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Climate and Crop Yields Union County

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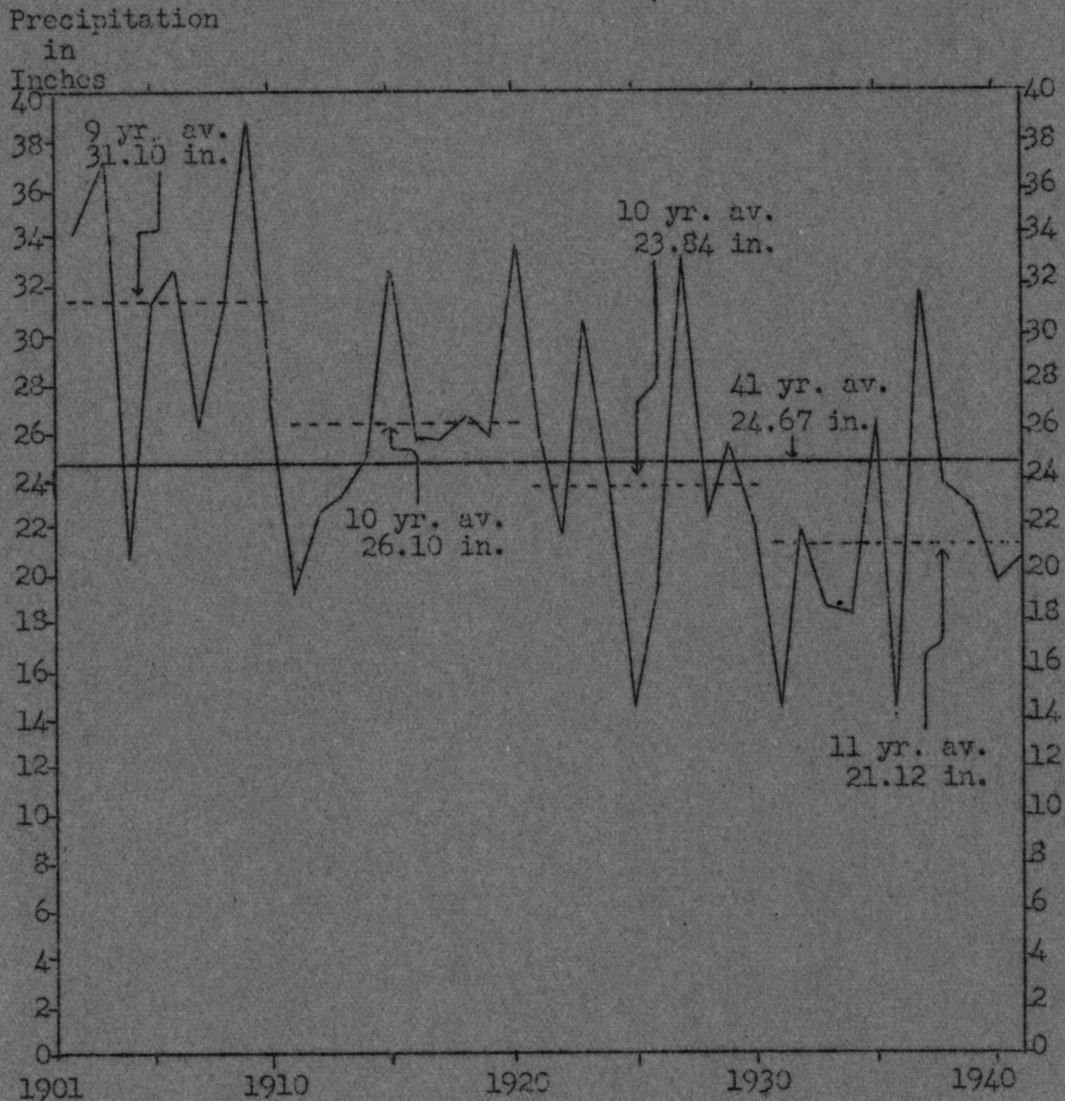
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CLIMATE AND CROP YIELDS
UNION COUNTY



Average Crop Year (Sept. 1 of previous year to Aug. 31 of designated year) Precipitation at Vermillion, South Dakota 1901-1941. 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).

