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Soil Moisture 1895.

J. B. WEEMS.

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The study of soil moisture is one of the many interesting subjects connected with the study of the soil. Perhaps in some cases the results of a single season may give valuable indications in certain lines. but it is the results of many years which give conclusions that mean much more to those interested in the subject. In commencing the work, the first part of which is presented to those interested in the subject, it was with the view that the work will be continued for some time to come, and as the work develops we hope that it will be the means of presenting some results that may be of value.

Among the many problems that present themselves in connection with the study of soil moisture, there may be mentioned the following: The amount of water evaporated from the soil under certain conditions of cultivation, the amount of water that is necessary for the growth of certain crops and the period of growth which demands the largest quantity of water to make it a successful crop, the amount of moisture which should be present in the soil to insure the best development of the crop and others of a similar nature which are full of interest and at the same time of a practical nature. Some of these problems have been investigated but they are of such value that in many cases they should be repeated under the conditions met with in this state.

The subject of soil physics, of which the study of soil moisture is a very small part, is one which has received comparatively little attention by those investigating agricultural subjects, but fortunately the interest in this subject is increasing, and when soil physics and soil chemistry are developed, each aiding the other, to investigate those problems relating to the soil and plant, we may look for a better understanding of plant growth and related subjects. There has been much valuable work done, but there is yet a great field for investigation and as the importance of the subject of soil physics is realized we may look for results, which while full of interest, will be of great value to those engaged in agriculture.

Naturally the work presented here is to be regarded only as one of a series of investigations which are to follow in the next few years. The land selected for these experiments in soil moisture is part of the experiment station farm, upon which were grown the following crops: clover, corn, oats, beets and blue grass. The samples of soil were taken from the following depths: top to four inches, four inches to one foot, one foot to two feet, two feet to three feet and three feet to four feet. The soil from these depths were well mixed and the sample was then placed in an air tight mason jar, carried to the laboratory and the amount of moisture determined in the usual manner. The investigation commenced April 9th, and ended October 29th, 1895, samples being taken each week. The nature of the land from which the samples were taken may be described as follows:

Plat I—Clover field. The first two feet consisted of black loam of a uniform good quality, the third foot being composed of fine gravel and grayish clay, and the fourth of gravel and clay.

Plat II—Corn field. The first two feet were loamy soil like plat one, the third foot was a yellowish clay loam mixed with black loam, and the fourth foot being of a yellow sandy loam.

Plat III—Oats field. The first two feet consisted of a loamy soil like that of plats one and two, the third being of a yellow clay loam mixed with black loam, and the fourth foot consisting of a yellow clay loam.

Plat IV—Root field. The first two feet were composed of the same kind of soil as the other plats, but the third foot being a black loam mixed with yellowish timber clay and the fourth foot consisting of stiff yellowish clay and fine gravel.

Plat V—Pasture. (blue grass). The first two feet consisted of loamy soil, the third foot being a fine sandy loam, brown in color, and the fourth foot composed of a fine sandy loam of a yellowish color.

The attention of those interested is called to the table giving the date of the rain fall during the time in which the experiment was made, also to the column with each table giving the rainfall for the week preceding the taking of the sample. The total rainfall for the period of thirty weeks was 25.08 inches, or the amount of water which each acre received being 2838.41 tons. The rain that fell during this period was under such favorable conditions that little if any was lost by draining from the soil.

DATES SHOWING RAINFALL FROM APRIL TO OCTOBER 1895.

Dates are given only for the days on which rain occurred.

DATE	Rain-fall Inches	DATE	Rain-fall Inches	DATE	Rain-fall Inches
April 6	.60	June 2	1.06	Aug. 2	.06
" 7	.12	" 3	.08	" 3	.03
" 14	.34	" 4	Trace	" 4	Trace
" 15	.54	" 7	.12	" 9	.64
" 26	.34	" 9	.36	" 15	Trace
" 29	1.08	" 10	.44	" 22	1.02
May 2	.37	" 13	.40	" 23	.74
" 3	.34	" 14	.99	" 25	.05
" 5	.04	" 16	.47	" 27	1.35
" 6	1.20	" 23	.43	" 28	Trace
" 10	.10	" 24	.24	" 30	.1
" 11	Trace	" 25	.44	Sept. 5	.32
" 13	"	" 26	.03	" 13	.52
" 15	.15	" 27	.20	" 18	.96
" 26	.17	July 14	.18	" 20	1.32
" 30	2 14	" 15	.22	" 22	.66
.....	.....	" 17	.82	Oct. 4	.1
.....	.....	" 20	.89	" 6	.23
.....	.....	" 25	.29	" 11	.37
.....	.....	" 28	.38	" 14	.07
.....	.....	" 29	.09	.....	.....

