

South Dakota State University  
**Open PRAIRIE: Open Public Research Access Institutional  
Repository and Information Exchange**

---

Agricultural Experiment Station Agricultural  
Economics Pamphlets

SDSU Agricultural Experiment Station

---

3-1-1942

## Climate and Crop Yields Clay County

G. Aaron Nelson

Virgil Wintrode

Follow this and additional works at: [http://openprairie.sdstate.edu/agexperimentsta\\_ageconomics](http://openprairie.sdstate.edu/agexperimentsta_ageconomics)



Part of the [Agricultural Economics Commons](#)

---

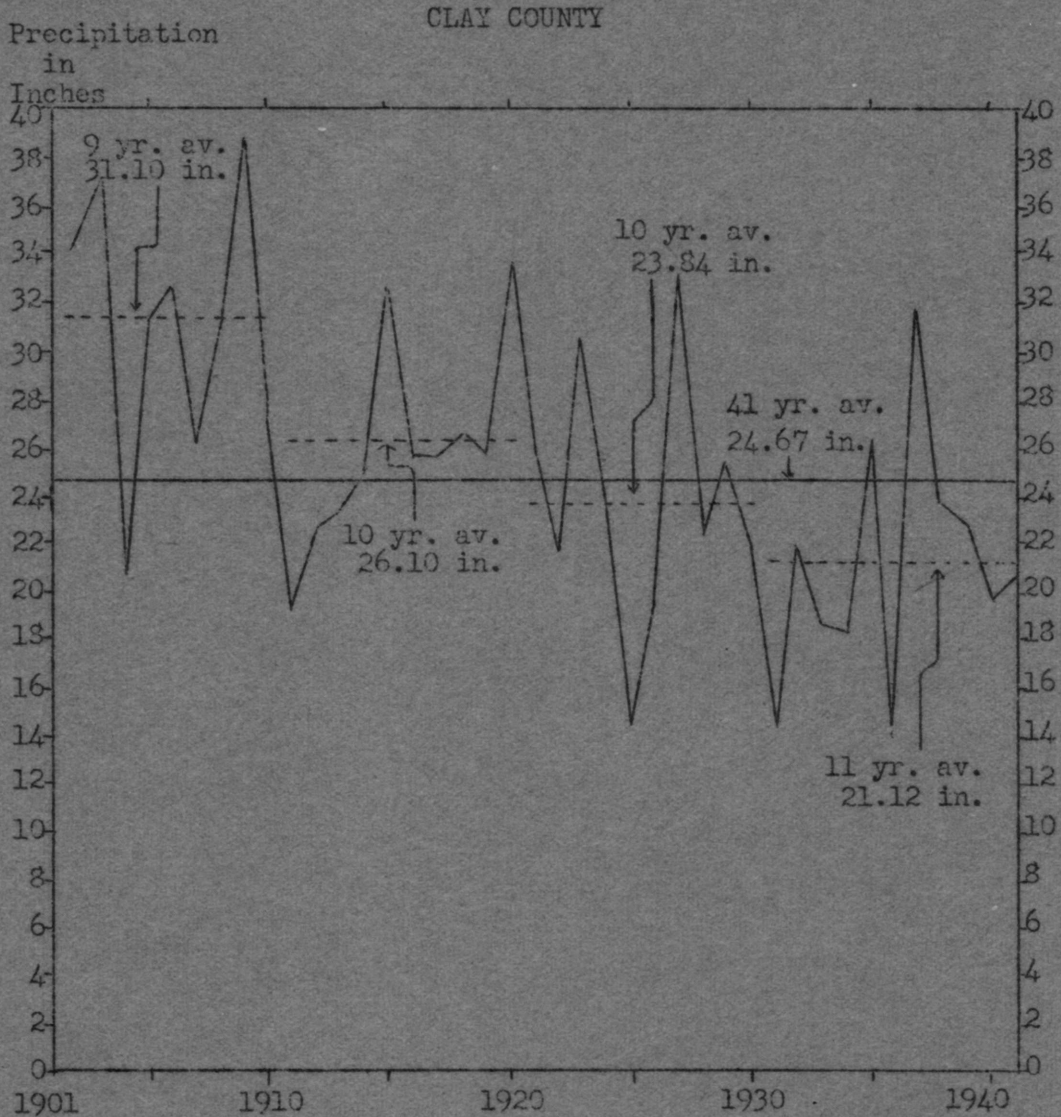
### Recommended Citation

Nelson, G. Aaron and Wintrode, Virgil, "Climate and Crop Yields Clay County" (1942). *Agricultural Experiment Station Agricultural Economics Pamphlets*. 1.

