

U. S. DEPARTMENT OF AGRICULTURE
WEATHER BUREAU AND
BUREAU OF AGRICULTURAL ECONOMICS

In Co-operation with the

Iowa Weather and Crop Bureau

LETTER OF TRANSMITTAL

Dear Sir: I have the honor to acknowledge the receipt of your letter of the 10th inst. and to advise you that the enclosed report of the Iowa Weather and Crop Bureau for the year 1928 is being prepared for publication in the Year Book of Agriculture, 1929.

Annual Report for 1928

Reprint Part XVII of the Twenty-ninth Annual Iowa
Year Book of Agriculture

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Published by
THE STATE OF IOWA
Des Moines

HISTORICAL

The Iowa Weather and Crop Service was established by an Act passed by the Twenty-third General Assembly, and approved by the Governor April 25, 1890. On July 1, 1923, it became a bureau of the State Department of Agriculture by act of the 40th General Assembly.

The object of the Service is to co-operate with Government Bureaus in collecting crop statistics and meteorological data, and more widely disseminate weather forecasts and storms and frost warnings for the producers and shippers of perishable products, and to promote general knowledge of meteorological science and the climatology of the State.

In accordance with the Act, on the recommendation of the directors of the State Agricultural Society, J. R. Sage was duly commissioned as director by Governor Boies on June 3, 1890, and General Greeley, then Chief Signal Officer, U. S. Army detailed Dr. George M. Chappel to serve as assistant director of the State Service. Mr. J. R. Sage resigned as director December 31, 1907, and Dr. George M. Chappel was commissioned on January 1, 1908, as director, and served in that capacity until March 31, 1918, when he resigned and was succeeded by Charles D. Reed. Toward the close of the year, 1919, co-operation in estimating acreage and production of crops was begun with the U. S. Bureau of Markets and Crop Estimates now known as the U. S. Bureau of Agricultural Economics, of which Mr. Leslie M. Carl is Agricultural Statistician for Iowa.

OFFICE FORCE DECEMBER 31, 1928

Charles D. Reed, M. Sc. Agr., Senior Meteorologist and Director.
J. Earl Cook, Statistician.

Hildur Renner, Stenographer.

Mildred T. Cannon, Stenographer.

CO-OPERATING ORGANIZATIONS

U. S. Weather Bureau

Fred L. Disterdick, Assistant Meteorologist.

Fred Cone, Observer.

Warren J. Rice, Assistant Observer.

John H. Aldrich, Minor Observer.

U. S. Bureau of Agricultural Economics

Division of Crop and Live Stock Estimates

Leslie M. Carl, Agricultural Statistician for Iowa.

Alfred C. Brittain, Assistant Agricultural Statistician.

Mildred S. Baldrige, Junior Clerk.

Gwen Sayler, Clerk.

ANNUAL REPORT, 1928

For convenient reference and comparison with past and future years, this report contains summaries of the weekly, monthly and annual bulletins of the Weather and Crop Bureau of the Iowa Department of Agriculture, in cooperation with the Weather Bureau and the Bureau of Agricultural Economics both of the United States Department of Agriculture, for the year 1928. Parts XVII, XVIII and XIX of the Year Book were prepared by the Weather and Crop Bureau as usual. Part XVIII, presenting in extensive tables and maps the agricultural statistics of 1928, gathered by assessors under the direction of the Weather and Crop Bureau will be published in the "Iowa Monthly Crop Report" for June, 1929. Part XIX of the Year Book, summarizing the statistics of the main crops of Iowa for all years of record, is revised and brought up to date.

Crop acreages within the counties are rather stable. There is no great need for county estimates in advance of the returns from assessors, so advance county estimates will be abandoned till further need arises. Live stock estimates by counties as of date of January 1, 1929, will be published in the "Iowa Monthly Crop Report" of July, 1929. These are based largely upon the live stock reported to the county auditors for taxation which will not become available in time to publish in the 1928 Year Book. Live stock marketed from Iowa and live stock shipped into Iowa during the year, 1928, published in the "Iowa Monthly Crop Report" for January, 1929, appear elsewhere in the 1928 Year Book.

WEALTH PRODUCED ON IOWA FARMS

After our Annual Report of 1927 was published it was learned that the statement made by the Agricultural Economics Section of Iowa State College, covered only gross sales of crops and live stock from Iowa farms, with no attempt to deduct live stock and feeds purchased from outside the State, and no allowance made for changes in inventory. There is probably no other single thing connected with our statistical work for which there is so much demand as for a complete, comparable and conservative statement of the annual production of wealth by Iowa farms, nor is there anything more difficult to prepare. Drawing from all Government statistics bearing on the case, and from daily market reports and other commercial sources of information, a statement is prepared

which appears each year in the front of the Iowa Year Book of Agriculture. In the live stock items our statement is open to the objection that they, or the crops they have eaten, are largely produced in the preceding year, or even more remotely, and that we are combining these with crops of the year under consideration sold off from farms, and part of the sales of these have not actually taken place but must be estimated at the time the statement is prepared. Also the live stock inventory is wholly a matter of estimate, for after many years of unsuccessful effort to obtain a dependable annual enumeration of live stock, the project was abandoned.

WEATHER FORECASTS AND WARNINGS

Weather forecasts were distributed daily by newspapers and eight radio stations in or near Iowa. No other state has such a wide distribution of forecasts by radio broadcasting stations and probably no other state has so many receiving sets in rural homes—about one for each third farm. The action of the Federal Radio Commission in taking station WOI off the air at night, and causing stations W O C and W H O to divide time at night, has greatly impaired the distribution of forecasts.

CLIMATE AND CROP WORK

The usual weekly and monthly weather and crop bulletins were prepared and published. Reports of cooperative observers were grouped into nine nearly equal areas or districts, comprising 11 or 12 counties each, as follows: Northwest, north-central, northeast, west-central, central, east-central, southwest, south-central and southeast. This corresponds with the district arrangement that has been in use for some time in crop reporting work.

In the annual summary of Climatological Data a new form of graph was published showing the average accumulated departure of temperature from the normal, and another graph showing the excess or deficiency of precipitation accumulated by monthly units. These graphs appear elsewhere in this report. It is intended to continue this each year. A similar graph for the Des Moines station has been published for several years. In this graph the accumulation is by daily units, which is not feasible with state averages.

CLIMATOLOGY OF THE YEAR

The mean temperature of the year 1928 for the State of Iowa as a whole, was 49.4°, or 1.4° above normal. Most of the excess in temperature accumulated in the colder months of the year, while the deficiencies were mostly in the warmer months, particularly April, June and September. (See Fig. 1.) The absence of extremes made the temperatures of the year generally pleasant. The mean temperature of the crop season, May to September inclusive, was 66.8°, which is 0.8° warmer than in 1927, and nearly 1.0° below the normal. The average length of the growing season for the State between the average dates of killing frosts, May 5 to September 25, was about 145 days, and about 10 days less than normal. Ninety per cent of the corn crop escaped frost damage.

AVERAGE TEMPERATURE DEPARTURE
State of Iowa, Year, 1928

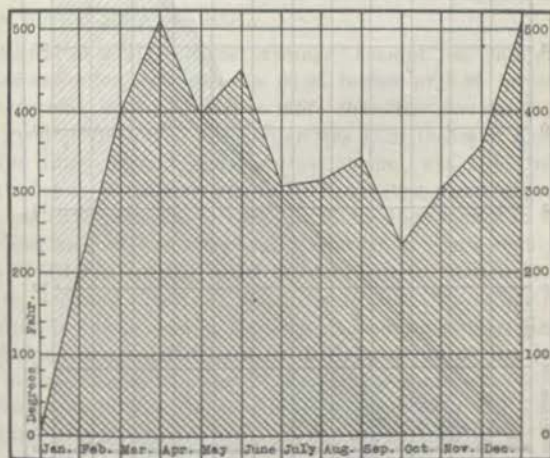


Figure 1.—Line bounding shaded area shows accumulated departure of temperature from normal. Upward slope means temperature above normal; downward, below.

Precipitation averaged 35.96 inches or 3.85 inches above the recently revised normal. A relatively dry April and May were favorable for planting, but a steadily accumulating excess of precipitation during June, July and August, made haying and harvest difficult, and except for deficiencies in September and December the excess in precipitation continued to accumulate so that at the end of the year the total precipitation was the greatest for the State

as a whole since 1919. (See Fig. 2.) Two notable snowstorms, April 5-6 and November 29-30, were mostly responsible for very large annual totals in the southwest portion of the State. The greatest total snowfall of the year, 51 inches, was at Atlantic. The rather heavy rains of the crop season mostly fell at night, so there was more than the normal sunshine, except in June. There were many small, local hailstorms and tornadoes. The hail damage was about 50 per cent greater than 1927.

AVERAGE PRECIPITATION
State of Iowa, Year, 1928

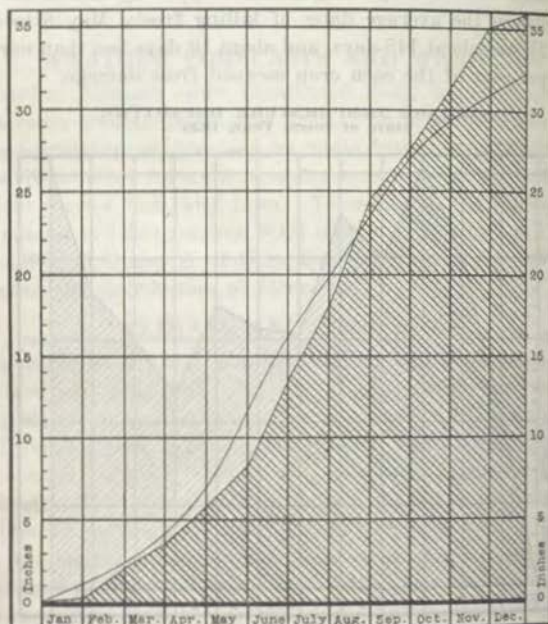


Figure 2.—Line bounding shaded area shows accumulated depth of precipitation in inches. Smooth curve shows normal.

Crop production was generally good, though winter wheat was badly winter killed and spring grains got off to a poor start. The yield of corn per acre was slightly above the average, and because of the large acreage, the total crop ranks as the second largest. Rainy or snowy weather between maturity and husking made corn husking difficult. Fields were too soft to haul husking machines and loads through them. The quality of the crop was

generally good. Conditions were favorable for fall seeding; wheat, grasses and clover made good progress, and pastures were excellent.

BAROMETER: (Reduced to sea level.) The average pressure of the atmosphere for the year was 30.02 inches. The highest pressure was 30.83 at Sioux City on January 2. The lowest pressure was 29.27 inches at Sioux City on June 12. The range for the State was 1.56 inches.

TEMPERATURE: The mean temperature for the State was 49.4° or 1.4° above normal. The highest annual mean was 53.1° at Keokuk in Lee county. The lowest annual mean was 45.4° near Postville in Clayton county. The highest temperature reported was 100° near Inwood in Lyon county on August 1. The lowest temperature reported was -20° at Forest City in Winnebago county and at Sanborn in O'Brien county, on January 2. The range for the State was 120°.

PRECIPITATION: The average amount of rainfall and melted snow for the year was 35.96 inches, or 3.85 inches more than normal, and 6.61 inches more than the average for 1927. The greatest amount at any station was 47.81 inches at Keosauqua in Van Buren county and the least amount was 24.67 inches at Sioux City in Woodbury county. The greatest monthly precipitation was 12.80 inches at Decorah in Winneshiek county in August. The least amount was a trace at Hawarden in Sioux county, Sanborn in O'Brien county, Ames in Story county, Harlan in Shelby county, Rockwell City in Calhoun county, Sac City in Sac county, Chariton in Lucas county, Earlham in Madison county, Knoxville in Marion county and Thurman in Fremont county in January. The greatest amount in any 24 consecutive hours was 5.70 inches at Keosauqua in Van Buren county, on September 11th and 12th. Measurable precipitation occurred on an average of 88 days, 6 days less than in 1927 and 3 days more than normal.

SNOWFALL: The average amount of snowfall was 22.5 inches. The greatest amount reported from any station was 51.1 inches at Atlantic in Cass county, and the least amount was 7.0 inches at Chariton in Lucas county. The greatest monthly snowfall was 22.5 inches at Earlham in Madison county in November.

WIND: The prevailing direction of the wind was from the northwest. The highest velocity reported was 48 miles per hour

from the northwest at Sioux City in Woodbury county, on April 18.

SUNSHINE AND CLOUDINESS: The average number of clear days was 180; partly cloudy, 89; cloudy, 97; as against 160 clear; 92 partly cloudy and 113 cloudy days in 1927. The average percentage of the possible amount of sunshine was 62 per cent, or about 3 per cent more than the normal.