The table of maximum temperatures is added to this report to give to those interested, the temperatures under which the experiment was carried out, also there is added to each

table a column showing the highest and lowest maximum temperatures on those days of the week preceding the time of taking the sample of soil.

TABLE SHOWING MAXIMUM TEMPERATURES IN DEGREES F.
For each day from April 1 to October 31, 1895.

Day of Month	April	May	June	July	Aug.	Sept.	Oct.
1.....	33	76	90	86	85	77	68
2.....	45	75	85	85	87	78	75
3.....	58	85	83	85	85	89	71
4.....	68	80	68	85	85	89	58
5.....	75	76	77	86	80	90	67
6.....	64	79	84	93	82	78	66
7.....	55	80	84	85	89	87	53
8.....	61	89	88	65	94	78	48
9.....	71	93	86	72	93	86	59
10.....	71	61	69	80	85	92	67
11.....	69	61	77	84	88	93	54
12.....	68	63	81	88	91	87	64
13.....	67	58	81	81	94	73	69
14.....	68	53	81	89	84	81	60
15.....	46	60	85	88	88	78	62
16.....	64	59	84	93	94	87	64
17.....	66	69	80	89	81	93	67
18.....	65	64	76	92	71	92	65
19.....	67	63	80	86	77	90	42
20.....	76	62	85	82	84	88	53
21.....	64	67	80	74	85	88	73
22.....	74	72	84	70	93	88	42
23.....	75	77	84	79	71	65	54
24.....	84	80	88	85	84	72	64
25.....	84	69	74	80	84	78	64
26.....	79	74	74	89	87	66	70
27.....	74	86	72	81	44	65	39
28.....	77	93	69	85	74	56	34
29.....	71	88	74	81	79	55	37
30.....	85	88	81	74	83	60	43
31.....		86		80	68		42

PLAT I, (Clover Meadow,) Soil Moisture, 30 Weekly Periods.

DATES	DEPTH AT WHICH SAMPLE WAS TAKEN					Inches rainfall for weekly period.	Maximum degrees of temperature for week preceding the taking of sample.
	top-4in	4in-1ft	1ft-2ft	2ft-3ft	3ft-4ft		
April 9	25.24	22.80	20.32	17.67	9.93	.72	55-75
" 16	26.61	23.86	28.86*	17.03	9.16	.88	46-71
" 23	23.88	22.87	19.56	17.28	13.39	.00	64-76
" 30	25.64	24.55	20.74	16.56	11.10	1.42	71-85
May 7	27.22	25.11	20.42	18.11	11.57	1.95	75-85
" 14	21.97	20.78	19.12	16.72	12.05	.10	53-93
" 21	18.84	19.61	19.62	17.11	13.28	.15	59-69
" 28	13.91	17.78	16.23	15.78	14.20	.07	69-93
June 4	25.46	23.76	18.17	15.48	13.02	3.28	68-90
" 11	25.04	19.89	16.39	15.76	13.33	.92	69-86
" 18	24.63	21.51	15.85	14.73	12.61	1.86	76-85
" 25	27.60	23.09	16.71	15.12	12.81	1.11	71-88
July 2	23.20	20.25	16.72	14.04	11.29	.23	69-86
" 9	15.18	18.63	16.14	13.64	12.01	.00	65-98
" 16	17.02	17.12	15.44	13.56	13.05	.00	80-93
" 23	22.42	20.21	16.86	15.42	11.05	1.71	70-92
" 30	19.61	18.76	14.45	13.27	13.42	.76	74-89
Aug. 6	17.39	14.62	15.41	15.55	13.73	.13	80-87
" 13	17.20	14.26	13.42	12.50	12.51	.64	85-94
" 20	12.52	13.36	12.65	12.90	14.75	T	71-94
" 27	23.60	20.56	15.64	12.47	11.47	4.06	71-94
Sept. 3	22.11	20.00	18.42	15.08	13.73	.10	68-89
" 10	17.13	17.12	14.10	12.67	10.35	.32	67-92
" 17	23.42	18.66	15.10	13.51	12.04	1.48	73-93
" 24	23.27	20.76	16.09	10.45	10.00	1.98	65-92
Oct. 1	20.67	18.47	15.93	11.18	8.04	.00	55-78
" 8	19.35	18.00	16.37	13.15	10.24	.33	48-75
" 15	19.94	16.60	14.05	11.31	9.69	.48	51-69
" 22	19.72	18.32	15.59	12.65	7.15	.00	42-73
" 29	16.60	16.58	15.39	12.85	10.59	.00	34-70
Average	21.18	19.58	16.55	14.45	11.73	.84	

