43	14.79	14.49	14.30	14.20	14.64	11.67	14.05	12.92	13.90	14.30	13.37
" 9	14.99	14.33	14.59	15.31	14.14	14.67	11.29	14.42	13.44	14.39	14.12	13.53
" 8	16.13	16.43	15.27	15.99	14.72	15.71	14.14	13.60	10.89	13.96	12.93	13.10
Average	14.84	15.03	14.62	14.92	14.30	14.74	13.17	13.66	12.87	13.53	13.32	13.31

METEOROLOGICAL CONDITIONS.

Averages for Periods.

	May 22—June 26.	June 26—July 31.	July 31—Aug. 28.	Aug. 28—Sept. 25.	Sept. 25—Oct. 30.
Precipitation—inches	3.43	4.84	3.59	3.13	1.48
Temperature—degrees F.	63.6	71.8	68.4	66.4	49.8
Wind velocity—miles per hour	9.85	11.43	8.67	11.32	11.63
Humidity—per cent. 7:00 a. m.	92.91	87.31	90.35	78.50	84.96
" 1:20 p. m.	85.06	66.91	72.27	66.44	65.73
" 6:00 p. m.	82.77	62.41	74.03	63.32	77.28

SOIL TEMPERATURE.

Averages for Periods.

	May 22—June 26.	June 26—July 31.	July 31—Aug. 28.	Aug. 28—Sept. 25.	Sept. 25—Oct. 30.
Suspended	70.60	78.27	70.80	72.46	54.87
Surface	71.82	76.25	71.61	71.60	57.71
1 inch	67.70	81.37	72.47	71.66	59.55
2 inches	72.02	82.95	74	72.53	58.84
4 inches	71.37	84.21	75	74.66	57.53
1 foot	59.45	69.48	65.64	64.58	54.01
2 feet	56.08	65.13	63.95	63.23	55.32
3 feet	53.13	61.34	61.90	61.52	55.82
4 feet	50.72	58.12	59.89	59.76	55.56
5 feet	48.73	56	58.50	58.66	55.48

It is believed that much valuable information may be gained from a careful study of these tables. Care should be taken, however, not to draw too hasty conclusions from a single year's observations, particularly as the season of 1897 was a somewhat unusual one as will be seen from the accompanying tables of "Meteorological Conditions," The heavy snows of the preceding winter afforded an abundant supply of soil moisture early

in the season, the rainfall during May was unusually light, but during the remainder of the season it was ample and well distributed, thus insuring an abundant and even supply of soil moisture throughout the season on all the plats and subdivisions. A table of soil temperature is also given.