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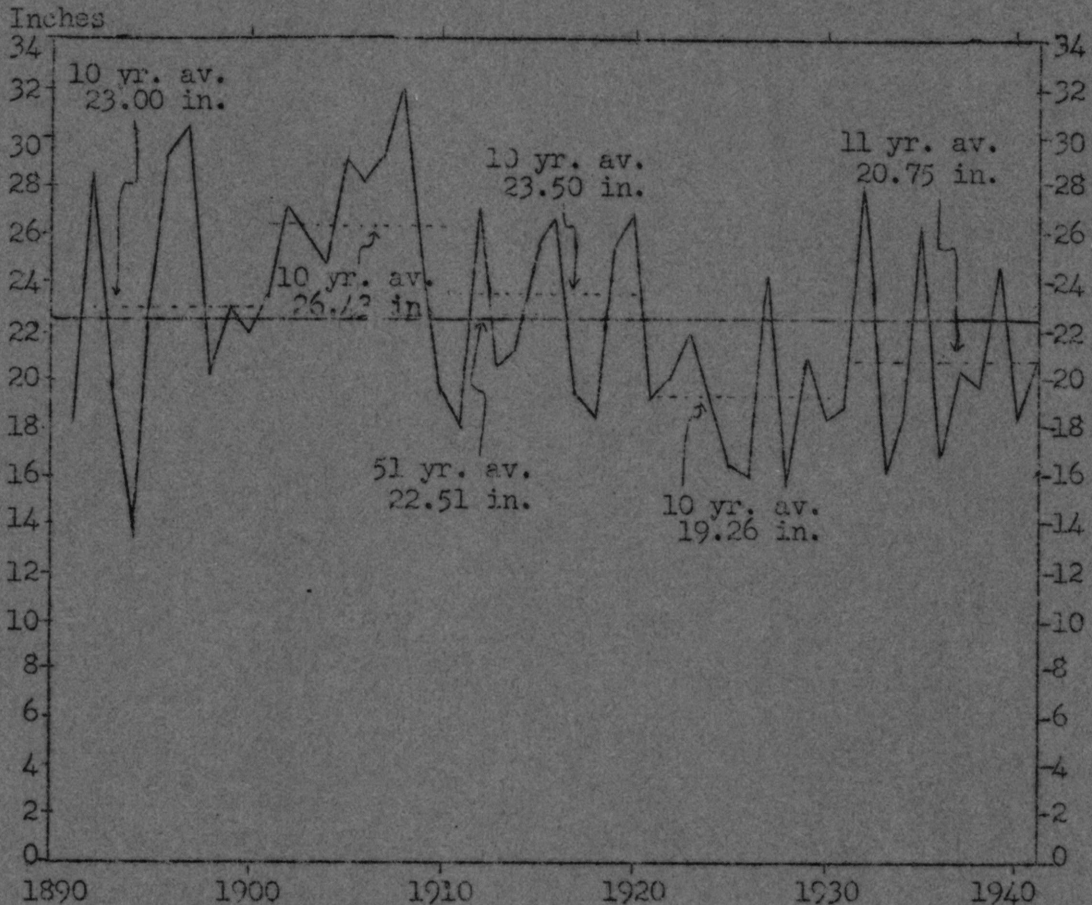
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CLIMATE AND CROP YIELDS

MOODY COUNTY

Precipitation
in



Average Crop Year (Sept. 1 of previous year to Aug. 31 of designated year) Precipitation at Flandreau, South Dakota, 1890-1941. The amount of precipitation varies greatly from year to year and from period to period. Precipitation is a major factor in crop yields. (Table III).

Department of Agricultural Economics
Agricultural Experiment Station
South Dakota State College
Brookings, South Dakota

THE COUNTY PAMPHLET SERIES

IN

AGRICULTURAL ECONOMICS

The County Pamphlet Series in Agricultural Economics is intended to make available to each county economic data concerning its farm history and present agricultural situation. It is hoped that these facts will be of use to county planning groups, individual farmers, research and extension workers and other persons interested in the agriculture of the counties.

Each pamphlet will treat one subject for one county, and is to be released when completed. Pamphlets on various other economic subjects for the different counties will be prepared as soon as possible.