MONTHLY SUMMARIES JANUARY

Mild winter weather prevailed during most of January. The first few days were the coldest of the month and zero weather was general throughout the State with the lowest temperature occurring on the 2d at most stations. From the 5th to the 19th, inclusive, a remarkable period of mild weather prevailed and during the entire period the temperature was considerably above normal. The daily excess was 20°, or more, above normal from seven days along the Missouri River to three days along the Mississippi, and along the Missouri it amounted to 30 degrees on the 18th and 12th. Unusually high maxima occurred from the 9th to 14th and while the State record for January was not broken, the record for several stations was. At Des Moines the record was exceeded by nearly two degrees. From the 20th till the end of the month the temperature averaged nearly normal, being somewhat below normal over the eastern half of the State and somewhat above over the western half. Zero weather occurred during this period over all portions of the State, the number of days ranging from seven in Emmet county to a single day in most of the southern portion.

The weather was favorable for all outdoor work. Plowing was possible and was reported from the southern portion of the State; some corn still in the fields was husked and stock needed very little protection and could get much of their forage from the open fields. Building operations were interrupted very little and at the end of the month ice harvest was generally completed though there was still a small amount being put up at a few places but the warm weather has reduced the thickness somewhat. The weather was not favorable for winter wheat and grasses, as most of the State was dry and had very little snow protection. In the wheat growing area there was practically no snow and there was damage from alternate freezing and thawing. The extreme dryness caused the surface soil of plowed ground to become dusty and whenever a moderately windy day occurred dust storms developed causing the soil to drift and much was blown from the roots of wheat. Water was scarce in many places and the soil was showing large cracks. Roads were the best ever known at this season of the year.

Temperature. The mean temperature of the State, derived from the means of nine districts of nearly equal area and based on records of 100 stations, was 25.2° or 8.6° above normal. Temperature departures were greatest in the western half of the State. In Audubon County the departure was more than 9°, and in Buena Vista, Carroll, Cherokee, Dallas,

Emmet, Hancock, Story, Warren and Woodbury Counties 8°, or more above normal. Along the Mississippi River and in Ringgold County the excess was less than 5°, the least being 3.6° in Des Moines County. The highest mean was 29.5°, at Keokuk, and the lowest was 19.8° at Lake Park. The absolute range for the State was 90°, from 70°, at Little Sioux on the 10th, to -20° at Forest City and Sanborn on the 2d. The average number of days with the minimum temperature, 32° or lower was 29; minimum zero or lower, 5; maximum, 32° or lower, 11.

Precipitation. The average precipitation for the State, derived from the averages of nine divisions of nearly equal area and from the records of 111 stations, was 0.17 inch, or 0.90 inch below normal. This is the least of record for Iowa in 56 Januaries. The east-central district had the largest average, 0.35 inch; and the west-central and the south-central districts had the smallest, 0.06 inch. The largest amount at a single station was 1.04 at Olin, and the smallest, a trace at ten stations. The greatest amount falling in 24 consecutive hours was 0.80 inch at Olin on the 19th. Rainy days (with 0.01 inch or more of precipitation) averaged three, or two less than usual, but not the least of record for the State. They were most frequent in the northeast, north-central and east-central districts, and least in the northwest, west-central, southwest and south-central districts.

Snowfall. The average snowfall for the State was 0.9 inch, or 5.8 inches less than the normal. This is the least January snowfall and also the least amount ever recorded in any winter month of record. The least previous average was 1.5 inches in 1899. The largest average was 2.1 inches in the east-central division and the least average was a trace

PRESSURE, RELATIVE HUMIDITY, WIND AND SUNSHINE

Stations	Barometric Pressure, Inches (Sea Level)				Relative Humidity, %		Wind				Sun- shine Departure from normal			
	Mean	Highest	Date	Lowest	Date	Mean	Total movement	Average hourly velocity				° possible Temperature from normal		
								Miles	Frost	Days				
Charles City	30.10	30.70	11	29.40	19	88.70	71	46	5,061	6.8	20	SW	19	62 + 13
Davenport	30.13	30.60	20	29.25	19	85.60	75	25	5,138	7.0	30	SW	19	64 + 17
Des Moines	30.13	30.76	20	29.44	14	78.50	64	31	5,000	6.8	27	SW	19	64 + 9
Dubuque	30.30	30.68	20	29.20	19	86.00	76	39	4,464	6.5	25	SW	20	59 + 10
Keokuk	30.16	30.74	20	29.43	19	75.30	60	39	5,331	8.0	30	SW	19	60 + 10
Noxix City	30.18	30.82	20	29.42	18	84.60	70	23	7,514	16.5	42	SW	19	62 + 31
Osaka, Neb.	30.16	30.50	20	29.44	14	77.64	67	29	5,696	7.4	21	SW	19	67 + 11
Means and extremes	30.13	30.83	20	29.27	19	82.07	71	30	5,760	7.0	28	SW	19	60 + 13
Normals and records	30.14	30.84	20	29.45	19	79	19	30	5,000	7.0	30	SW	19	61
	321.00	1905	185.71	1906	1906	833	1909	1909	5.0	27	20	SW	1900	

¹Local mean time. ²And other dates. ³Sioux City. ⁴Dubuque.
⁵January 1, 1925. 3-cup anemometers replaced the 4-cup instruments used since the establishment of the Weather Bureau stations. The new instruments will more accurately indicate the true wind movement. The records of the 4-cup instruments were somewhat too high at moderate velocities and considerably too high at the higher velocities. Tables of true velocities corresponding to indicated velocities appear below.

in the west-central and south-central districts. A large portion of the State was bare the entire month.

Miscellaneous Phenomena. Auroras: 1st, 20th, 26th, 27th. Fog: 8th, 9th, 12th, 16th, 17th, 18th, 19th, 23d. Halos (lunar and solar): 1st, 2d, 3d, 6th, 7th, 8th, 9th, 26th, 27th, 28th. Sleet: 1st, 14th, 15th, 16th, 18th, 19th, 24th, 28th. Thunderstorms (1 station): 18th.

Rivers. The Mississippi River averaged somewhat above the normal for January with considerable fluctuation but no important changes. There was a falling tendency during most of the first half of the month and rising thereafter. On the Missouri River moderate stages prevailed. Falling stages prevailed most of the first half of the month and rising stages the last. On interior rivers low and nearly stationary stages prevailed. The ice on all rivers was still intact at the end of the month with the thickness somewhat reduced but it had not commenced to get soft.

TABLE 1—TRUE WIND VELOCITIES

Correct or true velocities in miles an hour corresponding to velocities indicated by the 4-cup anemometer.

Indicated velocity	0	1	2	3	4	5	6	7	8	9
0			2.2	3.2	4.2	5.1	6.0	6.9	7.8	8.4
10	9.3	10.2	11.2	12.0	12.8	13.5	14.3	15.0	15.7	16.5
20	17.3	18.1	18.9	19.7	20.5	21.3	22.0	22.7	23.4	24.1
30	24.9	25.7	26.4	27.2	28.0	28.7	29.4	30.2	30.9	31.3
40	32.3	33.1	33.8	34.5	35.2	36.0	36.8	37.5	38.2	38.9
50	39.7	40.5	41.3	42.0	42.7	43.4	44.1	44.9	45.6	46.3
60	47.0	47.8	48.6	49.2	50.0	50.7	51.5	52.2	52.9	53.7
70	54.4	55.1	55.8	56.5	57.2	58.0	58.7	59.4	60.1	60.8
80	61.7	62.4	63.1	63.8	64.5	65.3	66.1	66.9	67.6	68.3
90	69.1	69.8	70.5	71.3	72.1	72.9	73.6	74.3	75.0	75.7
100	76.5	77.2	78.0	78.7	79.4	80.2	80.9	81.6	82.3	83.1
110	83.8	84.5	85.2	85.9	86.7	87.5	88.3	89.0	89.7	90.5
120	91.3	92.0	92.7	93.5	94.2	95.0	95.8	96.4	97.1	97.8
130	98.7	99.5	100.2	101.0	101.8	102.6	103.3	104.0	104.7	105.4
140	106.2	107.0	107.8	108.6	109.3	110.1	110.8	111.5	112.3	113.0
150	113.8	114.5	115.2	115.9	116.6	117.4	118.2	119.0	119.7	120.5
160	121.3	122.0	122.7	123.4	124.1	124.8	125.5	126.3	127.1	127.8
170	128.5	129.2	129.9	130.7	131.5	132.3	133.0	133.8	134.5	135.3
180	135.9	136.6	137.3	138.1	138.9	139.6	140.3	141.1	141.8	142.5

TABLE 2—TRUE WIND VELOCITIES

Correct or true velocities in miles an hour corresponding to velocities indicated by the standard 3-cup anemometer.

Indicated velocity	0	1	2	3	4	5	6	7	8	9
0			2.2	3.1	4.1	5.1	6.1	7.1	8.0	8.9
10	10.0	11.0	11.9	12.9	13.8	14.8	15.8	16.7	17.7	18.6
20	19.6	20.6	21.5	22.4	23.4	24.3	25.3	26.2	27.2	28.1
30	29.1	30.0	31.0	31.9	32.9	33.8	34.8	35.7	36.7	37.6
40	38.6	39.5	40.5	41.4	42.4	43.3	44.3	45.2	46.3	47.1
50	48.1	49.0	50.0	50.9	51.9	52.8	53.8	54.7	55.6	56.6
60	57.6	58.5	59.4	60.4	61.3	62.3	63.2	64.2	65.2	66.1
70	67.1	68.0	68.9	69.9	70.8	71.8	72.7	73.7	74.6	75.5
80	76.5	77.5	78.4	79.4	80.3	81.3	82.2	83.2	84.1	85.1
90	86.0	87.0	87.9	88.9	89.8	90.8	91.7	92.7	93.6	94.4
100	95.5	96.5	97.4	98.4	99.3	100.2	101.2	102.2	103.1	104.0
110	105.0	106.0	106.9	107.8	108.8	109.8	110.7	111.6	112.6	113.5
120	114.5	115.4	116.4	117.3	118.3	119.2	120.2	121.1	122.1	123.0
130	124.0	124.9	125.9	126.8	127.8	128.7	129.7	130.6	131.6	132.5
140	133.5									

REARRANGEMENT OF DATA

There has been a well defined change in the location of observing stations in Iowa. Most of the early records were in the more populous eastern counties, but in recent years it has been difficult to maintain cooperative observing stations in the eastern counties, while in the western counties the Weather Bureau has been unable to furnish equipment for the large number of persons who desired to cooperate in the observation work.

The Bureau has been more liberal with rain gauges than with temperature equipment for it is almost impossible to have too many rainfall records. Some of the earlier directors of the Iowa weather service advocated a rainfall record in every township. Observing stations, particularly rainfall stations, have become more numerous per unit area in the western than the eastern portions of the State. This has had a tendency to destroy the comparability of the older State means with the later State means, especially in precipitation, which decreases appreciably from east to west.

To correct these difficulties the State will hereafter be separated into nine nearly equal areas, called districts to distinguish them from the former separation into three divisions, north, central and south. The new districts will be (1) northwest, (2) north-central, (3) northeast, (4) west-central, (5) central, (6) east-central, (7) southwest, (8) south-central, and (9) southeast. This follows the districting system of the crop reporting service which will make it easier to compare crop and weather statistics. It will tend to prevent faulty distribution of stations from seriously influencing the State means.

This necessitated a rearrangement of normals and while this was being done, normals were prepared for several short record stations at which all available records were considered in connection with the normal maps. In the case of the temperature records this placed the short record stations on a basis of the uniform 46-year normals and the new precipitation normals are believed to be equivalent to those derived from 30 or more years of record. New precipitation normals for the first order Weather Bureau stations, based on the 50-year period ending with December 31, 1927, became effective January 1, 1928.

For the State, the normal annual precipitation is thus reduced from 36.22 inches to 30.11 inches. Part of this is due to the influence of the series of dry years since 1920, when the previous precipitation normal period ended.

FEBRUARY

For the fifth consecutive year the weather during February was mild and for the third consecutive winter December was rather cold and January and February were considerably warmer than normal. Except for a small area in the extreme eastern portion of the State, where the temperature was slightly below normal on the 1st, the first sixteen days were continuously above normal and also the last four days; from the 17th till the 25th there were numerous fluctuations in temperature with cold weather predominating and on the 18th and 25th zero weather was general over most of the State. As has been the rule for several months the

western half of the State averaged colder than the eastern though the departures were more uniform than before.