*Not figured in average

It will be seen, if we make a study of the results of PLAT I that at the commencement of the work the average amount of moisture for each foot in depth was 17.88 per cent. which would give about 1,246.16 tons of water present in an acre at this time, taken to a depth of four feet; and on Oct. 29th the last determination made, gave us an average per foot in depth, 13.85 per cent. of moisture present or 965.29 tons of water in one acre for a depth of four feet. If we take the difference between the number of tons present on April 9th, and the number of tons on Oct. 29th, we find that there was present 280.87 tons less, and this added to the rain fall of 2,838.41 tons gives 3,119.28 tons of water as the amount that was used by the clover crop. The yield of clover hay was about two tons per acre, or for each ton of clover hay 1,559.64 tons of water were required to meet the various demands. Over two-fifths of the rain fall for the time of the experiments fell during the months of June and July, the amount for each acre being 1,163 tons. As a result of this rain fall the amount of mois-

ture in the soil remained quite constant. The clover crop appears to have made a very constant demand upon the soil for moisture, and did not reduce the water present in the soil to the extent of some of the other crops. This may be due to some extent to the nature of the soil, but possibly it is caused by the fact that clover is a uniform feeder and that it sends its roots to a great depth in the soil. The demands made by the clover crop appear to have been more regular than any of the crops which were experimented upon. From the results it is seen that this plat contained the smallest amount of moisture on August 20, but here we have an average of 13.34 per cent. for each foot in depth.

The highest and lowest percentage of moisture for PLAT I with the dates, and range are shown in the following table

	top to 4in. date	4in to 1ft. date	1 to 2ft. date	2 to 3ft. date	3 to 4ft. date
Highest	27.60 June 25	25.11 May 7	20.74 April 20	18.11 May 7	14.75 20 Aug. 20
Lowest	12.52 Aug. 20	13.36 Aug. 20	12.65 Aug. 20	10.45 Sept. 24	7.13 Oct. 13
Range	15.08 per cent	11.75 per cent.	8.09 per cent.	7.66 per cent.	7.62 per cent

PLAT II (Corn Field,) Soil Moisture, 30 Weekly Periods.