[http://openprairie.sdstate.edu/agexperimentsta\\_ageconomics/1](http://openprairie.sdstate.edu/agexperimentsta_ageconomics/1)

This Pamphlet is brought to you for free and open access by the SDSU Agricultural Experiment Station at Open PRAIRIE: Open Public Research Access Institutional Repository and Information Exchange. It has been accepted for inclusion in Agricultural Experiment Station Agricultural Economics Pamphlets by an authorized administrator of Open PRAIRIE: Open Public Research Access Institutional Repository and Information Exchange. For more information, please contact [michael.biondo@sdstate.edu](mailto:michael.biondo@sdstate.edu).

CLIMATE AND CROP YIELDS



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).

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.

\* \* \* \* \*

\*  
\* ACKNOWLEDGEMENTS: The authors wish to extend \*  
\* their appreciation to members of the Extension \*  
\* Service and Experiment Station, especially those \*  
\* of the Agronomy Department, who have made sugges- \*  
\* tions on presentation of this material; also, to \*  
\* the Weather Bureau, U. S. Department of Commerce, \*  
\* and the South Dakota Crop and Livestock Reporting \*  
\* Service for basic data presented in this publica- \*  
\* tion. \*  
\*  
\* This pamphlet is published by the South Dakota \*  
\* Agricultural Experiment Station as a report on the \*  
\* Climate and Crop Yields phase of the Agricultural \*  
\* Planning Project through the cooperation of the \*  
\* Work Projects Administration, Official Project \*  
\* Number 265-1-74-57. \*  
\*  
\* \* \* \* \*

## 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. 3
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 (1928)
Shortest recorded growing season	147 (1934)
PRECIPITATION IN INCHES*	
For the Calendar Year, Jan. 1 to Dec. 31	
Average	25.23
Highest recorded	43.03 (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	28.11 (1909)
Lowest recorded	7.28 (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

