

WEATHER RECORDINGS FOR AGRICULTURAL RESEARCH

U.S. CENTRAL GREAT PLAINS FIELD STATION
AKRON, COLORADO

B.W. Greb ¹

State
University
Experiment
Station

**PROGRESS
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Weather measurements have been taken continuously at the station from 1908 to the present time to supply basic data for characterizing the climate. In this manner various agronomic practices can be best adjusted to these recorded natural climatic occurrences. Agronomic adjustments which are improved by increased weather knowledge in combination with technology include the following categories of activity: (1) cultural practices such as rates and dates of seeding, rotations, and field planting patterns, (2) better adapted genetic stock, (3) engineering practices such as terracing and land leveling, and (4) mechanical tillage and chemicals for water conservation, weed control, seed bed preparations and wind erosion control techniques.

Over a period of years, improved instrumentation has permitted an increased number of climatic measurements as are desirable for research purposes. A listing of the routine macro-climate measurements taken on a daily basis at the present include the following:

Precipitation; amounts, intensity and time of occurrence

Air temperature; maximum, minimum and mean

Soil temperature; maximum, minimum and mean

Evaporation; seven months, April through October

Wind velocity, mean mph

Wind velocity, automatic recorder for wind direction, time of day and mph

Evaporation; by an automatic weighing lysimeter under native grass conditons.

Some weather calculations: Frost free period
Day degrees above 40° F
Historical shifts in weather patterns
Correlation of weather factors to crop yields.

In our modern era, weather recordings are now made in many areas by remote sensing. The instruments may be placed on a mountain many

miles from where the data are being electronically recorded. Dr. Orr Roberts of the University of Colorado has one of the most advanced systems in the world functioning between Mt. Evans and Boulder, Colorado.

MACRO CLIMATE: AKRON, COLORADO

The long-term (1908-1968) climate averages and historical weather extremes are given in Tables 1 and 2. The climate of Akron, Colorado, as in all of the Central Plains, is distinctly semiarid. Semiarid climates are characterized by low erratic precipitation, large extremes in temperature, high average wind velocity, and high evaporation rates. A total of 17% of the world's land surface is semiarid and represents one of the last frontiers where the physical expansion of food production and population is possible.

The average annual precipitation at the station is now 16.65 inches which is down somewhat from the 1908-1950 average of 17.25 inches. The long-term air temperatures appear to be gradually warming during the winter season, as evidenced by a consistent +0.5° F shift per 10 years since 1920. The day degree data show that the climate of Akron is not quite warm enough to mature grain sorghum on a consistent basis. Nevertheless, the temperatures are nearly ideal for most small grains including millet.

One use of long-term weather data is shown in Figure 1. We have taken 55 years of mean daily air temperatures and daily wind velocities and determined the influence of these two factors with the loss of water by evaporation from a free surface. Evaporation constitutes the largest single loss of water in semiarid areas. Thus, certain conservation practices such as stubble mulch which would reduce soil surface temperatures and wind speed would be expected to reduce the evaporation of newly arrived rainfall. Research has shown this to be true.

Many people in the Akron area believe that average wind velocities in Washington County are unusually high. Quite the contrary, the average wind velocity at Akron is one of the lowest of any location anywhere in the North American Plains. And also contrary to people's beliefs,

¹ Research Soil Scientist, Northern Plains Branch, Soil and Water Conservation Research Division, Agricultural Research Service, USDA, in cooperation with the Colorado Agricultural Experiment Station.

the prevailing ground level winds are about equal in duration and velocity from the southerly direction as from the north. Most people assume that the northerly direction dominates.

MICRO CLIMATE

In recent years there has been intense interest in characterizing micro climate as related to crop growth and well-being. Micro climate are those climatic conditions that may exist in a small confined areas - such as the ground level position between two rows of sorghum which would modify wind velocity, air temperature, and gas exchange as compared to an open area. The same could be said in regard to a south versus a north slope of a large hill or a small lister furrow. The study of micro climate is a highly specialized field involving expensive sophisticated instrumentation. For instance, in August 1967 a team of nine soil

physicists spent three weeks at the U. S. Central Great Plains Field Station taking 19 different micro climate measurements with a series of equipment and instruments valued at approximately \$40,000. The information gathered by this team was one of the most comprehensive ever taken.