A few copies of each pamphlet will be placed with the county extension agent and a limited number will be sent to private persons upon request.

The project was initiated by the Department of Agricultural Economics and the work is under the direction of its regular staff.

* * * * *

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Climate and Crop Yields

Prepared under the direction of Aaron G. Nelson and Virgil Wintrode

Climate is one of the principal limiting factors in South Dakota agriculture. A knowledge of its effects on crop conditions should, therefore, be of value to farmers in making farm plans and adjustments in their farm operations. Information regarding length of growing season, temperatures, precipitation and variations in these during specified periods and the relationship between climatic factors and crop conditions should be of value in determining what climatic risks are probable and which crops are best adapted to a particular area.

While annual variations in crop yields are primarily dependent on climatic conditions one must not overlook other factors which may have a very marked effect on yields. Insect pests or crop diseases may reduce yields or completely destroy crops in spite of favorable weather conditions. Crop yields may also be greatly affected by short periods of adverse weather conditions, such as the occurrence of hot dry weather during the pollination period for corn.

No set rules or absolute conclusions can be made regarding the relationship between yields and climatological factors; if, however, other factors are given due consideration much can be learned regarding the effect of climatic factors on crop yields. It is believed, for example, that if variety of crop and time of planting are given careful consideration much can be done to abate losses from weather adversities.

Table 1. Summary of Observations, 1890 to 1941
Flandreau Weather Station

ELEVATION IN FEET	1965
GROWING SEASON	
Average date of last killing frost in spring	May 11
Average date of first killing frost in fall	Sept. 25
Average length of frost-free period in days	137
Latest recorded killing frost in spring	June 21 (1902)
Earliest recorded killing frost in fall	Aug. 23 (1891)
Longest recorded growing season in days	184 (1938)
Shortest recorded growing season in days	83 (1902)
PRECIPITATION IN INCHES*	
For the Calendar Year, Jan. 1 to Dec. 31	
Average	22.49
Highest recorded	34.77 (1908)
Lowest recorded	15.11 (1925)
For the Crop Year, Sept. 1 of previous year to Aug. 31 of designated year	
Average	22.43
Highest recorded	32.21 (1908)
Lowest recorded	13.80 (1894)
For the Growing Season, April 1 to Aug. 31	
Average	15.03
Highest recorded	24.66 (1908)
Lowest recorded	8.00 (1931)
For the Critical Period for Small Grain, May 1 to June 30	
Average	7.21
Highest recorded	16.45 (1905)
Lowest recorded	2.76 (1894)
For the Critical Period for Corn, May 1 to July 31	
Average	9.94
Highest recorded	18.50 (1908)
Lowest recorded	3.80 (1894)
TEMPERATURE	
Average annual temperature	44.2
Highest recorded -- Degrees above zero	117 (1940)
Lowest recorded -- Degrees below zero	38**

* All rainfall, snow and other moisture measured as inches of water.

** No date available.

Source: U.S. Weather Bureau, Monthly and Annual Reports, 1890-1941.