Vermillion Weather Station - Clay County

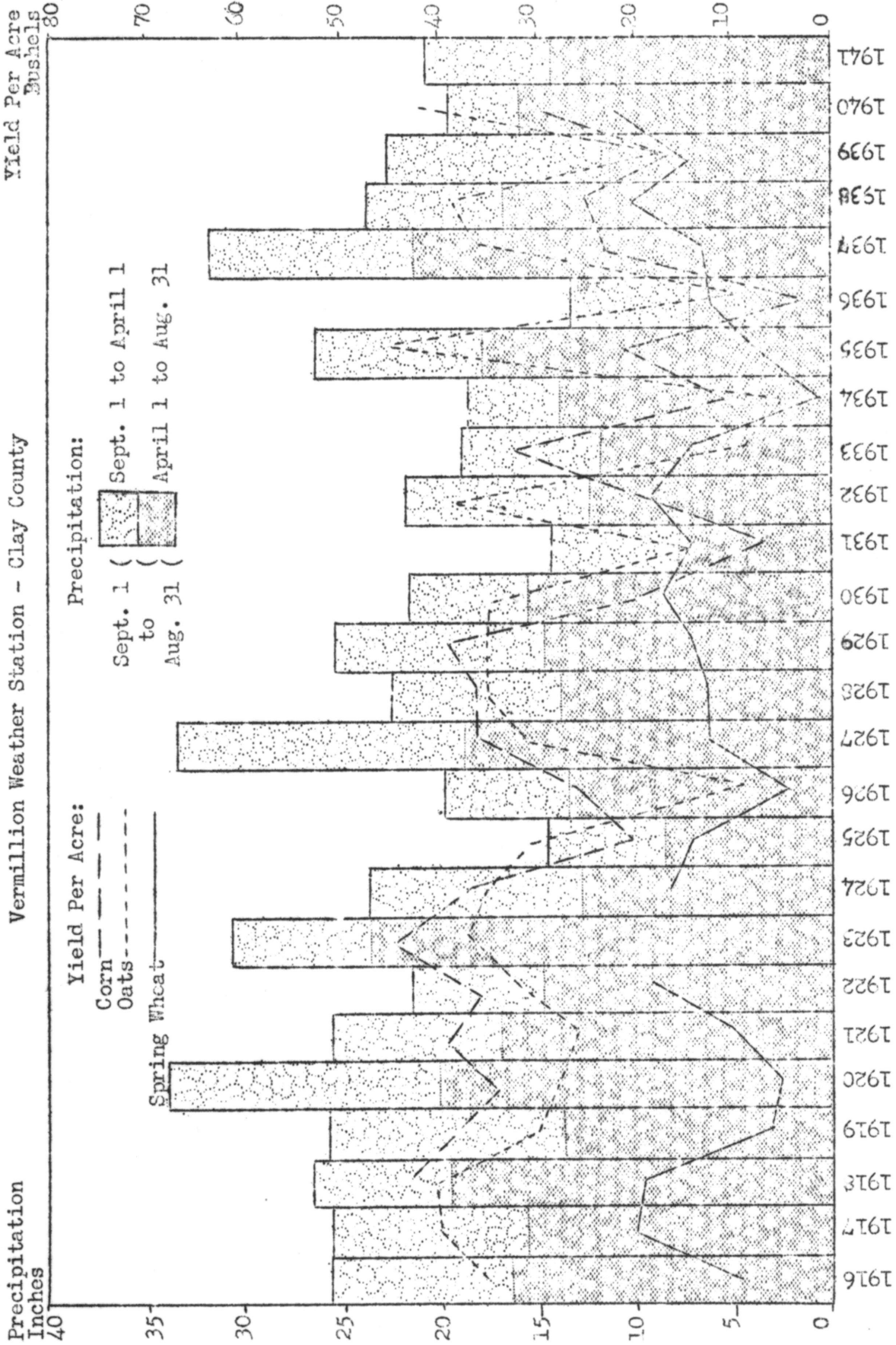


Fig. 1 - Precipitation is probably the most important factor affecting crop yields.