The dry condition that was universal over the State throughout January was relieved by a general period of precipitation extending from the 4th till the 8th. The precipitation was principally rain and was of great value in relieving a water shortage in many parts of the State as well as supplying much needed moisture to the soil which had become very dry and had drifted considerably. This storm developed into a glaze storm over a large area in the northwest portion and injured or destroyed a large number of fruit and shade trees and damaged telephone, telegraph and electric wires. There was also some sleet or glaze in some part of the State accompanying nearly every period of precipitation but about the only effect was to make traveling temporarily difficult. The snow storm of the 13th-14th and 17th-18th was accompanied by considerable wind and drifted considerably but travel was interrupted for only short periods. The mild weather was favorable for most outdoor work but on account of the soft condition of the soil there was very little farm work performed, though there was much of the State where the soil was free from frost, and about the only work done in the fields was the removal of corn stocks where it was possible. The weather was favorable for wintering stock and the general condition was good. Hog "flu" which had been troublesome earlier in the winter has almost disappeared.

There was very little of the State covered with snow for any length of time and it is likely that winter wheat and grasses have been damaged by the lack of snow as well as some damage from glaze. After the first rain began roads became bad and during the rest of the month travel on dirt roads was almost impossible most of the time.

Temperature. The mean temperature for the State, derived from the means of nine districts of nearly equal area and based on the records of 99 stations, was 23.6°, or 6.0° above normal. The departures were quite uniform though the northeastern, east-central and north-central divisions reported the greatest excess. The highest mean was 34.2°, at Keokuk, and the lowest was 22.6°, at Inwood. The absolute range for the State was 79°, from 65° at Bonaparte on the 3d, to -14° at Postville on the 15th. The average number of days with the minimum temperature 32°, or lower, was 27; minimum zero or lower, 2; maximum 32, or lower, 8.

Precipitation. The average precipitation for the State, derived from the averages of nine divisions of nearly equal area and from the records of 109 stations, was 1.95 inches, or 0.75 inch above normal. Only five times during the last 55 years has a greater average occurred in February. The greatest average and also the greatest excess occurred in the central division. The greatest amount at a single station was 3.97 inches at Lacona, and the least was 0.62 inch at West Bend. The greatest amount occurring in 24 consecutive hours was 1.57 inches at Riverton on the 6th.

Snowfall. The average snowfall for the State was 4.4 inches, the same as last February, or 2.6 inches less than normal. The greatest average was 8.1 inches in the west-central division, and the least, 2.3 inches in the south-central and southeastern divisions. The greatest amount re-

ported was 13.5 inches at Audubon and the least a trace at Creston. Six stations reported 10.0 inches, or more, and seven reported 1.0 inch or less.

Miscellaneous Phenomena. Aurora: 24th. Fog: 3d, 4th, 5th, 6th, 7th, 13th, 14th, 22d. Hail: 22d. Halos (lunar and solar): 1st, 2d, 3d, 5th, 11th, 15th, 17th, 28th, 29th. Haze: 3d. Parhelia: 2d, 3d. Sleet: 2d, 5th, 6th, 7th, 8th, 13th, 21st, 22d, 23d, 24th. Thunderstorms: 4th, 6th, 7th, 21st, 22d.

Rivers. There was considerable fluctuation on the Mississippi. Due to the heavy rains of the 6th-7th, there was a rise, within three days, of from three or four feet; the other fluctuations were due mainly to changing ice conditions. The mean stage was above the average and at Dubuque it averaged the highest for February in the history of the station. Ice conditions changed during the month with floating ice general from the 12th to 20th but it was frozen from the 21st till the end of the month though there were numerous open spaces. The heavy rains of the 6th-7th also caused a marked rise on the Missouri river immediately following the rains; thereafter there was a gradually falling tendency except there was a marked rise in the lower course on the 25th. The interior rivers fluctuated considerably but no damaging stages developed. Ice gorges caused some local overflows but there was very little damage from the movements of gorges.

THE WINTER OF 1927-1928

The mean temperature for the three winter months was 24.2°; which is 2.4° higher than the normal for the State and 0.5° lower than the mean of 1926-1927. The winter was similar to the two previous winters in that December has been consistently cold and January and February have been considerably warmer than normal. The highest temperature was 70° at Little Sioux on January 10th, and the lowest was -22° at Sanborn on December 8th.

PRESSURE, RELATIVE HUMIDITY, WIND AND SUNSHINE

Stations	Barometric Pressure, Inches (Sea Level)				Relative Humidity, %			Wind			Sun- shine				
	Mean	Highest	Date	Lowest	Date	Mean		Total movement	Average hourly velocity	Maximum					
						7 A. M. 12 Noon	7 P. M.			Miles		From	Date		
Charles City.....	30.19	30.54	25	29.66	22	89.69	77	45	19	4,980	7.5	sw	19	61	+ 8
Davenport.....	30.10	30.55	25	29.56	14	84.69	74	38	3	5,218	7.5	sw	19	57	+ 12
Des Moines.....	30.06	30.54	25	29.57	7	80.62	67	32	2	4,792	6.5	sw	19	61	+ 5
Dubuque.....	30.09	30.52	25	29.58	14	80.64	74	36	31	4,721	6.8	sw	19	55	+ 0
Keokuk.....	30.14	30.56	26	29.65	8	74.59	65	32	26	5,474	7.3	sw	19	57	+ 9
Sioux City.....	30.14	30.56	26	29.65	22	86.69	72	38	36	7,722	11.1	sw	19	67	+ 10
Omaha, Neb.....	30.13	30.56	26	29.65	22	74.64	67	37	12	6,107	6.8	sw	23	62	+ 4
Means and extremes.....	30.11	30.59	26	29.56	14	82.64	71	32	21	8.0	8.0	sw	19	58	+ 3
Normals and records.....	30.10	31.1	28.8	28.8	64	76	293	115	1880	8.6	sw	1917	4th	55	.....
		31.07	1918	28.69	109						8.6	sw	1917		

!Sioux City. *Davenport. †Des Moines. ‡Local Mean time. †And other dates. †;See footnote under similar table at end of January.

The average monthly precipitation for the State was 1.05 inches and the average total was 3.16 inches, or 0.25 inch less than the normal. December and January were below normal, December being only slightly below but January was the driest of record. The average snowfall was 9.7 inches or 10.0 inches less than normal.

The average number of days with 0.01 inch or more of precipitation was 15, or 2 more than the winter of 1926-1927. The average number of clear days was 43, partly cloudy 21, and cloudy 27, as compared with 37 clear days, 21 partly cloudy and 32 cloudy days during the winter of 1926-1927.

AN UNUSUAL OPTICAL PHENOMENON

A very complex solar halo was observed by a number of Cooperative Observers on February 2d and a number of descriptions were received in detail. A complete description accompanied by a drawing was furnished by Mr. D. E. Hadden, Cooperative Observer at Alta, Iowa, and the sketch and article was referred to the Chief of the Weather Bureau who made the following comment:

"I note that the various halos (counting the several distinct displays) sketched are: The 22° halo; the upper tangent arc, with extensions; the 46° halo; the parhelic circle; two parhelia; two parantelia; one infralateral tangent arc.

"Although each of these several phenomena is well known, and its cause fully understood, the display as a whole was a very unusual one, at least for our latitudes, and I thank you again for kindly bringing it to my attention."

MARCH

The temperature during March, 1928, was much above normal, being similar in that respect to the two preceding months, but the excess was less than either. The month began with a mild period of three days followed by a decided change to cooler which lasted two days, but in this brief period, on the 5th, the lowest temperature for the month occurred throughout the State. The longest period of mild weather prevailed from the 6th to 14th, but the 23d was the warmest day during the next longest warm period 20th-25th. A number of stations in the northwest portion had the highest temperature of record but the record for the State was not equalled, though it has been 18 years since a higher maximum occurred in March.

The mild weather permitted much out door work. Plowing was possible early in the month over nearly all portions of the State and much seeding of oats was done and started very early. Freezing weather occurred almost daily and the alternate thawing injured winter wheat and grasses, in some localities, considerably. Vegetation made rapid advance; fruit buds had swelled prematurely; and in localities in the southern division trees were in full bloom and were badly injured by the freeze at the end of the month. The mild weather also induced market gardeners to make extensive plantings and the heavy precipitation at the end of the month caused some seed to rot in the ground and large plantings were up and in danger of being frozen.

Precipitation was deficient except in the northwestern and east-central districts, but it was ample for all needs in nearly all portions of the State. There were three principal periods. Very little occurred during the first week, but precipitation was general on the 8th, and until the 13th rainy weather prevailed but it was very light in most of the western half of the State; on the 26th precipitation was general and again on the 28th-29th rain or snow was general throughout the State. The snowfall was rather heavy over most of the northern division and the extreme eastern portion.

For the most part March was very pleasant. About the usual number of storms passed near the State, but except for the passage of two energetic storms along the eastern and southern edges during the last week, that were attended by disagreeable weather, the usual March characteristics were absent, and the wind movement was unusually light. A severe local hail storm occurred at Bedford on the 24th. The stones covered the ground and were about the size of walnuts and fell with such force that automobile tops were punctured, but as light wind accompanied, no windows were broken. On the 24th a severe local wind storm occurred at Charles City and vicinity. Two plate glass windows were broken and a small milk house about 5 miles northeast was demolished, the total damage being about \$750. The blow occurred at 12:15 A. M., accompanied by one peal of thunder and by a roaring sound, suggesting the possibility of it being a small tornado.

Dirt roads were in poor condition following the periods of precipitation but during most of the month they were in very good condition. Stock were in good condition; the weather was favorable for young pigs and lambs and very little loss was sustained.

Temperature. The mean temperature for the State, derived from the means of nine districts of nearly equal area and based on the records of 96 stations, was 38.9°, or 4.3° higher than the normal. The greatest departure occurred in the southwestern district and the least in the northeastern district. Dividing the State into three divisions from west to east the departure diminished uniformly there being an excess of 4.8° in the western portion, 4.3° in the central portion, and 3.8° in the eastern portion. The greatest excess at any station was 7.3° at Sioux City, and the least was 2.3° at Boone. The highest mean was 43.8° at Clarinda and Thurman, and the least was 33.6° at Postville. The average range for the State was 87°, ranging from 88° at Little Sioux and Logan on the 23d, to 1° above at Lake Park, on the 5th. The average number of days with the minimum temperature 32°, or lower, was 25; zero, or lower, none and maximum with 32°, or lower, was 1.

Precipitation. The average precipitation for the State, derived from the averages of nine districts of nearly equal area and from the records of 112 stations, was 1.44 inches, or 0.32 inch less than the normal. The east central district had the greatest average, 2.46 inches, and the southwestern district had the least, 0.77 inch. Two districts, the northwestern and east-central, reported a slight excess and all other districts were deficient. All stations in the southwestern district were below normal and all except a single station in the west-central. The greatest amount reported

from a station was 2.75 inches at Davenport, No. 2, and the least was 0.36 inch at Oakland. The greatest amount falling in 24 consecutive hours was 1.20 inches at Oelwein on the 13th. The average number of days with 0.01 inch or more of precipitation was greatest in the south-central, southeastern and east-central districts, with 7, and the least was 4 in four districts. The number of rainy days ranged from 2, at seven stations, to 10 at one station.

Snowfall. The average snowfall for the State was 3.0 inches, or 2.4 inches less than the normal. The greatest amount, 11.1 inches occurred at Davenport, No. 2; a trace occurred at 8 stations. The snowfall occurred in two principal storms; over most of the northern portion the heaviest snow occurred on the 8th-9th and over the rest of the State the heaviest fall was on the 28th-29th. As a rule the snow was moist and over most of the State it drifted very little and remained on the ground for very short periods.

Miscellaneous Phenomena. Birds, (migration of): Atlantic, Robins, 9th; Belmond, Robins, 9th; Boone, Blue Birds, 1st; Robins, 5th; Black Birds, 12th; Red Headed Wood Pecker, 15th; Flicker, Brown Creeper, 17th; Chewink, 18th; Blue Heron, Mourning Dove, 23d; Phoebe, 24th; Turkey Buzzard, 30th; Earham, Robin, 12th; Marathon, Robins, 6th; Oskaloosa, Robins, Black Birds, 10th; Postville, Robins, Blue Birds, 12th; Spencer, Robins, 11th; Washta, Robins, 7th; Blue Birds, 10th. Fog: 8th, 10th, 12th, 25th. Hail: 8th, 24th, 28th. Halos, (lunar and solar): 2d, 2d, 5th, 6th, 7th, 8th, 11th, 15th, 16th, 24th, 27th, 30th, 31st. Haze: 11th. Sleet: 8th, 9th, 26th, 28th, 29th. Tornado, (Oskaloosa): 24th. Thunderstorms: 10th, 11th, 12th, 13th, 24th, 25th, 27th, 28th, 29th, 30th.