COMPARISON OF PRECIPITATION AND CROP YIELDS

Flandreau Weather Station - Moody County

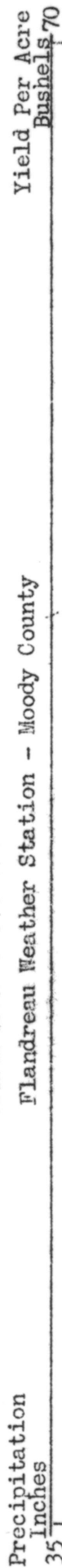
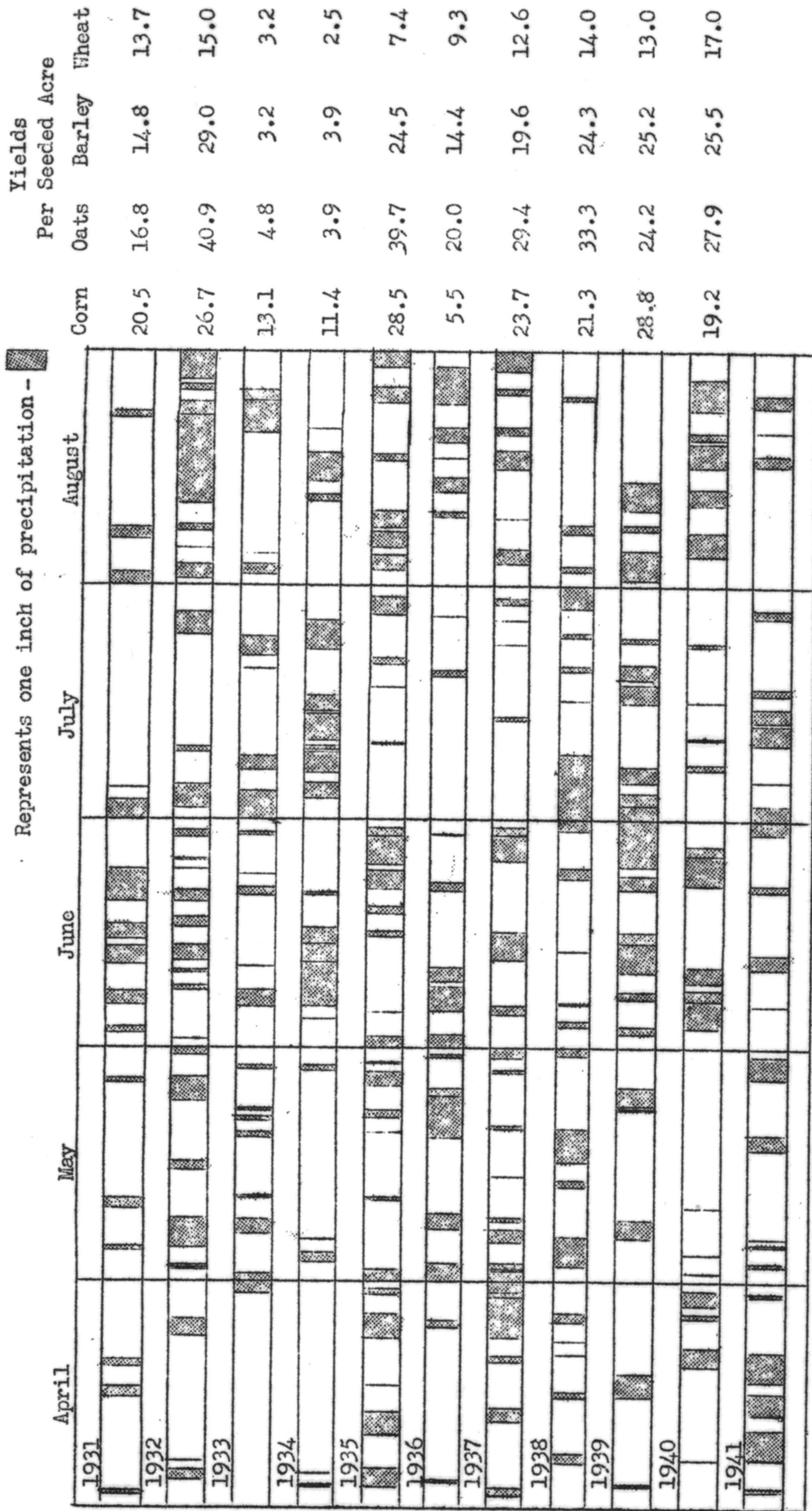


Fig. 1. Precipitation is probably the most important factor affecting crop yields.

Source: Tables II and III.

SUMMER PRECIPITATION, MOODY COUNTY, 1931 - 1941



Source: Precipitation data from Weather Bureau and Yields from Table III.

Fig. II. The distribution as well as the amount of precipitation during the growing season has an important effect on crop yields.