Source: Tables II and III

SUMMER PRECIPITATION, CLAY COUNTY, 1931 - 1941

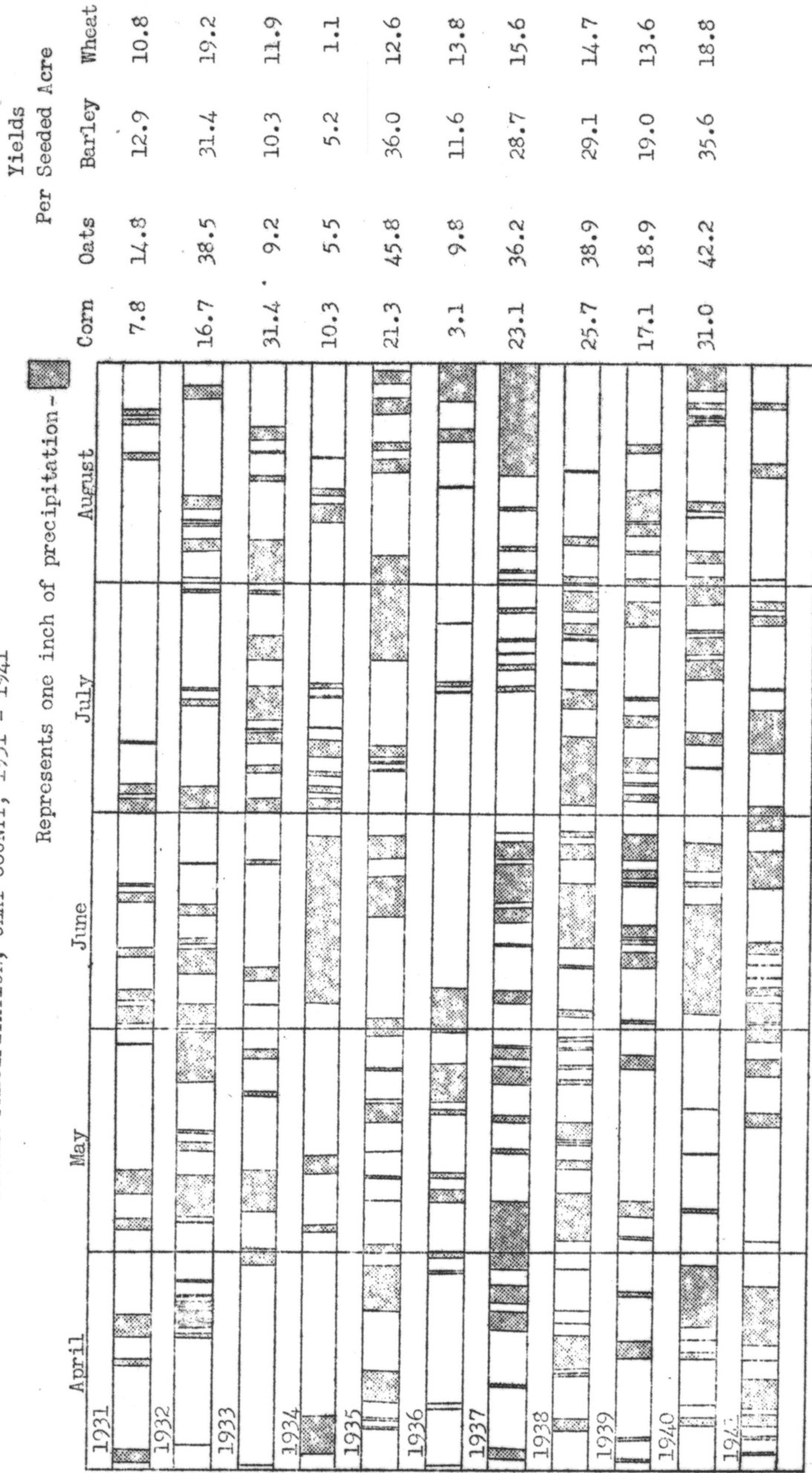


Fig. II. The distribution as well as the amount of precipitation during the growing season has an important effect on crop yields.