Rivers. There was considerable ice movement on the Mississippi river during February but no general breakup. Ice began to move on March 4th but no general movement began till the 10th and floating ice ce-

PRESSURE, RELATIVE HUMIDITY, WIND AND SUNSHINE

Stations	Barometric Pressure, Inches (Sea Level)				Relative Humidity, %				Wind				Sun- shine % Departure from normal		
	Mean	Highest	Date	Lowest	Mean				Total movement	Average hourly velocity		Maximum			
					7 A. M.	12 Noon	7 P. M.	Lowest		Miles	From	Date			
Charles City.....	30.30	30.47	5	29.41	35	80	57	64	24	4,849	5.7	5.6	n.w.	34	61
Davenport.....	29.99	30.50	5	29.32	36	79	54	60	5	5,332	5.7	5.6	n.w.	34	61
Des Moines.....	29.99	30.46	5	29.33	35	78	52	56	5	5,020	5.7	5.5	n.w.	34	61
Dubuque.....	29.98	30.49	5	29.37	35	78	52	59	5	5,160	5.7	5.5	n.w.	34	61
Keokuk.....	30.09	30.51	1	29.31	36	76	49	51	5	5,211	7.7	7.7	n.w.	34	61
Sioux City.....	30.02	30.46	15	29.37	35	76	56	59	5	7,421	10.0	10.0	n.w.	34	61
Omaha, Neb.....	30.00	30.43	5	29.40	5	74	48	49	22	5,824	7.5	7.5	n.w.	34	61
Means and extremes	30.00					77	52	57		7.5			n.w.	34	61
		30.51	1	29.31	36			52	23			31	n.w.	41	
Normals and records	30.01		29th		29th	80		67		18th				30th	57
		30.82	1921	*28, 79	1924			67		* 5	1918			33	w. 1920

!Sioux City. *Des Moines. †Local mean time. ‡And other dates. ††See footnote under similar table at end of January.

tinued till the end of the third week, when navigation opened. Falling stages prevailed on the Mississippi till the middle of the second week when there was a marked rise, lasting several days. Mostly falling stages prevailed till about the 25th when another rise occurred lasting till the close of the month. On the Missouri river nearly stationary stages prevailed most of the month but a sharp rise occurred at the beginning of the 2d week and another on the 26th. There were no high stages on the interior rivers but moderate rises followed each principal precipitation period. The ice on the Raccoon river went out on the 6th, but it remained intact on the Cedar river at Charles City till the 21st.

APRIL

The mild weather that prevailed throughout most of March continued until beyond the middle of the first week of April, when a severe, slow moving storm passed near the southern and eastern borders of the state, causing general precipitation that began as rain over most of the State and changed to snow. The storm developed into one of the most damaging of its nature in recent years. Over a large portion of the State the chief damage was due to drifting snow that blocked highways and delayed most all classes of traffic, but over an area of approximately 4,000 square miles, centering around Council Bluffs, very heavy loss was sustained due to a heavy wet snow that clung to overhead wires and froze, and before the storm ended wire service in the area was completely paralyzed. In the vicinity of Council Bluffs it was reported that not a telegraph pole was left standing and after a lapse of a month all telegraph wires in that city were lying on the ground in cables. About 10,000 telephone poles were down and the larger per cent were unfit for further use; this does not include local and rural telephone lines whose loss was severe and of which no reliable estimate can be obtained. The damage to telephone and telegraph lines is estimated at \$700,000. Communication by wire was so completely demoralized that the only means, for a time, was by radio. Communication was opened between the radio stations at Des Moines and Omaha and in this manner it was possible to dispatch repair crews and material at once.

From the 5th to the 28th, temperatures were continuously below normal and freezing weather occurred almost daily with the last general killing frost of the month on the 27th. A storm of more than ordinary severity occurred on the 13th-15th, giving general precipitation and locally very heavy snow. Precipitation also occurred, 16-18th, but during the rest of the month only a few light scattered amounts occurred.

The month was decidedly unfavorable from an agricultural standpoint. The frequent severe freezes further damaged winter wheat and grasses; also early seeded oats, some fields being killed and some failed to germinate. As a result the intended acreage will be reduced. Many market gardeners lost practically all the early seeding and some of the most hardy crops failed to germinate and practically all that came up were cut down by the hard freezes. Large plantings of cabbage and Bermuda onions had been made and the loss was almost total. However the cold weather had a beneficial effect on fruit. The development during March

was rapid, but during practically all of April the buds remained dormant so that apparently no damage had been done at the end of the month.

During the last two weeks the weather was favorable for outdoor work and preparation for corn planting was progressing rapidly. During the last three days of the month dust storms developed that affected the entire State. The dust was so dense at times that the sun was entirely obscured. The soil drifted considerably in the western and central portions of the State, in places as high as two feet, and loose soil was blown from the roots of growing crops. The fine particles of drifting sand cut down a great many plants that had been set out in the fields.

Temperature. The mean temperature for the State, derived from the means of nine districts of nearly equal area and based on the records of 100 stations, was 44.3°, or 4.6° lower than the normal. The greatest deficiency occurred in the northwestern division and the least in the southwestern. The greatest deficiency at any station was 7.4° at West Bend and the least was 2.5° at Corning and Maquoketa. The highest mean was 48.7° at Burlington and Keokuk, and the lowest was 38.8° at Lake Park. The monthly range for the State was 82°, the highest temperature being 88° at Oakland on the 2d, and the lowest was 6° at Mason City on the 15th. The average number of days with the minimum temperature 32°, or lower, was 16, ranging from 21 in the northwestern division to 13 in the southwestern; the average number of days that the maximum was 32°, or lower, was less than one, the average being 1 in the north-central, northeastern and east-central divisions and less than one-half in the rest of the State.

Precipitation. The average precipitation for the State, derived from the averages of nine districts of nearly equal area and based on the records of 114 stations, was 2.24 inches, or 0.72 inch less than the normal. The southeastern division reported the greatest average, 2.90 inches, and the northwestern, 1.51 inches, the least. All divisions were below normal and all stations in the northwestern and west-central divisions. The greatest amount reported from any station was 4.37 inches at Alton, and the least was 0.22 inch at Sioux City which is the least ever recorded at that city in April. The greatest amount falling in 24 consecutive hours was 2.10 inches at Riverton, on the 6th. The average number of days with 0.01 inch or more of precipitation was greatest in east-central division, and least in the northwestern division, the number being respectively ten and five. Three stations along the Mississippi river, Dubuque, Clinton and Le Claire reported a total of 13 and seven stations in the northwestern and west-central divisions reported only three.

Snowfall. The average snowfall for the State was 4.9 inches, or 3.0 inches greater than the normal. The greatest amount reported from any station was 24.0 inches at Estherville and the least was 0.0 at Corydon; Mt. Ayr and Chariton reported traces. The snowfall occurred in two principal storms; the first on the 5th and 6th and the other on the 13th. The average for the State was greater than March or any of the winter months. The snow remained on the ground generally for only short periods but in portions of the northwestern division sleighing was good for several days following the heavy snow of the 6th.

PRESSURE, RELATIVE HUMIDITY, WIND AND SUNSHINE

Stations	Barometric Pressure, Inches (Sea Level)			Relative Humidity, %		Wind			Sunshine						
	Mean	Highest	Date	Lowest	Date	Mean	Total movement	Maximum							
								Miles		Date	% possible	Departure from normal			
Charles City	29.93	30.39	37	29.35	29	77.54	59	19	28	6.116	8.5	36	s.	4	62 + 4
Davenport	29.92	30.33	9	29.28	29	74.93	59	23	26†	6.117	8.5	28	sw	5	57 + 0
Des Moines	29.92	30.36	27	29.37	29	75.51	51	12	30	6.154	8.5	28	sw	5	57 + 0
Dubuque	29.92	30.36	27	29.34	29	74.51	59	25	94	5.645	7.8	26	nw	3	39 + 0
Keokuk	29.94	30.38	8	29.28	6	71.59	52	13	30	6.276	8.7	24	w.	14	63 + 8
Sioux City	29.95	30.43	27	29.33	29	74.48	46	16	30	9.710	12.1	48	nw.	18	58 + 4
Omaha, Neb.	29.93	30.40	27	29.40	29	66.44	41	12	30	6.785	9.4	42	n.	13	69 + 10
Means and extremes	29.93	30.43	27	29.34	29	73.50	52	12	30	.....	9.1	.....	.....	18	61 + 5
Normals and records	29.98	.....	9th	.....	30th	76	57	125	.....	.....	.....	.....	.....	25th	57
	30.78	1918	.....	28.90	1868	.....	.....	.....	.....	.....	.....	.....	.....	1862	.....

†Dubuque. *Davenport. †Sioux City. †Local mean time. †And other dates. †See footnote under similar table at end of January.

Miscellaneous Phenomena. Aurora: 14th. Dust Storms: 28th, 29th, 30th. Fog: 16th, 22d. Hail: 4th, 17th, 23d. Halos (lunar and solar): 1st, 2d, 7th, 10th, 11th, 14th, 15th, 16th, 19th, 20th, 25th, 26th, 29th. Haze: 2d, 3d. Sleet: 5th, 6th, 7th, 13th, 14th, 16th, 20th, 23d. Thunderstorms: 4th, 5th, 6th, 18th, 21st, 29th. Winds, strong: 7th, 8th, 10th, 12th, 18th, 25th, 29th, 30th.

Rivers. There was a rise on the Mississippi river during the first nine days of the month and a general falling tendency during the rest of the month though there were several slight rises. The average stage was rather high but crest stages were well below the flood stage. At Dubuque the average stage for the month was the highest in six years. Moderate stages prevailed on the Missouri river with a gradual falling tendency except for a few slight rises. On all interior rivers rather low stages prevailed with very little fluctuation.

MAY

Following an unusually cold month, temperatures above normal predominated during May. There were a great many fluctuations but the periods in which the temperature was below normal were of short duration, and the only protracted cool weather during the month occurred during the last five days. The longest period of warm weather prevailed from the 14th to 20th, inclusive, but the highest temperature occurred generally either on the 9th or 24th. Frosts occurred at frequent intervals, the heaviest and most general being on the 12th, but following a period of dry weather, the damage was less than would be expected, for staple crops had not advanced sufficiently, and the damage was confined to tender truck crops. The heaviest damage was from the frost on the 28th. While a large area was affected the damage occurred principally in spots. Fields of tomatoes and peppers were completely destroyed,

while fields adjoining and apparently no more favorably situated were uninjured. A number of market gardeners had the entire planting of tomatoes killed. Strawberries also suffered somewhat but the crop had been damaged by the dry weather to such an extent that the frost damage was of little consequence.

Precipitation was but slightly more than half the normal and occurred in two principal rain periods, both periods being followed by protracted dry periods in which only a few light and widely scattered showers occurred. This condition resulted in unusually low humidity. The deficiency was general throughout the State but greatest in the central and eastern portions, where conditions became somewhat drouthy in localities but were relieved by the protracted rainy period beginning on the 15th. At the close of the month rain was generally needed. Severe storms were almost entirely lacking. The one exception was a tornado on the 2d that moved northeastward across Woodbury and Cherokee counties, the center of greatest damage being in the vicinity of Cherokee.

The weather was ideal for farm operations. Corn was planted generally earlier than usual and under the most favorable conditions. The crop came up to a good stand in nearly all fields and the development has been up to or in advance of the average. Cultivation has progressed and fields are starting out clean. Due to dry weather, small grain did not develop normally and pastures and hay at many places in the eastern, central and southern sections was injuriously affected by the lack of timely rains. The prospects for potatoes are unusually favorable. Fruit deteriorated considerably. Apples were falling badly and the set of small tree fruit was less than that anticipated. The prospects for blackberries and black raspberries was excellent and with favorable weather these fruits will yield good crops. Road conditions, except following the rainy period at the middle of the month, were good.

Temperature. The mean temperature for the State, derived from the means of nine districts of nearly equal area, and based on the records of 103 stations, was 62.6°, or 2.5° higher than the normal. The excess was general throughout the State and quite uniform, ranging from 3.2° in the central division to 1.7° in the southeastern division. The highest monthly mean was 65.1° at Burlington, and the lowest was 58.8° at Postville. The absolute range for the State was 67°, ranging from 93° at Inwood and Onawa on the 9th and Humboldt and Spencer on the 24th, to 26° at Webster City on the 12th. The average number of days with the maximum temperature, 90°, or above was 1, and the average number with the minimum 32°, or lower was also 1. More than two-thirds of the stations reported temperatures of 90° or higher, while considerably less than one-half reported temperatures of 32°, or lower.