DAYS WITH TEMPERATURES ABOVE 90 DEGREES
 Brookings Weather Station*
 May 1 - Aug. 14

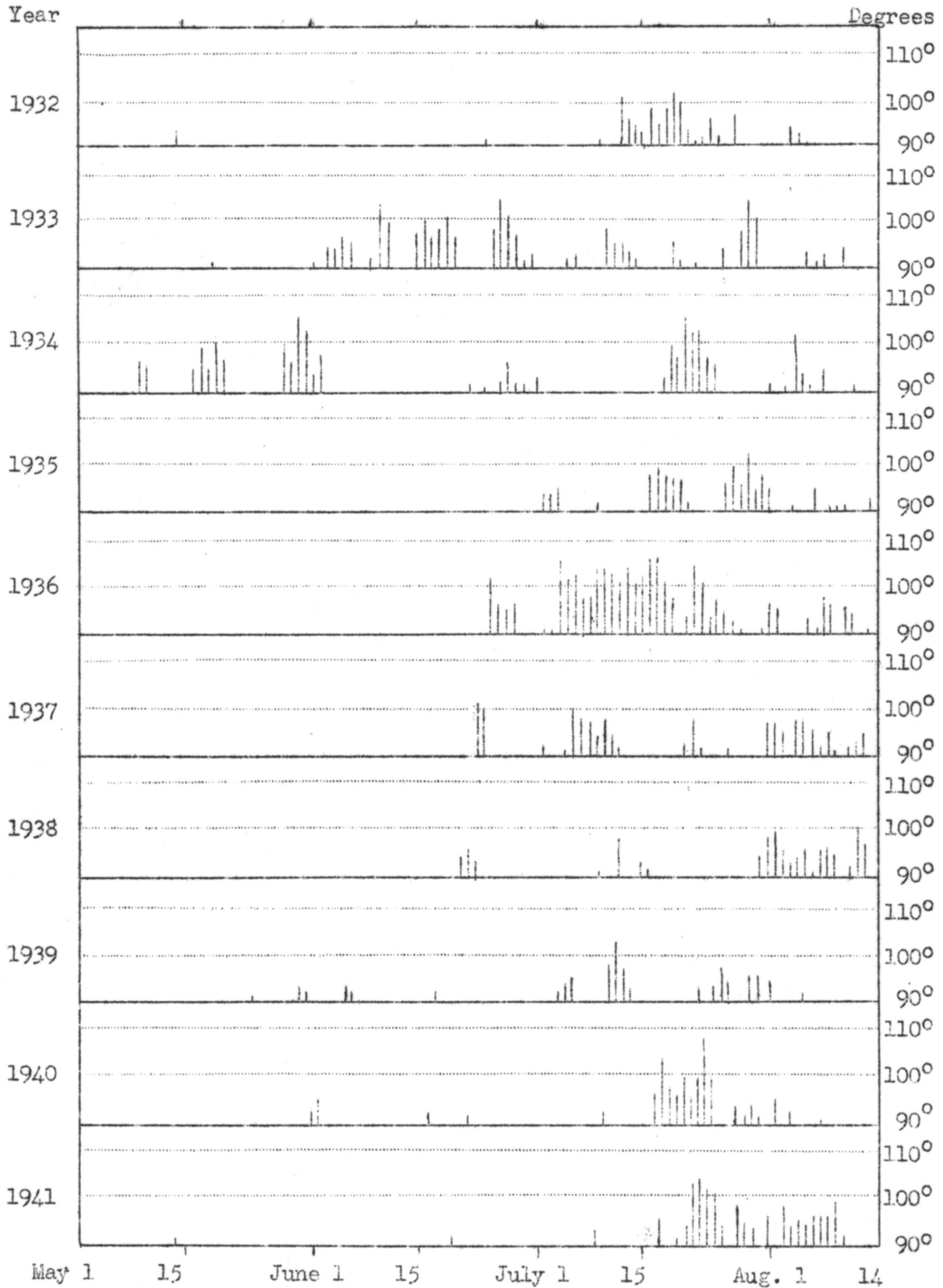


Fig. III. The vertical lines represent the highest temperatures of each day if over 90°.

* For lack of temperature records in Moody County, the Brookings Weather Station records are given.