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N O T E

Climatological data used in this pamphlet were taken from the Vermillion Weather Station, since complete climatological records for Union County are not available. While there may be some differences between Union County climate and that recorded at the Vermillion Weather Station, records from the latter should be quite representative of Union County.

Limited climatological records taken at the Elk Point Weather Station from 1898 to 1911 indicate that precipitation is slightly higher in Union than in Clay County. However, the discrepancies are relatively insignificant.

Crop yields presented in table III, however, are those for Union County and have been used in figures I and II.

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
Vermillion Weather Station

ELEVATION IN FEET	1,140
GROWING SEASON	
Average date of last killing frost in spring	May 1
Average date of first killing frost in fall	Oct. 8
Average length of frost-free period	162
Latest recorded killing frost in spring	May 25
Earliest recorded killing frost in the fall	Sept. 12
Longest recorded growing season	197 (1938)
Shortest recorded growing season	147 (1934)
PRECIPITATION IN INCHES*	
For the Calendar Year, Jan. 1 to Dec. 31	
Average	25.23
Highest recorded	45.03 (1909)
Lowest recorded	14.19 (1925)
For the Crop Year, Sept. 1 of previous year to Aug. 31 of designated year	
Average	24.67
Highest recorded	38.91 (1909)
Lowest recorded	13.83 (1936)
For the Growing Season, April 1 to Aug. 31	
Average	16.00
Highest recorded	23.11 (1909)
Lowest recorded	7.23 (1931)
For the Critical Period for Small Grain, May 1 to June 30	
Average	7.43
Highest recorded	13.79 (1905)
Lowest recorded	3.06 (1912)
For the Critical Period for Corn, May 1 to July 31	
Average	9.51
Highest recorded	19.43 (1909)
Lowest recorded	4.60 (1931)
TEMPERATURE	
Average annual temperature	50.2
Highest recorded - Degrees above zero	114 (1936)
Lowest recorded - Degrees below zero	31 (1936)

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

COMPARISON OF PRECIPITATION AND CROP YIELDS
Elk Point Weather Station - Union County