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

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

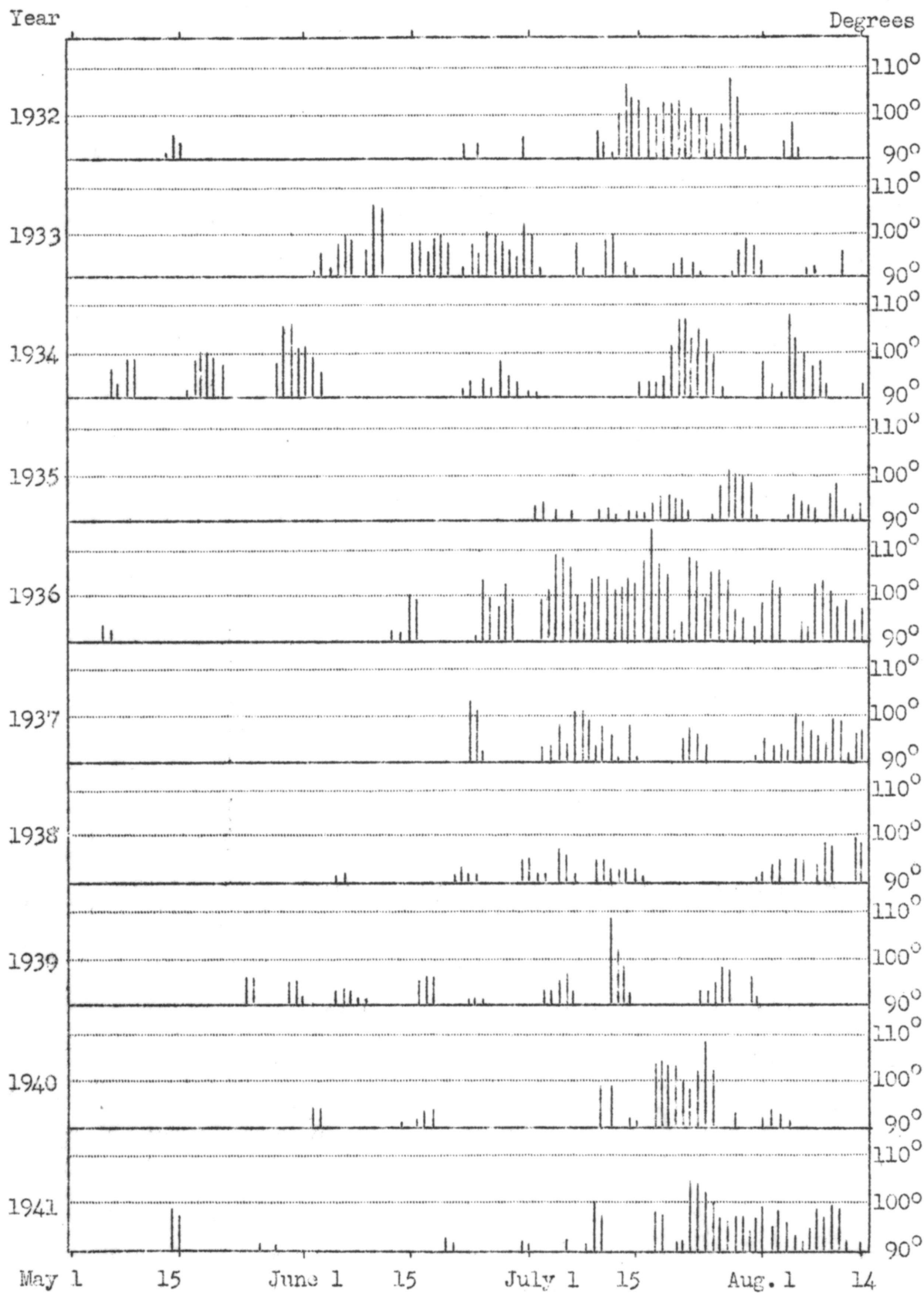


Fig. III. The vertical lines represent the highest temperatures of each day if over 90°.



The Number and Distribution of Frost-Free Days\*

Vermillion Weather Station

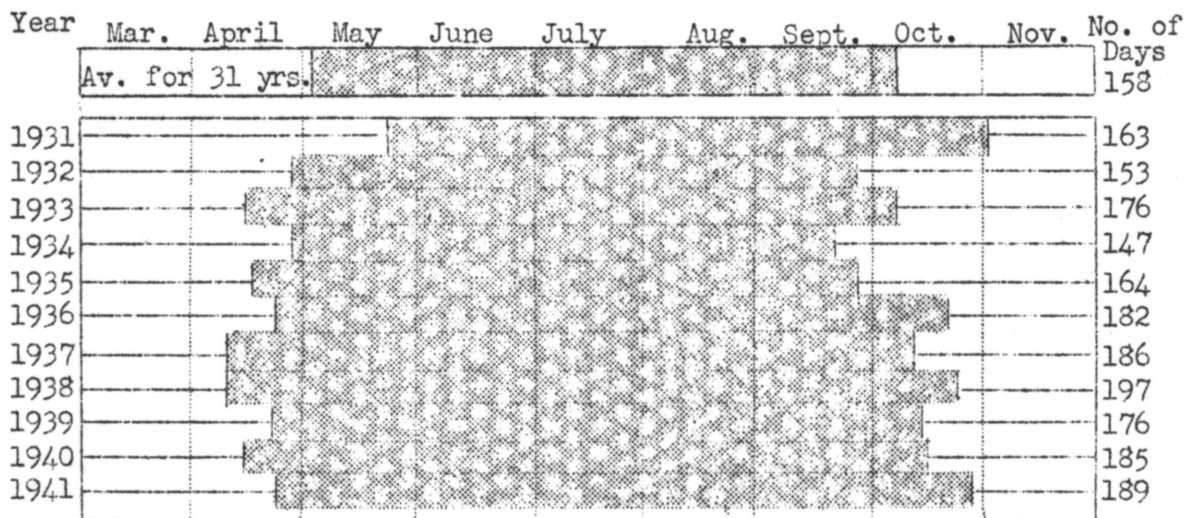


Fig. IV

\* 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.

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	16.15	101	26.04	103
1903	37.20	151	20.77	153	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

## 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.
1921	25.60	104	13.51	103	16.93	106	22.56	89
1922	21.58	87	13.81	105	14.82	93	23.41	93
1923	30.63	124	14.40	109	23.25	145	31.56	125
1924	23.72	96	9.60	73	12.85	30	21.56	85
1925	14.44	59	7.94	60	8.32	52	14.19	56
1926	19.74	80	8.87	67	13.28	83	26.55	105
1927	33.42	135	15.71	119	18.73	117	26.83	106
1928	22.23	90	11.95	91	13.72	86	25.86	102
1929	25.42	103	12.84	98	14.48	99	22.07	87
1930	21.57	87	11.93	91	15.24	95	22.39	89
Av. 1921-30	23.84	97	12.06	92	15.17	95	23.71	94
1931	14.12	57	6.62	50	7.23	46	15.34	61
1932	21.80	88	10.20	78	12.21	76	13.61	74
1933	18.30	76	8.87	67	11.61	73	18.08	72
1934	18.52	75	12.69	96	13.91	87	21.86	86
1935	26.42	107	14.54	110	17.71	111	23.52	93
1936	13.83	56	5.41	41	7.83	49	17.93	71
1937	31.87	129	11.37	86	21.27	133	28.78	114
1938	23.75	96	15.97	121	16.76	105	23.72	114
1939	22.73	92	8.58	65	11.02	69	14.34	57
1940	17.57	80	13.62	103	15.93	100	23.19	92
Av. 1931-40	21.16	86	10.79	82	13.55	85	21.04	83
1941	20.73	84	13.26	101	14.29	89	25.71	102
Av. 1901-41	24.67	100	13.16	100	16.00	100	25.28	100