DATES	DEPTH AT WHICH SAMPLE WAS TAKEN					Inches rainfall for weekly period.	Maximum degree of temperature for week preceding the taking of sample.
	top 4in	4in-1ft	1ft-2ft	2ft-3ft	3ft-4ft		
April 9	15.42	16.70	15.84	9.87	7.01	.72	55-75
" 16	17.69	18.39	15.27	10.23	6.86	.88	46-71
" 23	12.79	14.24	15.98	11.47	7.65	.00	64-76
" 30	18.47	18.26	16.38	11.62	7.55	1.42	71-85
May 7	19.15	19.23	17.00	12.02	7.52	1.95	75-85
" 14	15.55	16.52	16.25	12.71	6.17	.10	53-93
" 21	15.34	17.22	16.45	13.48	7.42	.15	59-69
" 28	11.67	17.05	16.86	14.66	11.15	.07	69-93
June 4	19.42	19.70	19.03	13.73	7.46	3.28	88-90
" 11	20.58	20.39	17.76	14.60	9.40	.92	69-88
" 18	17.79	20.42	18.12	14.75	10.05	1.86	76-85
" 25	21.12	20.27	18.22	16.17	10.50	1.11	74-84
July 2	13.85	15.94	16.01	14.47	11.03	.22	69-86
" 9	12.49	13.58	15.22	14.61	10.69	.00	65-93
" 16	10.38	13.60	14.45	13.71	10.21	.40	80-93
" 23	14.75	12.43	12.73	13.28	11.96	1.71	70-92
" 30	13.20	11.82	12.37	12.25	11.19	.76	74-89
Aug 6	6.78	7.24	8.31	9.19	10.27	.13	80-87
" 13	8.87	9.32	9.81	9.68	10.56	.64	85-94
" 20	6.30	7.90	8.68	9.26	9.92	.7	71-94
" 27	14.60	15.36	13.71	10.74	9.07	4.06	71-94
Sept 3	13.27	14.29	13.59	8.77	7.74	.10	68-89
" 10	10.73	12.45	10.44	8.75	13.01	.32	67-92
" 17	13.23	12.69	10.42	10.08	8.69	1.48	73-93
" 24	16.04	16.16	13.96	9.05	9.11	1.98	65-92
Oct. 1	12.41	14.20	11.59	9.89	9.10	.00	55-76
" 8	12.77	13.61	13.46	9.09	8.13	.33	48-75
" 15	13.61	13.85	11.73	8.64	9.50	.48	54-69
" 22	13.50	13.87	14.34	9.35	9.06	.00	42-73
" 29	11.80	13.91	12.50	8.65	8.97	.00	34-70
Ave.	14.12	15.01	14.22	11.48	9.50		

In the table containing the percentages of moisture of the corn field, we find that on May 7th, an average of 13.94 per cent. water for each of the four feet or 971.56 tons of moisture present. On Sept. 17th, an acre of soil contains as an average for each foot in depth 10.50 per cent. of moisture or 731.81 tons of water is found in an acre of soil four feet deep. The rain fall for the period May 7th to Sept. 17th was 19.27 inches or 2,186.56 tons of water, this amount of water added to the difference found on May 7th and Sept. 17th, gives for the amount of water disappearing as the result of the various demands, a total of 2,426.24 tons of water. The yield of this plat was 4.25 tons of air dry fodder per acre, and as a result there disappeared from an acre of the soil to the depth of four feet, 570.89 tons of water for each ton of air dry fodder.

It will be noticed that the results obtained from the investigation of the corn plat indicate that the demands made by the corn crop are not uniform, and that about Aug. 6th to 20th, it was very large; this reduced the amount of moisture in the soil to a very low per cent. The heavy rain fall during the week previous to Aug. 27th, no doubt was a great aid to the crop, at a time when it was much needed.

The following table gives the highest and lowest percentages of moisture for this plat, with the date and range of same for the various depths for the entire period of 30 weeks.

	top to 4 in date		4 in to 1 ft date		1 ft to 2 ft date		2 ft to 3 ft date		3 ft to 4 ft date	
Highest	21.12	June 25	20.42	June 18	19.03	June 4	16.17	June 25	13.01	Sept. 10
Lowest.....	6.20	Aug. 20	7.34	Aug. 6	8.31	Aug. 6	8.64	Oct. 15	6.17	May 14
Range	14.82 per cent		13.08 per cent		10.72 per cent		11.53 per cent		6.84 per cent	

PLAT III. (Oat field) Soil Moisture—30 Weekly Periods.