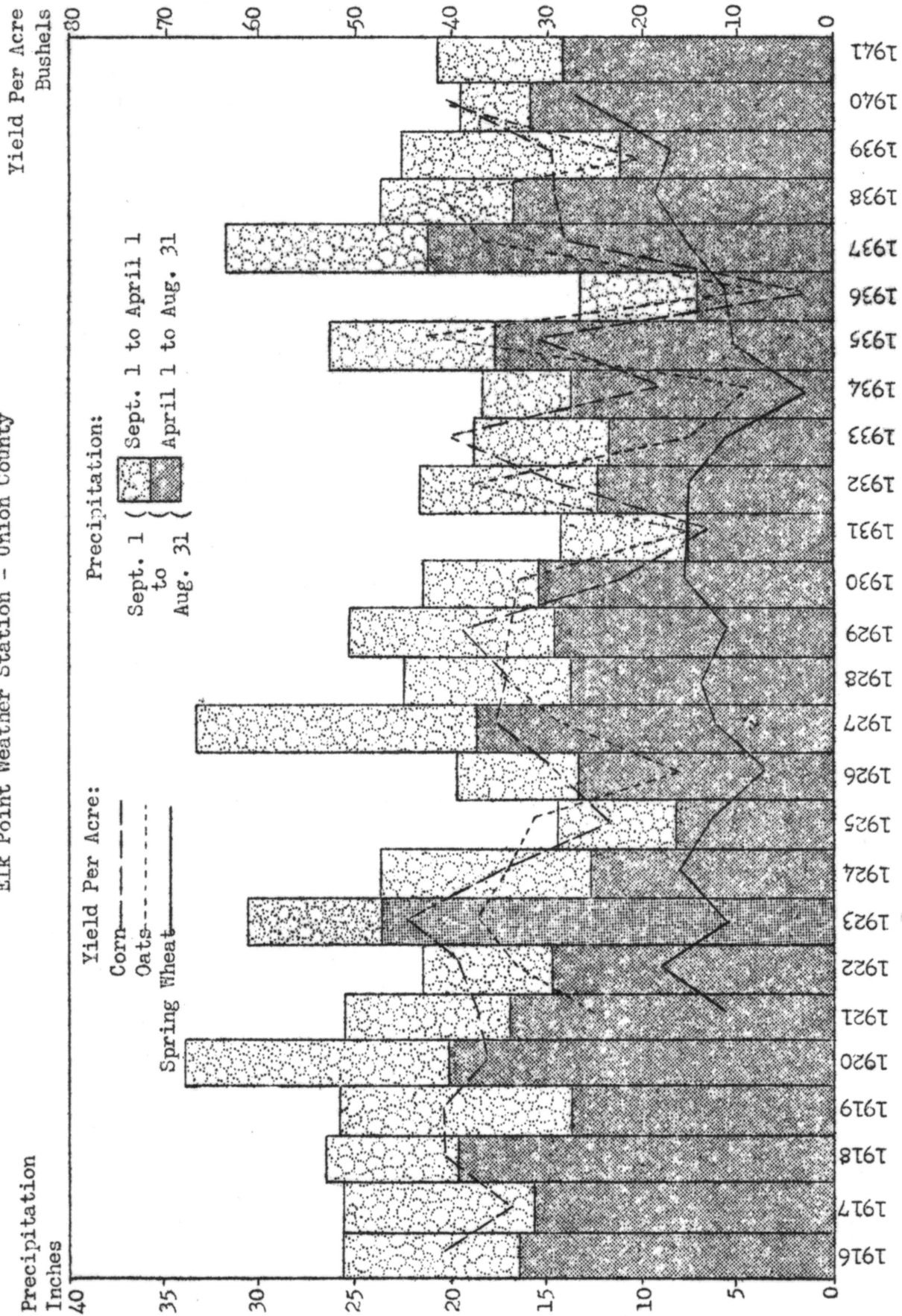


Fig. 1 - Precipitation is probably the most important factor affecting crop yields.
Source: Tables II and III.