Precipitation. The average precipitation for the State, derived from the averages of nine divisions of nearly equal area, and based upon the records of 118 stations, was 2.47 inches, or 2.11 inches less than the normal. The deficiency was general except in a few small areas. There were but two general precipitation periods, the first during the middle of the 1st week and the other covering most of the 3d week; during the rest of the month a few scattered showers occurred and at the end of the month

PRESSURE, RELATIVE HUMIDITY, WIND AND SUNSHINE

Stations	Barometric Pressure, Inches (Sea Level)				Relative Humidity, %			Wind				Sun- shine from normal				
	Mean	Highest	Date	Lowest	Date	Mean		Total movement	Average hourly velocity	Maximum			% possible Departure from normal			
						T. A. M. 11 Noon	P. M.			Miles	From			Date		
Charles City.....	29.97	30.48	12	29.62	9	64.39	42	19	13	4,291	5.5	27	sw.	12	82	+30
Davenport.....	29.90	30.48	12	29.60	9	63.40	44	20	13	4,642	6.3	21	e.	26	75	+13
Des Moines.....	29.95	30.46	12	29.60	9	63.40	41	16	1	4,699	6.3	29	sw.	24	70	+10
Dubuque.....	29.95	30.51	12	29.63	9	65.40	47	20	11	4,323	5.8	25	sw.	24	69	+11
Keokuk.....	29.96	30.49	12	29.62	9	63.43	43	17	13	4,737	6.4	24	w.	24	71	+6
Sioux City.....	29.97	30.48	12	29.50	9	66.46	45	12	25	7,140	9.6	8	s.	24	74	+17
Omaha, Neb.....	29.95	30.44	12	29.56	9	66.43	44	16	1	5,125	6.9	13	n.	4	71	+6
Means and extremes	29.96	30.51	12	29.50	9	64.41	44	.....	.....	6.7	.....	.....	sw.	8	73	+13
Normals and records	29.95	30.58	4th	29.43	7th	67.1	50	3rd	.....	.....	.....	.....	.....	.....	61	.....
		1910	29.02	1875	.....	610	1889	.....	.....	.....	.....	.....	.....	.....	.....	.....

†Local mean time. *Dubuque. †Omaha. ‡Also at Sioux City, 9th, 1927. §Sioux City. †Also other dates. ††See footnote under similar table at end of January.

drouthy conditions were developing at many places in the eastern and southern portions of the State. The greatest amount reported from a single station was 6.19 inches at Red Oak, and the least was 0.61 inch at Albia. The greatest amount occurring in 24 consecutive hours was 2.60 inches at Estherville on the 3d-4th.

Miscellaneous Phenomena. Aurora: 27th. Dust storms: 1st, 2d, 11th, Fog: 17th. Frost: 1st, 5th, 6th, 7th, 12th, 21st, 28th. Hail: 3d, 17th, 18th, 24th, 26th. Halos (lunar and solar): 5th, 8th, 14th, 20th, 28th. Haze: 8th, 22d, 23d, 24th, 28th. Thunderstorms: 2d, 3d, 4th, 8th, 9th, 10th, 15th, 16th, 17th, 18th, 20th, 24th, 25th, 26th, 30th, 31st. Tornado: 2d. Winds (strong): 1st, 2d, 4th, 7th.

Rivers. Except for slight rises at the beginning and about the middle of the month there was a gradual falling tendency on the Mississippi river, with the average stage slightly below normal; on the Missouri river the opposite condition prevailed and for the most of the month the stage gradually increased. On most interior rivers rising stages prevailed until near the middle of the month and a gradual fall the rest of the month. No damaging high water was reported from any stream.

JUNE

The outstanding feature of the weather during June was the persistent coolness. The average number of days with the temperature below normal was 26, and on those days which were above normal the excess was slight. The general impression that the month was cool was fully verified by the mean temperature for the State, which was 64.5°, equalling the previous low record for the State. There were a number of unusually cool days, but no abnormally low minima occurred and most of the deficiency was due to low maxima. No maxima as high as 90° occurred and the maximum for the State was the lowest of record for June. On only one other occasion in June has the maximum failed to reach 90°.

The precipitation for the State averaged nearly one inch above normal, but in about one-third, embracing nearly all the northern portion, there was a deficiency. There was no station that did not receive more than one-half of the normal precipitation and the amount, due to the cool weather, was ample in all the State. Conditions were rather dry during most of the first week, but before its close a general shower period set in and during the rest of the month shower periods were frequent and general. The showers were generally moderate; excessive falls occurred only at scattered places. Storms of a destructive nature occurred on a large number of days, the first on the 6th and the last on the 28th. Four distinct tornadoes occurred, the most destructive being in Adams county on the 18th.

From an agricultural standpoint the weather was mostly favorable. All crops advanced satisfactorily, but in some localities in the eastern and southern portions, cultivation of corn was impossible and fields were becoming grassy. Haying was interfered with considerably. Cool weather crops developed rapidly. Early potatoes showed good yields and truck crops and gardens were very promising, though weeds and grass became troublesome. Raspberries were ripening at the end of the month, other small fruit showed good prospects, and the apple crop, while light, promised good quality. Due to the frequent showers, dirt roads were in poor condition most of the time. Pastures generally showed rank growth toward the close of the month, and stock continued in good condition.

Temperature. The mean temperature for the State, derived from the means of nine districts of nearly equal area, and based on the records of 163 stations, was 64.5°, or 4.8° lower than the normal. The deficiency was general, pronounced and uniform in all divisions, the deficiency ranging from 5.2° in the north-central division to 4.2° in the east-central division. The highest monthly mean was 67.8° at Burlington and the lowest was 60.8° at Postville and Washta. The absolute range for the State was 57°, ranging from 88° at Clarinda, Corning, Lenox and Thurman on the 20th, to 31° at Mason City on the 2d. Two stations reported temperatures 32° or lower and none 90° or higher. While this condition is not without precedent it does not occur often.

Precipitation. The average precipitation for the State, derived from the averages of nine divisions of nearly equal area, and based upon the records of 116 stations, was 5.38 inches, or 0.89 inch more than the normal. The excess was greatest in the southeastern division and least in the north-central division. All divisions in the northern portion of the State were below normal, though some stations had rather large excesses. In the central and southern portions of the State all divisions reported excesses and a few stations in the southern portion reported amounts more than twice the normal. The longest period of fair weather occurred during the first week. During the rest of the month showers occurred at frequent intervals and the longest showerless period was four days. The greatest monthly amount was 10.31 inches, at Keosauqua, and the least was 2.31 inches at Cherokee. The greatest amount occurring in 24 consecutive hours was 3.97 inches at Mount Ayr, on the 17th.

PRESSURE, RELATIVE HUMIDITY, WIND AND SUNSHINE

Stations	Barometric Pressure, Inches (Sea Level)				Relative Humidity, %			Wind				Sun- shine				
	Mean	Highest	Date	Lowest	Date	Mean		Total movement	Average hourly velocity	Maximum			% possible Departure from normal			
						T. A. M. or N. M.	T. P. M.			Miles	From	Date				
Charles City	29.83	30.17	15	29.59	12	76.59	55	9	4,689	5.6	22	sw.	12	60	-8	
Davenport	29.87	30.19	15	29.48	17	79.57	56	29	1	4,495	6.2	24	se.	5	55	-14
Des Moines	29.81	30.14	15	29.44	12	80.51	56	27	1	4,514	5.9	25	sw.	12	57	-10
Dubuque	29.81	30.21	15	29.48	13	78.54	56	27	3	4,226	5.9	26	sw.	12	49	-10
Keokuk	29.83	30.20	15	29.51	17	79.56	60	27	1	4,477	6.2	26	s.	12	49	-10
Sioux City	29.83	30.12	16	29.27	12	79.54	52	24	10	6,945	5.6	30	sw.	12	65	-10
Omaha, Neb.	29.82	30.10	16	29.39	12	77.51	52	36	11	4,593	6.4	30	s.	24	61	-10
Means and extremes	29.82	30.21	15	29.57	12	78.54	56	27	3	4,514	6.2	26	sw.	12	57	-10
Normals and records	29.93	30.61	1913	29.61	1880	79	60	7	112	1926	6.8	w.	1917	67	---	

!Local mean time. *Dubuque, †Omaha, ‡Sioux City. †Also other dates. †!See foot-note under similar table at end of January.

Miscellaneous Phenomena. Aurora: 13th. Fog: 18th, 20th, 21st, 30th. Frost: 2d, 16th. Hall: 6th, 7th, 11th, 12th, 16th, 17th, 18th, 19th, 20th, 21st, 22d, 27th, 28th. Halos (lunar and solar): 2d, 3d, 4th, 7th, 11th, 13th, 16th, 17th, 27th. Parhelia: 3d. Rainbow: 5th, 31st. Thunderstorms: 3d, 4th, 6th, 7th, 8th, 11th, 12th, 13th, 16th, 17th, 18th, 19th, 20th, 21st, 22d, 23d, 24th, 26th, 27th, 28th. Tornadoes: 12th, 18th, 22d, 28th.

Rivers. Stages on all rivers averaged below normal. The highest stages occurred generally on the Mississippi on the 1st and there was a gradual fall till near the middle of the month after which there was no material change but numerous slight fluctuations. On the Missouri river there was a gradual rise until the first part of the 2d week and then a fall till the first part of the 3d week, when a moderate rise occurred; thereafter nearly stationary stages prevailed. There were numerous fluctuations on the interior rivers with moderate rises following the heaviest rain periods, the most important being at the close of the month. The only damage occurred on small streams and was local.

JULY

The mean temperature averaged very near the normal. There was a slight excess for the State and also in each division except the central, where the deficiency was 0.5°, and the greatest excess was 0.4° in two divisions. The first part of the month was the warmer, with a rather protracted warm period beginning on the first and continuing into the second week when there was considerable accumulated excess and the month promised to rank as warm. However, there was considerable oscillation above and below normal after the end of the warm period, in which the positive and negative departures about offset each other until the 27th, when a cool period set in, that continued till the end of the month and the accumulated excess was nearly consumed. As a whole,

the month was pleasant, though the humidity was slightly higher than normal. There were no abnormally warm periods and but few consecutive days in any part of the State, with the maximum temperature 96° or higher. The warmest day generally was the 6th and the coolest the 28th. The nights, with a few exceptions, were pleasant.

Over most of the State the precipitation was quite uniform but considering all the State there were great variations as to amounts and frequency. Nearly all the southern half had amounts greater than the normal, while more than half of the northern portion was deficient though the amounts were mostly ample for agricultural purposes. However, in several areas in the northwestern division and small areas in the adjoining divisions, the amounts were decidedly deficient and crop growth was not good. Heavy rains occurred at a large number of stations which caused considerable damage. In towns and cities, basements were flooded and in country districts small streams went out of banks and carried away shocked grain. Some grain had to be spread out to dry and re-shocked. Roads were washed out in places and bridges and culverts destroyed. Storms were numerous but not unusually severe. The first of consequence was of two different types on the night of the 3d-4th, affecting most of the State, but most pronounced in the central and southern portions. Early in the night, 3d-4th, numerous local storms developed in the western portion of the State, and moved east, accompanied by considerable wind and some hail, but the chief characteristic was rotating horizontal clouds and a terrifying roar that could be heard for a great distance and caused much alarm. There was very little damage from these storms for they were too far aloft, probably at least two miles. The second type of storm in the early morning of the 4th was accompanied by wind, hail, rain and lightning, which damaged crops, trees and buildings.

A singularly poor distribution of rainfall occurred in the vicinity of Sioux City, where measurable rain occurred on but two days, mostly on the 21st, when one of the most intense rainstorms in the history of Iowa set new State records for a period of 19 and 15 minutes and 1 hour. This will be discussed more fully in a later issue of this report.

The persistent wet weather over most of the State delayed threshing to some extent, caused grain in the shock to sprout and some threshed grain to heat in the bins. Threshing made fair progress, however, due to the fact that most of the rain occurred at night. The wet weather was a great benefit to corn, which made excellent progress and at close of the month its condition was very good to excellent. Pastures, except the dry areas, were green and gardens and truck crops were excellent. Bush fruits were damaged somewhat by too much rain but the yield was the best in years. The wet weather and favorable temperatures caused weeds to make rank growth and gave some trouble in corn fields and will interfere with the harvesting of certain truck crops. Dirt roads in the eastern and southern portions of the State were in poor condition most of the month.

Temperature. The mean temperature for the State, derived from the means of nine districts of nearly equal area, and based on the records of

194 stations, was 73.9°, or 0.2° higher than the normal. All divisions reported an excess except the central division which had a deficiency of 0.5°. The average excess in the other divisions ranged from 0.1° to 0.4° though there were stations in all divisions that were slightly deficient in temperature. The highest monthly mean was 77.4° at Keokuk, and the lowest was 69.9° at Postville. The absolute range for the State was 56°, ranging from 98° at Burlington and Sioux City on the 6th, to 43° at Mason City on the 28th. The average number of days with the maximum temperature 90°, or above, was 6. The average number was highest, 12, in the southwestern district, and least in the northwestern and north-eastern districts, the average being 4.