DATES	DEPTH AT WHICH SAMPLE WAS TAKEN					Inches Rainfall for weekly period.	Maximum Temper- atures.
	top-4in	4ft.-1ft	1ft-2ft	2ft-3ft	3ft-4ft		
April 9	20.55	16.37	15.04	14.26	12.65	.72	35-75
" 16	19.75	17.94	15.34	15.34	13.85	.88	46-71
" 23	16.74	16.01	13.84	13.27	12.05	.00	64-76
" 30	20.13	16.96	13.69	15.69	12.88	1.42	71-85
May 7	22.18	19.08	16.76	16.04	14.53	1.95	75-85
" 14	14.14	14.38	12.23	12.49	13.91	.10	53-93
" 21	12.07	12.24	13.25	15.69	13.11	.15	59-69
" 28	7.36	8.08	10.45	13.10	12.90	.07	69-93
June 4	17.03	13.48	9.27	12.42	12.84	3.28	68-90
" 11	15.43	11.43	10.60	13.71	13.89	.92	69-88
" 18	12.79	10.37	10.66	8.82	12.93	1.86	76-85
" 25	13.89	10.49	10.10	11.38	12.24	1.11	74-88
July 2	10.44	9.58	8.71	12.08	11.63	.23	69-86
" 9	6.32	6.79	7.46	9.68	11.05	.00	65-93
" 16	7.70	6.92	7.15	8.83	10.70	.40	80-93
" 23	15.62	10.50	7.28	8.50	10.01	1.71	70-92
" 30	16.51	12.27	6.87	8.27	9.50	.76	74-89
Aug. 6	12.13	8.07	7.41	10.17	....	.13	80-87
" 13	15.55	13.01	7.76	....	....	.64	85-94
" 20	9.07	9.27	7.12	7.70	....	T	71-94
" 27	16.65	15.24	13.47	9.07	8.07	4.06	71-94
Sept. 3	15.61	14.69	13.34	13.89	10.20	.10	68-89
" 10	12.17	11.19	10.26	10.40	7.89	.32	67-92
" 17	14.52	11.11	8.27	9.03	9.99	1.48	73-93
" 24	14.79	13.00	9.42	9.05	10.30	1.98	65-92
Oct. 1	13.50	13.41	12.05	11.30	11.69	.00	55-78
" 8	13.58	12.62	11.70	11.55	11.02	.33	48-75
" 15	13.08	12.84	10.13	11.56	10.10	.48	54-69
" 22	13.07	12.43	11.46	10.48	10.48	.00	42-73
" 29	9.81	11.32	9.30	9.68	11.15	.00	34-70
Average	14.07	12.37	10.66	11.50	11.54	.84	

The table for soil moisture for the oat field shows, taking the period between April 9th and July 18th, that on the first of these dates there was present in the soil, moisture to the amount of 14.93 per cent, as an average for each of the four feet in depth and therefore, one acre of the soil to a depth of four feet contained 1,040.56 tons of water, and on July 16th, which is the nearest date to the time of harvesting, we find that 8.47 per cent. of moisture was present for each foot in depth, or there was 590.33 tons of water in an acre of the soil for a depth of four feet.

The rain fall for the period from April 9th to the harvesting of the oats, was 13.09 inches or 1,480.32 tons. This amount added to the difference of the amount of water in the soil as shown above gives as a result 1,930.55 tons of water which was necessary to supply the various demands. The entire crop of oats per acre was 3,861 pounds, or to produce one ton of straw and oats there disappeared from the soil 1000.02 tons of water. If we consider the amount of water necessary to grow the oats, only, we would have the following results. There

were grown on one acre of this plat 61.8 bushels of oats; which would give about 31.22 tons of water for each bushel of oats; not considering the amount required for the straw:

The table indicates that the oat crop makes a very large demand for water, especially near the surface. The soil contained the highest amount of moisture in May, which decreased until the crop was harvested.

The following table gives the date, per cent. of moisture present, for the highest and lowest amounts, with range of same.

	top to 4in date		4in to 1ft date		1ft to 2ft date		2ft to 3ft date		3ft to 4ft date	
Highest ...	22.18	May 7	19.08	May 7	16.86	May 7	16.04	May 7	14.53	May 7
Lowest	6.32	July 9	6.79	July 9	7.12	Aug 20	7.70	Aug 20	7.89	Sept 10
Range ...	15.86	per cent	12.29	per cent	9.74	per cent	8.34	per cent	6.64	per cent

PLAT IV (Root Field, Mangels) Soil Moisture—30 weekly periods.