SUMMER PRECIPITATION, UNION COUNTY, 1931 - 1941

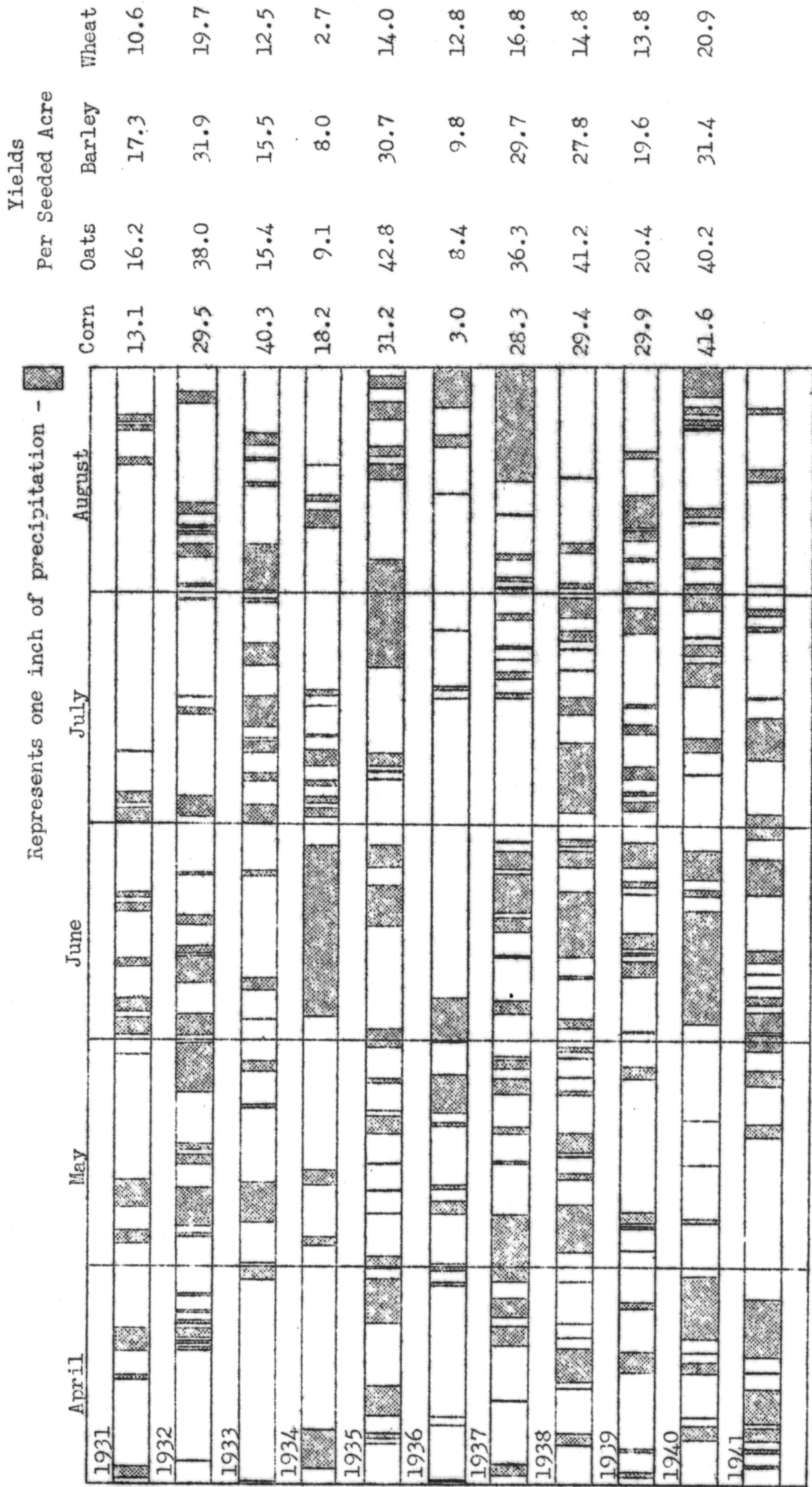


Fig. II. The distribution as well as the amount of precipitation during the growing season has an important effect on Crop yields.

Source: Precipitation data from Weather Bureau and yields from table III.