Mocdy County

The Number and Distribution of Frost-Free Days, 1890-1941
Flandreau Weather Station

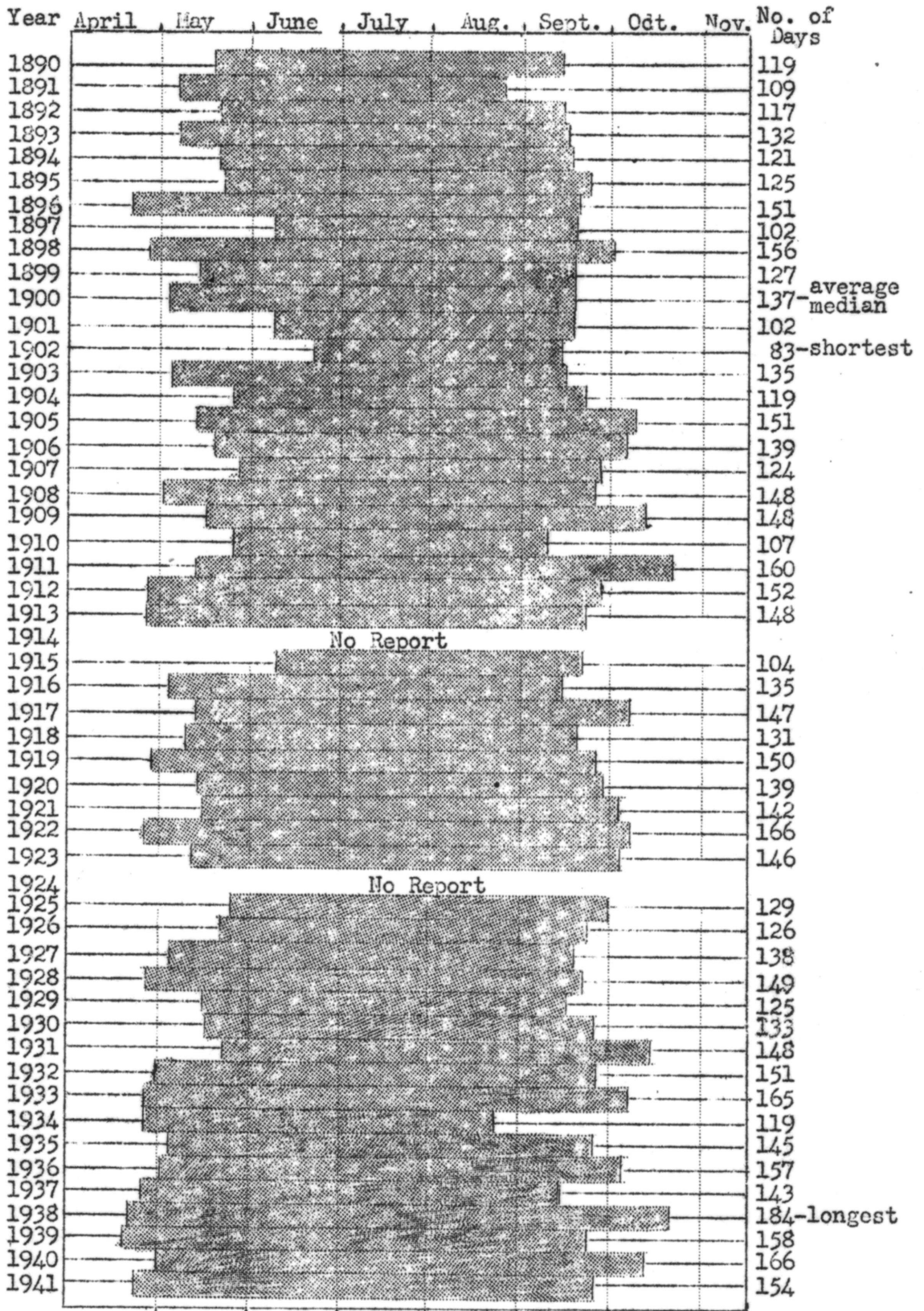


Fig. IV

Moody County

Table II

PRECIPITATION

Flandreau Weather Station, 1890 - 1941*

Year	Crop Year Sept. 1 - Aug. 31		Short Growing Season April 1 - July 31		Long Growing Season April 1 - August 31		Calendar Year Jan. 1 - Dec. 31	
	Inches	Percent of 1890-1941 Av.	Inches	Percent of 1890-1941 Av.	Inches	Percent of 1890-1941 Av.	Inches	Percent of 1890-1941 Av.
1890	--	--	15.16	124	17.22	114	20.53	91
1891	18.32	82	21.54	95	13.84	92	20.72	92
1892	28.97	129	18.98	156	21.98	146	26.36	117
1893	19.87	88	13.53	111	15.68	104	20.26	90
1894	13.80	61	6.23	51	9.60	64	15.74	70
1895	23.62	105	16.57	136	18.05	120	24.51	109
1896	29.23	130	17.70	145	18.86	125	31.33	139
1897	30.78	137	15.76	129	19.58	130	26.35	117
1898	20.28	90	13.80	113	15.46	103	22.70	101
1899	23.03	102	11.47	94	14.96	100	20.97	93
1900	22.06	98	13.12	108	15.69	104	26.14	116
Av. 1891-1900	23.00	102	13.87	114	16.37	108	23.51	104
1901	23.62	105	10.66	87	14.93	99	22.72	101
1902	27.08	120	9.18	75	19.02	126	26.14	116
1903	26.02	116	13.99	115	18.29	121	29.35	130
1904	24.83	110	12.70	104	14.82	98	19.95	88
1905	29.07	129	18.78	154	22.69	159	32.57	145
1906	28.22	125	11.34	93	18.75	124	29.28	130
1907	29.32	130	17.46	143	19.00	126	24.38	108
1908	32.21	143	21.58	177	24.66	164	34.77	154