SUMMARY

A harmonious integration of water, energy and nutrients is necessary for optimum plant growth. These factors are best obtained by gathering critical information by systematic recording and interpretation of both the macro and micro climatic conditions that exist under natural field environments.

The station staff has assembled all of the weather data from 1908 to 1969 into a series of 11 different weather information categories for public distribution and use. These can be obtained at the station business office.

Table 1 - Climatic Data, 1969 and long-term average. U. S. Central Great Plains Field Station, Akron Colorado, elevation 4538 ft.

Month	Precipitation		Mean Temp.		Day Degrees *		Wind Velocity		Evaporation	
	1969	1908-1968	1969	1908-1968	1969	1931-1969	1969	1911-1926 1958-1968	1969	1911-1968
	— Inches —		°F				MPH		— Inches —	
Jan.	.37	.30	28.8	25.2			6.0	6.4		
Feb.	.27	.35	32.9	29.3			6.6	6.6		
Mar.	.15	.72	30.1	35.5	38	87	7.1	7.6		
Apr.	.62	1.76	50.6	46.4	326	257	8.8	8.4	4.9	4.7
May	4.14	2.94	59.3	56.4	589	520	6.2	7.7	5.1	6.5
June	1.79	2.59	62.7	66.7	672	801	6.4	6.6	6.2	7.9
July	2.83	2.68	74.5	73.3	1071	1055	5.4	5.8	7.5	9.2
Aug.	.35	2.08	74.3	71.7	1066	992	6.1	5.5	7.9	8.2
Sept.	.72	1.35	65.7	62.1	782	683	6.0	5.9	5.5	6.3
Oct.	2.63**	.95	40.7	50.4	218	376	6.5	6.1	1.6	3.6
Nov.	.37	.50	39.0	37.0	82	79	6.0	5.9		
Dec.	.28	.43	32.0	27.5			5.4	6.3		
Totals	14.52	16.65			4844	4850			38.7	46.4
Means			49.2	48.5			6.4	6.6		

* From daily mean temperatures above 40° F.

** Measurements by core sampling of snow = 4.03 inches precipitation.

1969 Frost free period - Apr. 29 to Oct. 5 = 159 days
Long term ave. = 145 days

Table 2 - Weather Extremes, Central Great Plains Field Station, Akron, Colorado. 1908-1969.

Month Recorded	Wettest Month		Driest Month		Max. Single Storm		Mean Warmest Month		Mean Coldest Month		Warmest Day		Coldest Day		High Day		Low Day		High Evap.		Low Evap.		Mean High Wind		Mean Low Wind	
	Inches	Month	Inches	Month	Inches	Month	OF	OF	OF	OF	OF	Day	Day	OF	Day	Degrees ^a	Degrees ^a	Day	Day	Inches	Inches	MPH	MPH	MPH	MPH	
January	1.43		.00		1.20	8	35	72	8	-29	307	72	-29										8.2	4.8		4.8
February	1.68		.00		1.05	18	38	78	18	-28		78	-28										8.2	4.9		4.9
March	3.06		.00		1.38	20	48	86	20	-22	396	86	-22										9.7	5.6		5.6
April	5.19		.17		2.50	36	53	95	36	-4	794	95	-4										10.4	6.8		6.8
May	7.79		.47		3.49	50	65	97	50	20	1011	97	20										9.7	5.9		5.9
June	6.84		.19		3.15	59	75	105	59	30	1238	105	30										8.1	5.4		5.4
July	7.22		.31		3.78	63	80	107	63	40	1139	107	40										7.3	4.4		4.4
August	7.36		.25		3.56	65	77	105	65	39	822	105	39										8.1	4.3		4.3
September	4.83		.02		3.14	54	67	100	54	16	578	100	16										7.0	4.4		4.4
October	3.30		.00		1.78	43	59	93	43	-5	187	93	-5										9.4	4.4		4.4
November	2.37		.00		1.25	24	45	85	24	-13		85	-13										7.9	4.7		4.7
December	3.27		.00		1.64	18	36	72	18	-24		72	-24										8.5	4.6		4.6

a - Based on accumulated day degrees above 40° F per day.