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

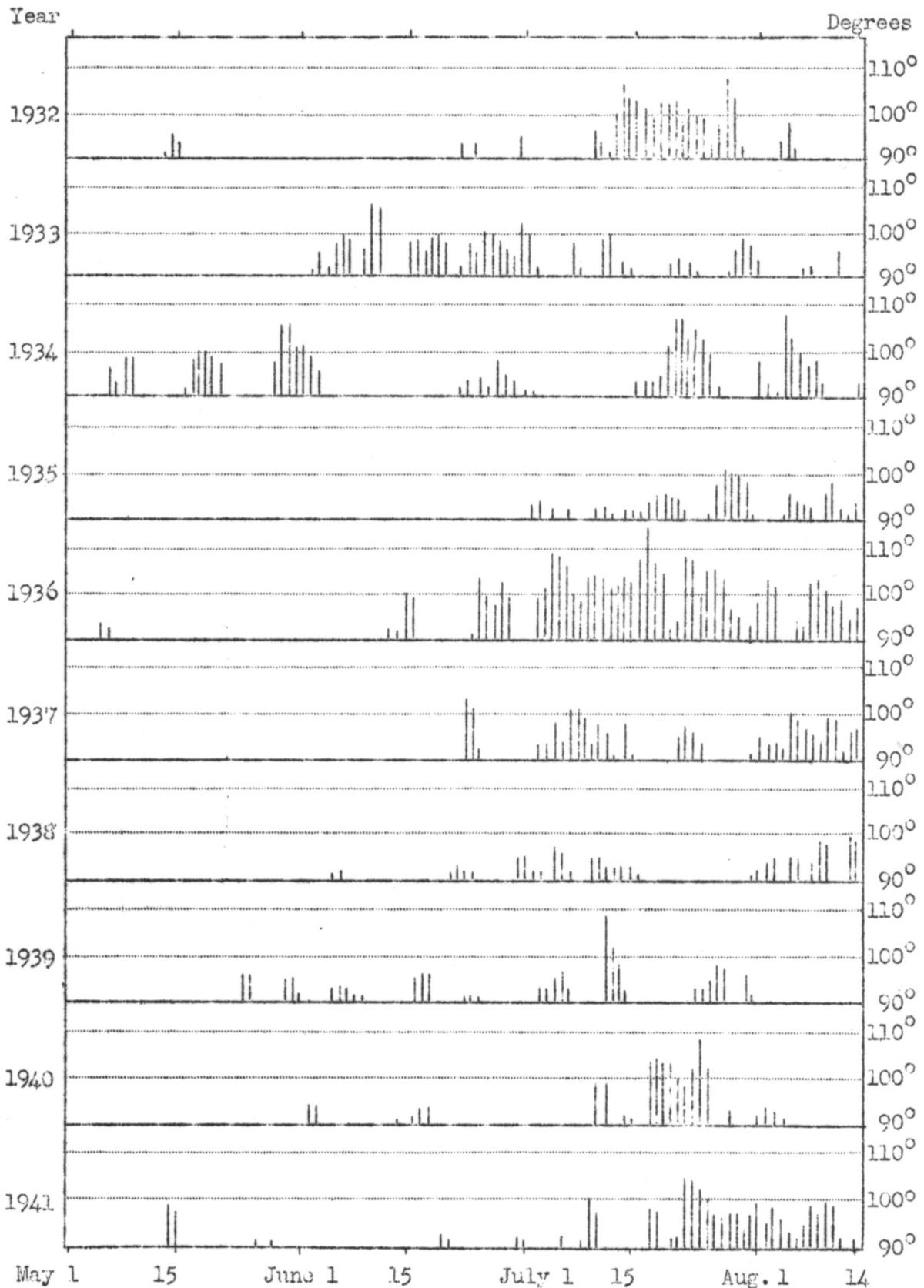


Fig. III. The vertical lines represent the highest temperatures of each day if over 90°.

The Number and Distribution of Frost-Free Days*

Vermillion Weather Station

Year	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	No. of Days
Av. for 31 yrs.										158
1931										163
1932										153
1933										176
1934										147
1935										164
1936										182
1937										186
1938										197
1939										176
1940										185
1941										189

Fig. IV

* There are no published data available for individual years prior to 1931. However, the average number of frost-free days for a 31 year record prior to 1931 is listed as 158. There was an average of 162 frost-free days for all years prior to 1942 for which data are available. For the period 1931-1941, the longest growing season recorded was 197 days, while the shortest was 147 days.