Precipitation. The average precipitation for the State, derived from the average of nine divisions, of nearly equal area, and based on the records of 116 stations, was 4.43 inches, or 0.61 inch more than the normal. There was an excess in all except the northwestern and west-central divisions. The excess was pronounced in the east-central and all southern divisions. The average number of rainy days varied greatly, ranging from 5 in the northwestern division to 10 in the east-central division and the station extremes ranged from 2 at Sioux City to 14 at Des Moines. The shower periods were numerous, rather protracted and covered large portions of the State. The most protracted and extensive period occurred from the 18th to 21st, inclusive. The greatest amount reported from a single station was 9.32 inches at Mt. Ayr, and the least was 0.65 inch at Estherville. The greatest amount occurring in 24 consecutive hours was 4.30 inches at Mt. Ayr on the 21st.

Miscellaneous Phenomena. Aurora: 7th, 20th, 21st, 22d, 23d. Fog: 1st, 12th, 13th. Hail: 2d, 3d, 4th, 7th, 8th, 9th, 10th, 11th, 12th, 13th, 19th, 20th, 21st, 26th. Halos (lunar and solar): 7th, 23d, 28th, 29th. Thunderstorms: All dates except 5th, 6th, 14th, 15th, 16th, 23d, 24th, 25th.

PRESSURE, RELATIVE HUMIDITY, WIND AND SUNSHINE

Stations	Barometric Pressure, Inches (Sea Level)			Relative Humidity, %			Wind			Sun- shine			
	Mean	Highest	Date	Lowest	Mean		Total movement	Average hourly velocity	Maximum				
					F. A. M.	12 Noon†			Miles		From	Date	% possible departure from normal
Charles City.....	29.96	30.26	29	29.68	82	56.64	36	154	3,220	4.3	sw	19	74 + 1
Davenport.....	29.97	30.28	29	29.74	80	56.50	37	145	13,174	4.0	sw	19	74 + 1
Des Moines.....	29.95	30.24	29	29.82	85	56.69	40	22	3,522	5.2	sw	7	74 + 1
Deloitte.....	29.96	30.27	29	29.68	82	56.52	35	15	3,487	4.7	sw	19	74 + 1
Keokuk.....	29.98	30.29	29	29.79	79	56.58	39	39	3,800	5.1	sw	19	74 + 1
Sioux City.....	29.94	30.26	29	29.63	81	56.52	33	124	6,292	8.4	n	21	71 + 1
Omaha, Neb.....	29.94	30.23	29	29.68	4	78.54	38	61	4,024	5.4	sw	4	80 + 1
Means and extremes.....	29.96	30.29	29	29.63	6	82.55	36	121	5.4	sw	n	21	74 + 1
Normals and records.....	29.97	30.47	7th	29.29	9th	79	57	254	112	1894	ne	1906	73

*Davenport. †Sioux City. ‡Des Moines. §Omaha. ¶Record for 28 days. ††Local mean time. †††And other dates. ††††See footnote under similar table at end of January.

Rivers. The mean stage of the Mississippi was below the July average. There were no important rises though numerous slight fluctuations with falling stages predominating. The greatest extremes were 1.5 feet for the entire month while at one station the extremes were less than 1.0 foot. On the Missouri river the lowest stage occurred at the beginning of the month and the highest the last of the 2d week and the beginning of the 3d. The extremes ranged from 2.3 feet at Sioux City to 3.7 feet at Omaha. Fluctuations were frequent though generally slight. On the principal interior streams there were no important rises. The highest stages occurred mostly during the 1st week. Following the rainy period from the 18th to 21st, inclusive, a large number of small streams in the southern portion of the state were out of banks for several days.

Death Removes Faithful Observers. On July 14, 1928, Mr. Alex Maxwell, Cooperative Observer at Mount Ayr, died at the Methodist Hospital in Des Moines, where the writer had a pleasant visit with him a short time before his death. Mr. Maxwell was born in Londonderry, Ireland, March 22, 1853. Upon arrival in America he came at once to Mount Ayr on September 2, 1880. In June, 1912, he became the cooperative observer and did not miss making a report till the time of his death, except during a few short absences when he provided a competent substitute.

Last December this service lost a devoted cooperator through the death of Mr. J. K. Medberry, who had been the observer at Rock Rapids for almost exactly 10 years. His daughter, Miss Nellie F. Medberry, is continuing the work.

Both of these men, though very accurate in taking and recording observations, were of the type that accepted occasional corrections and suggestions, charitably, gracefully and profitably. A missing observation cannot be found in their records except when some instrument failed.

AUGUST

There were no unusual temperature features during August, 1928. The mean temperature was one degree above normal and the weather was generally pleasant. The period from the 6th to the 16th inclusive, was the warmest during the month and there were several short periods that were rather cool. There were about the usual number of days in which the temperature was above 90° but there was no abnormally warm periods, and the nights, as a rule, were pleasantly cool. Light frost occurred on lowlands in some localities, mostly in the north-central district, on the 24th and 25th, but no damage resulted.

The most important feature of the month's weather was the heavy rainfall that occurred over almost the entire State. The falls were characterized by unusually heavy downpours that covered most of the State on several dates. The average for the State has been exceeded but twice during the last 56 years, while a number of stations in the northeastern and north-central divisions had the greatest August total of record, and two stations reported the greatest total for any month. The development of storms was unusually rapid and many were accompanied by destructive winds, damaging hail and terrifying thunder and lightning. During the period, 7th to 15th inclusive, there was practically no rainfall,

but during the rest of the month there were no periods of more than three days without rain. Threshing made good progress during the second week but slow the rest of the month. However, 93% of the threshing was done by the close of the month, the most backward districts being the northeast and west-central. The rainy weather caused shocked grain to sprout, interfered with and delayed threshing, and caused threshed grain to heat in bins to such an extent that it will be unfit for seed. In local areas corn lodged so badly that it will be impossible to harvest except by "hogging" and in the large trucking centers the major crops were damaged by the continuous wet weather and the shipments will be greatly reduced. Small streams in many localities were out of banks and carried away farm animals, stacked grain and small buildings, and also damaged bridges, caused numerous washouts and interfered with road construction.

In connection with the marked storm activity, a series of tornadoes developed on two different dates. The first developed on the 20th and was felt in Calhoun, Hamilton, Hardin, Pocahontas, Story and Webster counties. In this storm three persons were killed, Mrs. G. A. Speer, Havelock, Miss Stella Powell, Traer, and infant daughter of Mr. and Mrs. Arthur Neubauber, near Ellsworth, a number injured and great property damage sustained. The second series on the 26th, affected Adams, Cass, Mills, Montgomery and Pottawattamie counties. In this storm four persons were killed, F. T. Jervis, D. D. Jervis, and Richard T. Smith of Elliott, and Kenneth Hyatt of Mt. Etna, a large number injured, many head of livestock killed, and much property destroyed.

There was considerable plowing during the second week but during the rest of the month it was generally too wet. The copious rainfall kept pastures in vigorous condition but interfered somewhat with haying, and likely injured clover seed. Late potatoes were benefited and are promising, gardens were in vigorous condition throughout the month, and the outlook was promising for fruit. Dirt roads were rough or muddy most of the month.

Temperature. The mean temperature for the State, derived from the means of nine districts of nearly equal area, and based on the records of 161 stations, was 72.7°, or 1.0° higher than the normal. There was an excess in each division, ranging from 1.4° in the west-central, east-central and southwestern divisions to 0.5° in the central. There was one or more stations in each division, except the west-central, east-central and south-eastern divisions that showed a slight deficiency in temperature. The highest monthly mean was 75.9° at Keokuk, and the lowest was 68.4° at Postville. The absolute range for the State was 63°, ranging from 100° at Inwood on the 1st, to 37° at Rock Rapids and Sheldon on the 24th. The average number of days with the maximum temperature 90°, or above, was 8. The number was greatest, 12 in the south-western division and least, 5 in the north-central and north-eastern divisions. At only one station did the maximum fail to reach 90°.

Precipitation. The average precipitation for the State, derived from the average of nine divisions, of nearly equal area, and based on the records of 116 stations, was 6.42 inches, or 2.98 inches more than the

had the most corn immature, had the least frost. Truck crops and gardens suffered the most injury and a large amount of grapes that were slow in ripening were badly damaged, many so badly that they were unfit for use.

Except for a protracted rainy period during the second week, the precipitation was light and somewhat scattered. Over most of the State by far the greatest amount occurred during a single 24-hour period. Heavy rains in the northeastern portion of the State caused streams to overflow, doing a great deal of damage. Crops were washed away, many farm animals drowned, fences and small buildings carried away and rail traffic was delayed. A number of bridges on highways were washed out and the highways badly damaged, which interfered with automobile travel for some time. During the first part of the month mosquitoes were almost a plague in many parts of the State. Horses doing field work became almost unmanageable; in the cauning districts it was necessary to build smudges to harvest crops and protect workers in the factories, and cattle were severely annoyed. During the last half of the month farm work made good progress and much plowing was done and the soil was generally in good condition. The sunshine was much above normal and this caused the corn to dry satisfactorily and with further favorable weather there will be very little that will be soft. Pastures were generally good and supporting a large amount of stock, and silos were mostly filled before frost. Cattle were in healthy condition, but there were some cases of hog cholera in scattered places.

Temperature. The mean temperature for the State, derived from the means of nine districts of nearly equal area, and based on the records of 194 stations was 60.5°, or 3.8° lower than the normal. The deficiency was greatest in the southeastern division and least in the northwest, the range being 1.1°; over most of the divisions the range was less than 0.5°. The highest monthly mean was 63.1° at Keokuk, the lowest was 56.4° at Postville. The absolute range for the State was 69°, ranging from 53° at Keokuk and Wever on the 9th, to 24° at Sanborn on the 25th, Maquoketa on the 26th and Washta and Webster City on the 27th. Temperatures of 90°, or higher, occurred at about one-third of the stations. The number was least in the northeastern division with only one station reporting 90°, and greatest in the southeastern division, one station reported 90°, or higher on three days. The average number of days with the minimum temperature 32°, or lower, was two and one-half. The greatest number was five at twelve stations; at eight stations the temperature did not reach 32° and included all divisions except the northwestern and west-central.

Precipitation. The average precipitation for the State, derived from the averages of nine divisions of nearly equal area, and based on the records of 118 stations, was 3.98 inches, or 0.59 inch less than the normal. There was a deficiency in all the central and northern divisions and an excess in all southern divisions. All stations in the northwestern, west-central and east-central divisions were deficient and all but one in the north-central division. The stations that reported excesses were mostly in the extreme southern portion, though there were several sta-

PRESSURE, RELATIVE HUMIDITY, WIND AND SUNSHINE

Stations	Barometric Pressure, Inches (Sea Level)			Relative Humidity, %			Wind			Sunshine					
	Mean	Highest	Lowest	Mean			Total movement	Average hourly velocity	Maximum		% possible temperature from normal				
				A. M.	1/2 Night	P. M.			Miles	From		Direction			
Charles City	30.00	30.28	29.00	14	37	59	31	24	2,873	5.4	16	8	18	78	-14
Davenport	30.04	30.22	29.02	14	35	45	22	24	2,668	5.1	15	8	12	74	+11
Des Moines	30.00	30.27	29.04	13	34	65	26	20	3,175	5.7	21	sw	16	74	+19
Dubuque	30.05	30.24	29.05	14	30	51	21	24	3,487	4.8	19	se	15	69	+9
Keokuk	30.04	30.25	29.71	13	70	45	27	21	3,333	5.5	17	sw	7	73	+8
Sioux City	30.05	30.40	29.50	13	70	41	31	29	7,087	10.1	36	sw	13	73	+9
Omaha, Neb.	29.92	30.28	29.50	13	74	47	23	29	4,614	6.4	33	sw	11	77	+12
Means and extremes	30.00	30.49	29.50	13	41	65	22	29	.....	6.1	36	W	11	.....	.....
Normals and records	30.00	30.53	29.50	13	56	56	25	29	.....	.....	.....	.....	.....	73 1/2	00
	300.07	1906	439.28	1927	.....	.....	.....	.....	.....	.....	186	W	.....	.....	.....

*Sioux City. †Des Moines. ‡Omaha. §Davenport. ¶Local mean time. †††All other dates. †††See footnote under similar table at end of January.

tions with marked excesses in the central and northeastern divisions and were due mainly to heavy downpours on a single day. The precipitation was well distributed throughout the month but by far the greatest amount occurred during the 2d week and that which occurred during the last half of the month was of little importance. The greatest amount was 9.95 inches at Centerville and the least was 1.64 at Sheldon. The greatest amount occurring in 24 consecutive hours was 5.76 inches at Keosauqua on the 11th-12th.