1909	24.41	108	12.26	100	15.84	105	25.04	111
1910	19.50	87	8.29	68	10.72	71	15.83	70
Av. 1901-1910	26.43	117	13.62	112	17.87	118	26.00	115

Table II Cont'd.

Year	Crop Year Sept. 1 - Aug. 31		Short Growing Season April 1 - July 31		Long Growing Season April 1 - August 31		Calendar Year Jan. 1 - Dec. 31	
	Inches	Percent of 1890-1941 Av.	Inches	Percent of 1890-1941 Av.	Inches	Percent of 1890-1941 Av.	Inches	Percent of 1890-1941 Av.
1911	18.04	80	9.44	77	12.63	84	25.76	114
1912	27.37	124	11.52	94	15.65	104	19.95	88
1913	21.45	95	15.11	124	17.59	117	23.29	103
1914	23.29	103	14.59	116	17.25	114	24.15	107
1915	25.38	113	14.87	122	17.31	115	26.81	119
1916	26.79	119	15.16	124	16.67	110	22.02	98
1917	19.37	86	12.87	106	13.97	93	19.05	84
1918	18.21	81	11.87	97	14.91	99	21.51	96
1919	25.38	113	17.82	146	18.23	121	25.09	111
1920	26.95	120	16.41	135	19.66	130	27.33	121
Av. 1911-1920	23.01	103	13.90	114	16.29	109	23.42	104
1921	19.05	85	7.72	63	10.86	72	20.52	91
1922	20.10	89	7.10	58	9.19	61	18.98	84
1923	22.02	98	11.71	96	14.88	99	22.24	99
1924	19.26	86	9.89	81	11.65	77	16.94	75
1925	16.40	73	10.89	89	11.59	77	15.11	67
1926	16.02	71	8.20	67	12.86	85	19.94	88
1927	24.41	108	15.61	128	16.10	107	22.08	98
1928	15.88	70	8.52	70	10.66	71	17.74	79
1929	21.14	94	11.13	91	12.98	86	23.05	102
1930	18.28	81	7.28	60	9.18	61	20.26	90
Av. 1921-1930	19.26	86	9.81	80	12.00	80	19.69	87