Clay County

Table II

PRECIPITATION

Vermillion Weather Station, 1901 - 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 1901-1941 Av.	Inches	Percent of 1901-1941 Av.	Inches	Percent of 1901-1941 Av.	Inches	Percent of 1901-1941 Av.
1901			11.57	88	13.97	87	31.18	123
1902	34.27	139	12.15	92	16.16	101	26.04	103
1903	37.20	151	20.77	158	26.21	164	34.46	136
1904	20.46	83	12.29	93	14.20	89	23.47	93
1905	31.19	126	17.76	135	19.96	125	33.70	133
1906	32.86	133	11.29	86	20.45	128	31.04	123
1907	26.17	106	15.06	114	16.24	102	24.14	95
1908	31.31	127	21.21	161	22.48	140	31.58	125
1909	38.91	158	22.94	174	28.11	176	45.03	178
1910	27.50	111	8.51	65	13.32	83	19.38	77
Av. 1901-10	31.10	126	15.36	117	19.11	119	30.00	119
1911	19.42	79	9.75	74	12.94	81	22.09	87
1912	22.81	92	8.39	64	11.86	74	19.36	77
1913	23.21	94	15.83	120	16.86	105	24.18	96
1914	24.99	101	16.91	128	18.74	117	28.05	114
1915	32.98	134	19.75	150	20.26	127	31.31	124
1916	25.66	104	15.10	115	16.35	102	25.29	100
1917	25.53	103	13.52	103	15.51	97	23.31	90
1918	26.50	107	14.99	114	19.25	120	30.55	121
1919	25.91	105	12.63	96	13.72	86	26.74	106
1920	33.94	138	17.37	132	19.95	125	32.37	128
Av. 1911-20	26.10	106	14.42	110	16.54	103	26.33	104

Table II Cont'd

Clay County

Year	Crop Year				Short Growing Season				Long Growing Season				Calendar Year	
	Sept. 1 - Aug. 31		April 1 - July 31		April 1 - July 31		April 1 - August 31		April 1 - August 31		April 1 - August 31		Jan. 1 - Dec. 31	
	Inches	Percent of 1901-1941 Av.	Inches	Percent of 1901-1941 Av.	Inches	Percent of 1901-1941 Av.	Inches	Percent of 1901-1941 Av.	Inches	Percent of 1901-1941 Av.	Inches	Percent of 1901-1941 Av.	Inches	Percent of 1901-1941 Av.
1921	25.60	104	13.51	103	16.93	106	22.56	89	22.56	89	22.56	89	22.56	89
1922	21.58	87	13.81	105	14.82	93	23.41	93	14.82	93	23.41	93	23.41	93
1923	30.63	124	14.40	109	23.25	145	31.66	125	23.25	145	31.66	125	31.66	125
1924	23.72	96	9.60	73	12.85	80	21.56	85	12.85	80	21.56	85	21.56	85
1925	14.44	59	7.94	60	8.32	52	14.19	56	8.32	52	14.19	56	14.19	56
1926	19.74	80	8.87	67	13.28	83	26.55	105	13.28	83	26.55	105	26.55	105
1927	33.42	135	15.71	119	18.78	117	26.88	106	18.78	117	26.88	106	26.88	106
1928	22.23	90	11.95	91	13.72	86	25.86	102	13.72	86	25.86	102	25.86	102
1929	25.42	103	12.84	98	14.48	90	22.07	87	14.48	90	22.07	87	22.07	87
1930	21.57	87	11.93	91	15.24	95	22.39	89	15.24	95	22.39	89	22.39	89
Av. 1921-30	23.84	97	12.06	92	15.17	95	23.71	94	15.17	95	23.71	94	23.71	94
1931	14.12	57	6.62	50	7.28	46	15.34	61	7.28	46	15.34	61	15.34	61
1932	21.80	88	10.20	78	12.21	76	18.61	74	12.21	76	18.61	74	18.61	74
1933	18.80	76	8.87	67	11.61	73	18.08	72	11.61	73	18.08	72	18.08	72
1934	18.52	75	12.69	96	13.91	87	21.86	86	13.91	87	21.86	86	21.86	86
1935	26.42	107	14.54	110	17.71	111	23.52	93	17.71	111	23.52	93	23.52	93
1936	13.83	56	5.41	41	7.83	49	17.93	71	7.83	49	17.93	71	17.93	71
1937	31.87	129	11.37	86	21.27	133	28.78	114	21.27	133	28.78	114	28.78	114
1938	23.76	96	15.97	121	16.76	105	23.72	114	16.76	105	23.72	114	23.72	114
1939	22.78	92	8.58	65	11.02	69	14.34	57	11.02	69	14.34	57	14.34	57
1940	19.67	80	13.62	103	15.93	100	23.19	92	15.93	100	23.19	92	23.19	92
Av. 1931-40	21.16	86	10.79	82	13.55	85	21.04	83	13.55	85	21.04	83	21.04	83
1941	20.73	84	13.26	101	14.29	89	25.71	102	14.29	89	25.71	102	25.71	102
Av. 1901-41	24.67	100	13.16	100	16.00	100	25.28	100	16.00	100	25.28	100	25.28	100