Miscellaneous Phenomena. Aurora: 24th, 28th. Fog: 8th, 11th, 12th, 13th, 17th, 18th, 20th, 28th, 29th, 30th. Frost: 3d, 4th, 21st, 22d, 23d, 24th, 25th, 26th, 27th, 28th, 29th. Hail: 3d, 13th, 14th. Halos (lunar and solar): 28th. Haze: 17th, 18th. Thunderstorms: 1st, 2d, 19th, 31th, 12th, 13th, 14th, 18th, 19th, 20th, 21st, 26th, 29th, 30th. Tornadoes: 13th, 14th.

Rivers. Falling stages prevailed on the Mississippi river till about the middle of the 2d week and thereafter there was a slight rise until the end of the month. The average stages were above normal. On the Missouri there were no important changes except a marked rise occurred about the middle of the 4th week. On all interior rivers the most important changes occurred after the heavy rains at the end of the 2d week. Small streams in the southern and northeastern portions of the State were out of banks and caused considerable local damage.

OCTOBER

October, 1928, was warm and wet. The mean temperature while considerably above the normal was not unusually warm compared with previous Octobers and was more than one degree cooler than last October. The precipitation was more than one inch above normal and not once 1900 has the average precipitation for the State been greater.

Mild weather prevailed during the greater portion of the month, and, except for a day or two, the first twelve days were continuously above normal and the latter part of this period was decidedly above. From the 13th until the 24th fluctuations were numerous with no marked departures, but the last week was cold with the temperature continuously below normal and the average daily deficiency more than 6 degrees. There was very little frost or freezing weather during the first three weeks and that part of the State which escaped frost during September did not experience a killing frost until about the 26th and in the extreme southeast portion until the 29th. High temperatures were general on the 10th but the maxima were generally considerably below the October record. At Charles City the October record was equalled.

There were more cloudy days, more days with measurable precipitation and less sunshine than the average. While precipitation occurred on a large number of days, most of the total occurred during the principal period of the month, 11th-22d. During this period very little favorable weather prevailed. Heavy downpours occurred at a large number of stations, and the number that reported one inch, or more, during a 24-hour period was unusually large. Some damage occurred in towns and cities but none from overflowed streams. Nearly all small streams, usually dry at this season of the year, showed running water at all times during the month.

From an agricultural standpoint the month was mostly unfavorable. The frequent rainfall interfered with the gathering of corn and kept it from drying. Strong winds, particularly on the 10th-11th, blew down a large amount of corn and knocked many ears off in the mud, causing them to mold, rot or sprout. The condition of the fields made machine gathering almost impossible and hand picking slow and difficult. The wet fields also interfered with the gathering of sugar beets and caused the supply on hand to become very low. The absence of freezing weather permitted canning factories to consume the entire supply of pumpkins without any being damaged, apples were generally gathered in good condition, and root crops still in the ground were uninjured.

Temperature. The mean temperature for the State, derived from the means of nine districts of nearly equal area, and based on the records of 100 stations, was 54.2°, or 2.4° higher than the normal. The excess was general throughout the State and ranges from 1.5° in the northwestern district to 3.1° in the south-central and southeastern districts. The highest monthly mean was 58.5°, at Keokuk, and the lowest was 50.0° at Rock Rapids. The absolute range for the State was 76°, ranging from 93° at Le Mars, Little Sioux and Washta, on the 10th, to 17° at Fayette, Fort Dodge, Sanborn, Webster City and West Bend on the 29th. Temperatures of 90°, or higher, occurred at about one-third of the stations and at all but one station in the northwestern district. This temperature was not reached at a single station in the three eastern districts. Thurman, in the southwestern district, reported the occurrence of 90° on two days. The average number of days with the temperature 32°, or lower, was 6, being greatest in the northwestern district with 8, and least

in the south-central district with 4. The greatest number at a single station was 11 at Washta, and the least was a single day at Keokuk.

Precipitation. The average precipitation for the State, derived from the averages of nine districts of nearly equal area, and based on the records of 117 stations, was 3.66 inches, or 1.33 inches more than the normal. The excess was greatest in the southeastern district, where the average was more than double the normal and least in the southwestern where the excess was only 0.02 inch more than the normal. The amounts were above normal at all stations in three districts and all except one in two districts. The greatest monthly amount was 7.38 inches at Little Sioux and the least was 1.48 inches at Red Oak. The greatest amount occurring in 24 consecutive hours, 4.39 inches, was at Denison on the 12th. There was one principal rainy period, extending from the 11th till the beginning of the 4th week. Most of the heavy, general rains occurred on the 12th, 16th and 21st; the other rains were less general and during the passage of one storm the precipitation was confined almost entirely to the southeastern district.

Miscellaneous Phenomena. Aurora: 24th, 25th. Fog: 14th, 18th, 22d, 26th, 27th, 30th. Frost: 2d, 22d, 24th, 25th, 26th, 27th, 28th, 29th. Hail: 4th. Halos (lunar and solar): 28th, 29th, 31st. Thunderstorms: 4th, 5th, 8th, 11th, 12th, 14th, 15th, 16th, 17th, 18th, 21st. Tornado: 4th.

Rivers. Unusually high stages prevailed on the Mississippi river for this season of the year. There was a gradual decline during most of the first half of the month and a gradual rise thereafter, except in the extreme upper portion where a fall had started at the end of the month. On the Missouri river moderate stages prevailed with very little fluctuation in the upper portion of the stream; at Sioux City the extreme stages occurred within a period of three days and amounted to less than one foot; during most of the time the stages were nearly stationary. Over

PRESSURE, RELATIVE HUMIDITY, WIND AND SUNSHINE

Stations	Barometric Pressure, Inches (Sea Level)				Relative Humidity, %			Wind			Sunshine						
	Mean	Highest	Date	Lowest	Date	Mean		Total movement	Average hourly velocity	Maximum							
						7 A. M.	12 Noon			Miles		From	Date	% possible			
Charles City	30.05	30.64	29	29.46	4	86	58	72	54	6	4,217	5.7	23	sw.	10	56	-1
Davenport	30.05	30.63	29	29.33	4	81	68	66	23	7	4,454	6.0	23	w.	4	28	-3
Des Moines	30.04	30.61	29	29.42	4	80	65	62	16	6	4,738	6.4	25	sw.	10	56	-7
Dubuque	30.05	30.60	29	29.43	4	88	65	68	7	4	4,134	5.6	28	sw.	4	45	-10
Keokuk	30.07	30.59	29	29.61	4	79	55	64	24	9	4,546	6.1	25	sw.	4	54	-7
Sioux City	30.05	30.60	29	29.44	4	74	55	57	20	21	7,965	10.7	44	sw.	10	52	-10
Omaha, Neb.	30.04	30.66	29	29.45	4	75	54	56	20	6	5,173	7.0	28	sw.	21	54	-8
Means and extremes	30.05					80	56	63			6.8					54	-6
		30.69	29	29.42	4							44	sw.	10			
Normals and records	30.05		31.81		29.18	31	69		61							161	60
		30.69	1913	328.96	1876				519	1925			44	sw.	1850		

*Davenport and Sioux City, 29th, 1929. †Des Moines. ‡Omaha. ††Local mean time. ‡‡And other dates. †††See footnote under similar table at end of January.

the southern portion of the stream the fluctuations were more pronounced but occurred mostly in the first half of the month; during the last half the changes were slight. On the interior streams moderate stages prevailed with no marked rises except during the middle of the third week.

NOVEMBER

The month opened and closed with the temperature below normal but values above normal prevailed during about two-thirds of the month. The mean temperature for the State averaged 2.1° above the normal and the excess was unusually uniform in all districts. The departures were more pronounced in the western portion of the State. During the first four days the average daily deficiency in the extreme western portion of the State was 12°, while in the extreme eastern portion it was less than 2°. The positive departures also were greater over the western portion but the contrast was not so marked. There were no unusually warm days and the general excess was mainly due to high minima.

There was a decided excess in precipitation for the State but there was a deficiency in most of the northwestern district and a single station in the west-central district, all stations reporting a deficiency being in a single area. Since July, excepting September, when there was a slight deficiency in precipitation, all months have shown a material excess in precipitation and there is now a marked accumulated excess in precipitation in a large portion of the State, amounting in places to more than 25 per cent. There were four snowstorms but none were general throughout the State. The first, occurring on the 1st and 2d, was general over most of the western and central portions and heavy over most of the northwestern district, and throughout this district practically no snow fell during the rest of the month; the storms of the 9th and 17th were mostly light except some locally heavy falls occurred on the 17th in the central and northeastern districts. The storm occurring on the 29th-30th was one of the heaviest November storms of record, amounting to 14 inches at several stations. As this storm was accompanied by very little wind there was little drifting but the fall was so heavy in localities that traffic was temporarily blocked and the weight broke wires and damaged trees to some extent. The storm of the 17th was the most damaging as it was in the form of sleet in portions of the State, the worst condition being in the central, east-central and northeastern districts. Many telephone and telegraph wires were broken, hundreds of poles snapped off, and many fruit and shade trees damaged. In the extreme southern portion of the State this storm was in the form of heavy rainfall, which caused many small streams to overflow with considerable damage.

One of the most unusual features in connection with the month's weather was the development of a series of tornadoes on the afternoon of the 14th. The principal one showed a well defined path from the vicinity of Vinton, Benton County, northeastward to Manchester, Delaware County. There was a great deal of damage in this area. On the same afternoon a number of tornadoes were reported from Floyd and Howard counties and unverified reports from Worth, Mitchell and Chicka-

saw Counties. As far as can be ascertained, this is the latest date that a tornado ever occurred in Iowa.

Farm work was badly hampered by the weather. The snow at the beginning of the month interrupted corn husking for several days in the western and central portions, and broke down a large amount. The subsequent rainy weather caused further delay where the progress has been least. Husking has been difficult the entire season due first to the large amount broken down, and later to the continual wet weather that prevented the use of machines, and in some parts of the State it was impossible for wagons to be drawn through the wet bottom lands. There has been a great amount of corn wasted in gathering this year, and there is some corn in the mud that cannot be salvaged even by hogs. Plowing was possible in the northwest district and well drained lands in the other districts, but in most of the State the soil was too wet. All water courses had running water and the stages were high for the season; water in wells is the highest in years and the soil is thoroughly saturated. The generally mild weather permitted building operations and paving to be carried on with very little interruption, but the wet weather kept dirt roads in poor condition almost the entire month. Stock generally was in good condition and continued on pastures or stalk fields with very little protection.

Temperature. The mean temperature for the State, derived from the means of nine districts of nearly equal area, and based on the records of 103 stations, was 38.7°, or 2.1° higher than the normal. The excess was general throughout the State and more uniform than usual. The range by districts was 0.6°, being greatest in the northeastern district, where the excess was 2.4°, and least in the southeastern and south-central districts, where it was 1.8°. The highest monthly mean was 42.9° at Keokuk, and the lowest was 34.5° at Inwood and Rock Rapids. The absolute range for the State was 62°, ranging from 70°, at Centerville, Davenport, No. 2 and Washington on the 15th, to 8° at Inwood on the 3d and 25th and Sanborn on the 25th. The absolute range for the month was the least since 1885. The average number of days on which the maximum temperature did not go higher than 32° was 2 and the greatest number was 3 in the north-central district, and least in the southwestern and south-central districts where the total number for this entire area was only 4. The average number of days on which the temperature was 32°, or lower, was 20, the greatest average being 23 in the north-central district and least in the southeastern district with an average of 14; for individual stations the extreme range was from 28 days at Estherville to 9 at Davenport and Keokuk.

Precipitation. The average precipitation for the State, derived from the averages of nine districts of nearly equal area, and based on the records of 115 stations was 3.83 inches, or 2.28 inches more than the normal. The excess was greatest in the south-central district and least in the northwestern district, where it amounted to only 0.14 inch. The excess was less than one inch in the west-central district but throughout the rest of the State it was pronounced. The total in the three southern districts was more than three times the November normal. The greatest

monthly amount was 6.83 inches at Mount Ayr and the least was 6.77 inch at Lake Park. The greatest amount occurring in 24 consecutive hours was 3.28 inches at Wever on the 17th. There were three rainy periods, occurring on the 1st, 7th and 14th, that covered the entire State but the storms that produced the heaviest rains missed the northern and much of the western portions. The average rainfall for the State was the greatest since 1909 and only one other time since 1873 has a greater average amount been recorded in November.