Table II Cont'd

PRECIPITATION

Flandreau Weather Station, 1890 - 1941

Year	Crop Year Sept. 1 - Aug. 31		Short Growing Season April 1 - July 31		Long Growing Season April 1 - August 31		Calendar Year Jan. 1 - Dec. 31	
	Inches	Percent of 1890-1941 Av.	Inches	Percent of 1890-1941 Av.	Inches	Percent of 1890-1941 Av.	Inches	Percent of 1890-1941 Av.
1931	18.84	84	6.54	54	8.00	53	16.69	74
1932	28.07	125	10.21	84	17.52	117	24.26	108
1933	16.05	71	7.22	59	9.77	65	16.85	75
1934	18.39	82	10.43	86	12.32	82	23.17	103
1935	26.38	117	10.60	87	14.84	98	19.26	86
1936	16.69	74	7.41	61	10.85	72	17.32	77
1937	20.21	90	10.48	86	13.64	90	20.30	92
1938	19.88	88	12.19	100	13.21	88	22.74	101
1939	34.53	109	12.36	101	15.50	103	20.62	92
1940	18.31	81	7.12	58	12.42	82	20.62	92
Av. 1931-1940	20.74	92	9.46	78	12.75	84	20.23	90
1941	20.92	93	12.01	98	13.12	87	21.35	95
Av. 1890-1941	22.51	100	12.19	100	15.08	100	22.52	100

* No 1914 precipitation data available for Flandreau Weather Station. Data taken from Brookings Weather Station.

Table III
Yield Per Acre of Various Grain Crops, Moody County, 1916-1940^{1/}

Year	Corn	Winter Wheat	Durum ^{2/} Wheat	Spring ^{2/} Wheat	Oats	Barley	Rye	Flax
1916	30.0			7.3	25.7	15.0	20.0	10.6
1917	28.2			14.0	40.0	27.3	15.0	13.0
1918	32.0			19.5	45.0	30.0	14.0	10.0
1919	35.0			9.0	28.0	19.0	10.0	6.5
1920	36.5			7.0	36.0	19.0	13.5	8.5
Av. 1916-20	32.3			11.4	34.9	22.1	14.5	9.7
1921	34.0			8.5	27.0	17.0	14.0	8.0
1922	33.0			11.5	31.0	21.0	16.5	11.0
1923	36.0			14.0	33.0	21.0	16.0	10.0
	Yield Per Seeded Acre ^{4/}							
1924	20.3			15.5 ^{5/}	40.0	28.3	14.2	11.8
1925	21.0			14.0 ^{5/}	38.8	25.6	9.9	9.0
1926	26.2	8.0		2.9	15.7	12.8	3.1	7.0
1927	28.0	15.0		17.7	31.2	28.6	18.0	11.4
1928	26.7	12.3	14.3	9.8	27.1	27.0	11.4	7.2
1929	35.0	--	16.8	12.0	37.6	29.7	20.8	7.3
1930	24.3	15.5	9.8	14.3	38.7	30.5	18.1	8.4
Av. 1921-30	28.4	12.7 ^{3/}	13.6 ^{3/}	12.0	32.0	24.2	14.2	9.1
1931	20.5	10.5	15.0	14.2	16.8	14.8	6.9	3.2
1932	26.7	--	16.4	14.2	40.9	29.0	15.2	6.5
1933	13.1	6.0	3.2	2.7	4.8	3.2	4.9	2.3
1934	11.4	3.0	3.5	2.1	3.9	3.9	0.6	1.8
1935	28.5	--	5.5	7.6	39.7	24.5	16.9	6.7
1936	5.5	0.0	9.8	10.4	20.0	14.4	6.1	3.0
1937	23.7	--	14.0	12.1	29.4	19.6	9.5	5.4
1938	21.3	8.0	14.0	14.3	33.3	24.3	9.5	8.8
1939	28.8	12.0	13.0	13.0	24.2	25.2	4.5	5.6
1940	19.2	0.0	15.0	17.6	27.9	25.5	8.8	6.8
Av. 1931-40	19.9	5.6 ^{3/}	10.9	10.8	24.1	18.4	8.3	5.0
Av. 1916-40	25.8	8.2 ^{3/}	11.6 ^{3/}	11.4	29.4	21.4	11.9	7.6

- ^{1/} Farm Production and Prices, 1890-1926, Agr. Exp. Sta. Bulletin #225.
South Dakota Agricultural Statistics, 1924-1936, U.S.D.A. (Unpublished).
^{2/} South Dakota Agricultural Statistics, Annual Report, 1937-1940, U.S.D.A.
^{3/} Durum Wheat yields were included with spring wheat for the period 1916-1928.
^{4/} Average for years reporting.
^{5/} Prior to 1924 records do not tell whether yields were per harvested or seeded acre.
^{5/} Yield per harvested acre.