Table III

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

Year	Corn	Winter Wheat	Durum ^{2/} Wheat	Spring ^{2/} Wheat	Oats	Barley	Rye	Flax
1916	41.0							9.0
1917	33.7							8.0
1918	41.0							
1919	41.0							
1920	36.0							8.0 ^{3/}
Av. 1916-20	38.5							8.3
1921	37.0			11.0	25.0	27.0	24.0	7.5
1922	39.0			18.0	33.0	28.0	23.5	9.0
1923	44.5			11.5	37.0	31.0	18.0	10.0
		Yield Per Seeded Acre ^{4/}						
1924	35.2			16.0 ^{5/}	33.8	30.3	12.3	10.0
1925	23.8			13.0 ^{5/}	31.7	30.0	15.6	8.0
1926	29.2	10.7		7.7	16.2	12.9	5.9	6.0
1927	35.0	21.5		12.4	28.9	28.6	20.8	9.3
1928	34.4	12.9	18.8	13.8	34.6	32.7	18.0	9.3
1929	38.5	18.1	16.0	10.9	33.8	29.7	16.5	7.8
1930	22.2	29.0	15.5	15.9	33.0	31.7	20.8	4.6
Av. 1921-30	33.9	18.4 ^{3/}	16.8 ^{3/}	13.0	30.7	28.2	17.5	8.1
1931	13.1	9.1	14.5	15.0	16.2	17.3	11.8	1.3
1932	29.5	21.2	17.5	15.3	38.0	31.9	13.7	8.4
1933	40.3	13.5	11.2	11.5	15.4	15.5	6.1	1.0
1934	18.2	2.4	---	2.9	9.1	8.0	1.9	.6
1935	31.2	18.5	11.0	10.6	42.8	30.7	21.5	8.8
1936	3.0	13.6	12.0	11.0	8.4	9.8	6.6	2.5
1937	28.3	17.2	15.0	15.0	36.3	29.7	11.6	9.0
1938	29.4	14.0	15.0	18.7	41.2	27.8	12.7	10.0
1939	29.8	13.1	14.0	17.0	20.4	19.6	7.6	4.2
1940	41.6	10.2	27.5	27.2	40.2	31.4	4.5	11.4
Av. 1931-40	26.4	13.3	15.3 ^{3/}	14.4	26.8	22.2	9.8	5.7
Av. 1916-40	31.8	15.0 ^{3/}	15.7 ^{2/}	13.7 ^{2/}	28.7 ^{2/}	25.2 ^{2/}	13.6 ^{2/}	7.1 ^{2/}

^{1/} Farm Production and Prices, 1890-1926, Agr. Exp. Sta. Bulletin #225.

South Dakota Agricultural Statistics, 1924-1936, U.S.D.A. (Unpublished).

South Dakota Agricultural Statistics, Annual Report, 1937-1940, U.S.D.A.

^{2/} Durum Wheat yields were included with Spring Wheat for the period 1916-1928.^{3/} Average for years reporting.^{4/} Prior to 1924 records do not tell whether yields were per harvested or seeded acre.^{5/} Yield per harvested acre.