DATES	DEPTH AT WHICH SAMPLE WAS TAKEN					Inches rain* all for weekly period.	Maximum degrees of temperature for week preceding the taking of sample.
	top—4in	4in—1ft	1ft—2ft	2ft—3ft	3ft—4ft		
April 9	21.06	19.03	17.07	16.89	14.10	.72	55--75
" 16	23.29	21.71	17.00	15.14	12.61	.88	46--71
" 23	17.45	17.72	17.38	15.95	14.12	.00	64--76
" 30	20.62	20.44	16.42	17.04	15.12	1.42	71--85
May 7	22.85	23.27	21.18	17.72	12.79	1.95	75--85
" 14	19.01	19.61	16.64	14.12	13.57	.10	53--93
" 21	18.09	19.47	15.73	14.52	13.68	.15	59--69
" 28	16.93	18.58	16.22	14.29	13.20	.07	69--93
June 4	23.30	22.92	16.69	13.96	12.63	3.28	68--90
" 11	24.49	21.59	15.74	15.66	14.46	.92	69--88
" 18	23.73	20.39	17.05	15.01	13.22	1.86	76--85
" 25	23.20	21.29	17.68	17.19	14.75	1.11	74--88
July 2	19.67	17.77	17.10	16.29	14.16	.23	69--86
" 9	16.47	16.39	16.08	14.86	12.73	.00	65--93
" 16	18.13	16.76	15.63	14.54	13.25	.40	80--93
" 23	20.20	17.58	16.01	16.42	16.46	1.71	70--92
" 30	18.64	16.10	14.29	15.88	16.23	.76	74--89
Aug 6	12.23	14.98	14.16	12.95	12.99	.13	80--87
" 13	10.76	11.49	13.06	15.57	14.90	.64	85--94
" 20	6.59	9.01	10.74	14.12	14.81	T	71--94
" 27	17.99	16.81	14.75	14.63	15.76	4.06	71--94
Sept 3	16.35	19.64	9.25	16.06	17.10	.10	68--89
" 10	13.46	12.74	13.96	11.92	10.27	.32	67--92
" 17	16.85	17.47	15.25	15.67	14.60	1.48	73--93
" 24	18.62	16.79	15.36	14.16	12.69	1.98	65--92
Oct 1	15.64	14.32	12.83	12.26	12.64	.00	55--78
" 8	14.04	14.00	*8.32	12.57	11.62	.33	45--75
" 15	14.44	13.80	12.59	13.05	14.43	.48	54--69
" 22	13.28	14.83	13.61	14.25	14.11	.00	42--78
" 29	12.30	10.39	11.50	10.71	12.51	.00	34--70
Average	17.66	17.21	15.17	14.76	13.85	.84	

*Not figured in average.

A study of the table of the results obtained from the root field shows that the consumption of moisture by the crop of mangels during the time between May 21th and Oct. 15th, gives the following results. On May 21th an acre of the root field contained as an average for each foot 15.73 per cent mois-

ture, or to a depth of four feet there was 1,096.31 tons of water and on Oct. 15th the same amount of soil contained as an average for each foot in depth 13.47 per cent. or 938.80 tons in each acre, four feet deep. The rain fall during this period of time was 2,247.64 tons making as a total consumption of moisture 2,405.15 tons for the crop. The crop yielded 17.5 tons of mangels per acre, or in other words, there was for each ton of mangolds a consumption of 137.49 tons of water to meet all the demands from various sources.

The following table shows the highest and lowest amounts of moisture found in the soil with the range and date of same.

Depth	top to 4in date	4in to 1ft date	1ft o 2ft date	2ft to 3ft date	3ft to 4ft date
Highest	23.73 June 18	23.27 May 7	21.18 May 7	17.72 May 7	17.10 Sept 3
Lowest	6.54 Aug 20	9.01 Aug 20	9.25 Sept 3	10.71 Oct. 29	11.52 Oct 8
Range	17.19 per cent.	14.26 per cent.	11.93 per cent.	7.01 per cent.	5.58 per cent.