Table III

Yield Per Acre of Various Grain Crops, Clay County, 1916-1940<sup>1/</sup>

Year	Corn	Winter Wheat	Durum <sup>2/</sup> Wheat	Spring <sup>2/</sup> Wheat	Oats	Barley	Rye	Flax
1916	35.7			9.2	35.1	19.0		8.0
1917				20.0	40.0	35.0		8.0
1918	43.0			19.0	41.0	30.0		
1919	39.0			6.0	30.0			5.0
1920	34.0			5.0	28.5	26.5		
Av. 1916-20	37.9 <sup>3/</sup>			11.8	34.9	27.6 <sup>3/</sup>		7.0 <sup>2/</sup>
1921	39.5			10.0	26.0		15.0	
1922	36.0			18.0	32.0	31.0	20.0	9.0
1923	44.5				37.5	26.7	25.0	
		Yield Per Seeded Acre <sup>4/</sup>						
1924	37.4			16.4 <sup>5/</sup>	35.0	27.3	12.5	8.9
1925	20.1			14.0 <sup>5/</sup>	31.1	28.3	14.6	6.8
1926	26.2	7.5		4.8	9.7	11.0	6.9	6.3
1927	36.0	20.4		12.5	31.2	27.3	18.9	11.7
1928	36.2	11.2		12.7	35.3	32.4	18.7	9.1
1929	39.0	19.5		14.0	35.8	27.7	15.4	6.1
1930	20.3	25.4		17.2	34.8	31.4	13.8	7.4
Av. 1921-30	33.5	16.8 <sup>3/</sup>		13.3 <sup>3/</sup>	30.8	27.0 <sup>3/</sup>	16.6	8.2 <sup>3/</sup>
1931	7.8	9.8		14.4	14.3	12.9	8.9	3.2
1932	16.7	19.4		18.3	38.5	31.4	14.9	4.6
1933	31.4	11.2		14.3	9.2	10.3	5.2	0.6
1934	10.3	.8		1.9	5.5	5.2	1.3	1.1
1935	21.3	16.7		7.6	45.8	36.0	17.8	4.6
1936	3.1	14.1		12.0	9.3	11.6	7.4	2.0
1937	23.1	15.8	14.0	13.8	36.2	28.7	12.6	
1938	25.7	12.6	15.0	20.2	38.9	29.1	12.9	10.0
1939	17.1	12.9	16.0	14.9	18.9	19.0	7.5	3.3
1940	31.0	15.2	22.5	22.2	42.2	35.6	8.4	10.9
Av. 1931-40	13.8	12.8	16.9 <sup>3/</sup>	14.0	26.9	22.0	9.7	4.5 <sup>3/</sup>
Av. 1916-40	28.1 <sup>3/</sup>	14.2 <sup>3/</sup>	16.9 <sup>3/</sup>	13.3 <sup>3/</sup>	29.7	24.9 <sup>3/</sup>	13.1 <sup>3/</sup>	6.4 <sup>2/</sup>

<sup>1/</sup> Farm Production and Prices, 1890-1926, Agr. Exp. Sta. Bulletin #225.  
South Dakota Agricultural Statistics, 1924-1936, U.S.D.A. (Unpublished).

<sup>2/</sup> South Dakota Agricultural Statistics, Annual Report, 1937-1940, U.S.D.A.  
<sup>3/</sup> Durum Wheat yields were included with spring wheat for the period 1916-1928.

<sup>4/</sup> Average for years reporting.

<sup>5/</sup> Prior to 1924 records do not tell whether yields were per harvested or seeded acre.

<sup>6/</sup> Yield per harvested acre.