PLAT V (Blue-grass Meadow) Soil Moisture—30 weekly periods

DATES	DEPTH AT WHICH SAMPLE WAS TAKEN					Inches Rainfall for weekly period.	Maximum Temperatures.
	top-4in	4ft.-1ft	1ft-2ft	2ft-3ft	3ft-4ft		
April 9	19.18	18.10	17.04	11.62	8.33	.72	55-75
" 16	19.08	17.93	16.75	13.36	9.75	.88	46-71
" 23	14.97	15.44	15.36	13.42	11.15	.00	64-76
" 30	17.40	25.10*	15.76	12.44	9.56	1.42	71-85
May 7	20.64	19.42	16.49	12.63	13.65	1.95	75-85
" 14	15.81	16.70	16.30	14.12	11.38	.10	53-93
" 21	15.81	15.52	14.62	12.25	10.77	.15	59-69
" 28	9.03	10.37	12.55	10.35	11.19	.07	69-93
June 4	17.75	17.34	15.54	12.85	9.67	3.28	68-90
" 11	18.56	17.83	14.25	11.18	9.76	.92	69-88
" 18	18.05	17.20	15.72	12.22	9.46	1.86	76-85
" 25	19.04	16.41	13.78	11.54	10.82	1.11	74-88
July 2	14.88	14.92	14.58	12.11	10.29	.23	69-86
" 9	10.41	11.29	13.17	12.03	10.45	.10	65-93
" 16	8.44	8.68	10.13	9.93	9.36	.40	80-93
" 23	16.37	15.80	12.67	11.03	10.31	1.71	70-92
" 30	14.23	14.38	15.80	16.17	13.05	.76	74-89
Aug 6	7.73	8.64	9.16	10.69	10.31	.13	80-87
" 13	8.04	8.11	8.21	8.13	9.45	.64	85-94
" 20	7.58	8.26	7.81	7.91	9.00	T	71-94
" 27	12.96	14.51	14.25	13.76	10.06	4.06	71-94
Sept 3	10.45	9.35	12.27	9.29	8.82	.10	68-89
" 10	9.98	12.50	12.10	7.80	5.92	.32	67-92
" 17	17.42	16.88	14.15	10.74	9.29	1.48	73-93
" 24	19.70	19.38	17.17	14.24	11.40	1.98	65-92
Oct 1	9.67	11.34	16.98	15.72	13.33	.00	55-78
" 8	14.26	14.16	14.39	10.64	8.94	.33	48-75
" 15	14.56	13.82	13.30	10.43	8.92	.48	54-69
" 22	12.20	12.39	12.69	9.50	8.99	.00	42-73
" 29	10.37	9.85	9.60	6.90	6.81	.00	34-70
Average	14.16	13.96	13.75	11.50	10.00	.84	

*Not figured in average.

The study of the moisture present in the blue-grass plat gives us the following results. The average percentage of moisture for each foot in depth on April 9th, was 13.86 per

cent, or considering the amount to the depth of four feet, there was present 965.98 tons of water in an acre.

On Oct. 29th we find as an average for each foot 8.33 per cent, or for an acre of soil four feet deep we would have 580.57 tons of moisture present, giving as the difference in the water present of 385.41 tons per acre.

The rain fall during the period from April 9th to Oct. 29th, was 25.08 inches, or 2,838.41 tons, which added to 385.41 tons gives 3,223.82 tons as the amount of water which was used to meet the various demands of the crop and soil. The demand for moisture made by the crop reduced the moisture content of the soil quite low between Aug. 6th and 20th, indicating that this crop required more water than the clover crop at the same time, and no doubt the rain which fell the following week furnished the crop the required moisture at the time when it was greatly needed. Comparing the amount of moisture that disappeared from the clover with the amount from the blue grass, we have for the clover field per acre 3,119.28 tons, and for the blue grass 3,223.82 tons per acre, or in other words, an acre of ground with clover as a crop made use of 104.54 tons of water less than the same amount of ground having a crop of blue grass, or an amount that equals a rain fall of about .93 inches.

The following table gives the highest and lowest percentage of moisture at different depths with date of same and range.

Depth	top to 4in date		4in to 1ft date		1ft to 2ft date		2ft to 3ft date		3ft to 4ft date	
Highest	20.64	May 7	19.42	May 7	17.04	April 9	16.17	July 30	13.65	May 7
Lowest	7.58	Aug 20	8.11	Aug 13	7.81	Aug. 20	6.90	Oct. 29	6.81	Oct. 29
Range	13.06 per cent.		11.31 per cent.		9.23 per cent.		9.27 per cent.		6.84 per cent.	