Snowfall. The average snowfall for the State was 6.9 inches, and with the exception of 1898, when the average for the State was 8.7 inches, the greatest November snowfall of record. Most of the snowfall occurred during the last two days of the month and embraced a wide belt reaching northeastward across the State, the center of the belt stretching from Mills to Clayton counties. Along this line for over 200 miles the amounts ranged from 10 to 14 inches and diminished to the northwest and southeast where none occurred north of a line running from Logan to Forest City and south of a line running from the southeast corner of Appanoose County to Clinton. The greatest average occurred in the southwestern district and the least in the southeastern district. Several stations in the east-central and southern districts reported only traces of snow. The greatest amount reported from a single station was 22.5 inches at Earlham, and the least was 0.0 at Wever.

Rivers. In the extreme upper portion of the Mississippi there was a slight fall throughout the month; at Dubuque a gradual fall occurred until the 18th when there was a 1.0 foot rise and a gradual fall till the end of the month. About the same condition prevailed at Davenport except a slight rise occurred on the 6th. The same general conditions were true at Keokuk except the heavy rains of the 16th-17th caused a decided rise, amounting to 5.5 feet in 24 hours and the crest was within

PRESSURE, RELATIVE HUMIDITY, WIND AND SUNSHINE

Stations	Barometric Pressure, Inches (Sea Level)				Relative Humidity, %				Wind				Sun- shine from normal			
	Mean	Highest	Date	Lowest	Mean				Average hourly velocity		Maximum					
					T. A. M.	11 Noon	7 P. M.	Lowest	Date	Total movement	Miles	From		Date	% possible	
Charles City	30.10	30.70	25	29.42	14	84	72	80	30	6	4,945	6.5	27	sw	14	41
Davenport	30.08	30.65	25	29.53	17	80	66	72	30	4	5,258	7.3	26	s.	11	41
Des Moines	30.09	30.73	25	29.49	14	84	69	72	38	26	5,317	7.4	27	sw	14	35
Dubuque	30.07	30.66	25	29.69	17	80	66	73	35	6†	5,058	7.0	24	nw	21	46
Keokuk	30.11	30.71	25	29.57	17	80	63	73	31	25	5,479	7.6	31	s.	14	46
Sioux City	30.12	30.78	25	29.38	14	82	69	70	39	21	8,303	11.5	45	sw	14	51
Omaha, Neb.	30.11	30.78	25	29.40	14	79	65	65	36	21	6,089	8.5	28	n.	17	51
Means and extremes	30.10	30.78	25	29.28	14	81	67	72	30	4†	8.0	—	—	—	—	46
Normals and records	30.07	30.96	24	28.81	11	81	—	72	6†	—	—	—	—	—	—	51
		30.06	1806	29.05	1918	—	—	—	—	—	—	—	—	—	—	1919

*Sioux City. †Davenport. ‡Omaha. §Keokuk. ¶Local mean time. †And other dates. ††See footnote under similar table at end of January.

1.4 feet of flood stage. Bottom lands were overflowed in the lower Des Moines drainage basin and along other streams in the extreme southern portion which damaged corn considerably and a few residences also were damaged. On the other minor streams there were numerous fluctuations with some rather sharp rises but without any damage. High stages for the season prevailed on the Mississippi and nearly all interior streams. Moderate stages prevailed on the Missouri river. At Sioux City the extreme stages were 4.6 and 5.0 feet and during the last 10 days there was no change in the stage. At Omaha the extreme stages were also less than one foot ranging from 7.3 to 8.0 feet.

Miscellaneous Phenomena. Fog: 7th, 9th, 10th, 12th, 15th, 16th, 27th, 28th, 29th. Hall: 14th. Halos (lunar and solar): 8th, 13th, 15th, 20th, 23d, 26th. Haze: 28th, 29th. Sleet: 2d, 3d, 17th, 20th, 21st, 27th, 28th, 29th, 30th. Thunderstorms: 1st, 2d, 14th, 15th, 16th. Tornado: 14th.

DECEMBER

Mild winter weather prevailed during the greater part of December, 1928. The mean temperature was 4.6° above normal and 10.0° warmer than last December. Also, it was the first time since 1923 that December has been warmer than normal. The first ten days were mostly rather cold, with an average daily deficiency of 6°. Zero weather was general over nearly all the State on the 5th, the lowest temperatures as a rule being in the central district where the snow cover was greatest. During the rest of the month the temperature was continuously above normal, except for a short period extending from the 19th to 21st. The mild weather that set in during the second week, in connection with the general heavy rain of the 13th, removed all frost from the ground and left the soil in a thoroughly saturated condition. This situation produced the worst possible condition as to mud. Dirt roads in all portions of the State were impassable to automobiles, graveled roads were badly cut up and unpaved streets in cities could not be used for about one week. A great many automobiles were temporarily abandoned where stranded. The situation was relieved by freezing weather that set in on the 19th, but all roads froze rough and, until worn down, travel was difficult. There was still considerable corn to gather in the eastern and southern portions of the state and this work had to be suspended on account of the soft condition of the fields.

There were no severe storms during the month, and only very light scattered precipitation after the 13th. The snow fall was unusually light and drifted very little. With the exception of 1922, the average for the State was the least in December since 1913. The ground was practically bare of snow after the 13th over the entire State. The ground was snow covered for an average of 7 days, ranging from 15 days at a few stations in the northwestern district to none at a few stations in the northeastern district. During the cold weather at the beginning of the month, most all streams froze and the ice was rather thick. The mild weather following the first cold period caused a break up in nearly all streams and for an extended period the streams were free of ice, a condition that rarely occurs after once frozen over.

Conditions were unusually favorable for building operations. Stock began the winter under conditions that were favorable, and there was very little sickness among farm animals.

Temperature. The mean temperature for the State, derived from the means of nine districts of nearly equal area, and based on the records of 102 stations, was 28.7°, or 4.6° higher than the normal. The excess was general throughout the State. The excess was greatest in the northwestern district, amounting to 6.8°, and least in the southeastern district where it was 3.5°, making the departure range by districts 3.3°. The highest monthly mean was 33.4° at Ottumwa, and the lowest was 24.6° at Postville. The absolute range for the State was 72°, from 57° at Sioux City on the 27th to -15° at Perry on the 5th. The average number of days on which the maximum temperature did not exceed 32° was 8. The greatest number occurred in the north-central district with an average of 11 and the least occurred in the southwestern district with an average of 5; the average number of days that the minimum was 32°, or lower was 26, ranging from 28 in the north-central to 25 in the east-central, south-central and southeastern districts; the average number of days of zero weather was 1. The average was 2 in the three northern and central districts; only three stations in the southwestern district reported zero, or lower. The greatest number was 5 at two stations and at one or more stations in all districts zero was not reached.

Precipitation. The average precipitation for the State, derived from the average of nine districts of nearly equal area, and based on the records of 112 stations, was 0.89 inch, or 0.25 inch less than the normal. There was a deficiency in all districts, except the southeast. The greatest deficiency occurred in the west-central district where it was 0.44 inch. The greatest monthly total was 1.98 inches at Wever and the least was 0.11 at Akron. The greatest amount occurring in 24 consecutive hours was 1.28 inches at Lacona on the 13th. The heaviest amounts occurred generally on the 13th, mostly in the form of rain.

Snowfall. The average snowfall for the State was 2.3 inches, or 2.1 inches less than the normal. The average ranged from 3.6 inches in the northwestern district to 1.0 inch in the northeastern. The greatest amount reported from any station was 7.2 inches at Alton and the least was none at Clarinda; Charles City and Decorah reported only traces. This is the first time in 38 years that there has not been measurable snowfall at Charles City in December and the second time in that period that a measurable amount failed to occur during a winter month. The heavy November snowfall remained on the ground until the second week over most of the State when a rainy period occurred. The ground was practically bare the rest of the month over the entire State.

Rivers. There was considerable fluctuation in all rivers. There was a steady fall on the Mississippi river until the latter part of the 2d week when there was a marked rise due to rather heavy rains and a protracted period of warm weather. The fluctuations during the latter part of the month were due mostly to ice conditions. A serious situation developed in the vicinity of Burlington that threatened lowlands but it finally passed with very little damage. Falling stages prevailed on the Missouri

PRESSURE, RELATIVE HUMIDITY, WIND AND SUNSHINE

Stations	Barometric Pressure, Inches (Sea Level)			Relative Humidity, %			Wind			Sun- shine					
	Mean	Highest	Date	Lowest	Date	Mean		Total movement	Maximum						
						7 A. M. 12 Noon	7 P. M.		Average hourly velocity		Miles From	Date	% possible Departure from normal		
Charles City.....	30.10	30.57	7	29.45	10/20	90	75	49	6	4,053	6.3	21	nw.	18	20 - 5
Davenport.....	30.12	30.54	8	29.51	10/20	86	70	74	40	4,483	6.0	22	sw.	3	46 + 3
Des Moines.....	30.10	30.57	7	29.53	10/20	88	70	79	35	4,478	6.0	23	sw.	26	45 - 2
Dubuque.....	30.10	30.56	8	29.45	10/20	84	67	77	41	4,092	5.5	19	n.	31	35 - 7
Keokuk.....	30.12	30.57	8	29.58	10/20	82	64	75	45	4,948	6.7	24	w.	3	45 - 7
Sioux City.....	30.11	30.57	7	29.63	10/20	84	66	72	28	7,606	10.3	26	nw.	24	38 + 4
Omaha, Neb.....	30.12	30.57	7	29.61	10/20	80	69	66	31	5,337	7.3	20	nw.	31	48 - 4
Means and extremes.....	30.11	30.57	7	29.45	10/20	85	69	76	-----	-----	6.9	-----	-----	-----	45 - 2
Normals and records.....	30.12	30.57	7	29.45	13th	84	77	12th	-----	-----	-----	-----	-----	24th	47
		*31.00	1917	29.00	1920	-----	-----	-----	-----	-----	-----	*47	nw.	1007	-----

*Sioux City. †Dubuque. ‡Keokuk. †Local mean time. †And other dates. ††See footnote under similar table at end of January.

the greater part of the month, being mostly slight but amounting to more than one foot on the 6th. Changing ice conditions produced a rise of two feet at Sioux City on the 20th. Falling stages prevailed on interior streams until after the heavy rains of the 13th when there was a marked rise; during the rest of the month there was a gradual fall.

Miscellaneous Phenomena. Aurora: 19th. Fog: 1st, 2d, 9th, 10th, 11th, 12th, 13th, 14th, 15th, 16th, 24th, 25th, 28th. Haze: 30th. Halos (lunar and solar): 1st, 20th, 21st, 25th, 28th, 30th. Sleet: 16th, 26th, 27th, 28th, 29th. Thunderstorms: 2d.

WINTERS AT KEOKUK

By Arthur H. Christensen

Official in Charge, Weather Bureau Office, Keokuk, Iowa, January 4, 1929.

The statement is frequently made that our winters are not as severe as they were 20, or 30, or 50 years ago, and that we don't have as heavy snowfalls as they did "years ago" when "old Dobbins" had to plow through snowdrifts up to his belly to get the family to church on Sunday morning, and when stories were told of snow-drifts 10 to 15 feet deep along the roadside. Probably with many of the story tellers the depth of snow increased with each repetition of the yarn. At any rate, let us see what the figures of the United States Weather Bureau records, as compiled over a period of 35 to 57 years have to say on the subject.

In determining the severity of any particular winter, two primary factors should be considered—temperature and snowfall, with various phases of each factor entering in, in differing degrees of importance.

Considering first the matter of snowfall, our records at Keokuk extend back 42 years to 1886, and in comparing the average winter snowfall for the first half of this period with that of the last half, it is found that the first half averaged 20.6 inches of snow per winter, while the last half

averaged only 19.9 inches, a difference of seven-tenths of an inch or a decrease of about three per cent.

Records Made Recently

The statement is frequently made that snow does not remain on the ground as long as formerly. Our record of the number of days with snow-covered ground extends back 35 years to 1893, and dividing this record into halves (omitting the middle year to make an equal division) we find that the snow remained on the ground an average of 31 days per winter during the first half and 34 days per winter during the last half of the record, or an increase of about ten per cent. In checking over the total yearly snowfall for the same period we find that this has also increased from 18.9 inches per winter to 21.3 inches or an increase of nearly 13 per cent. Furthermore, the heaviest winter snowfall of the entire record was 58.2 inches in 1925-26, which was about 25 inches heavier than any snowfall during the first half of our record from 1893 to 1907. Also the winters of 1911-12, 1917-18, 1924-25, and 1925-26, all had a greater number of days with snow on the ground than any winter in the first half of that record, from 1893 to 1910. This is certainly strong evidence in disproof of the theory that our snows are not as heavy and do not remain on the ground as long as formerly.

The fact that our 42 year record tends to show a 3 per cent decrease in total annual snowfall, while the 35 year record shows an increase of nearly 13 per cent, indicates that the record is too short to draw any definite conclusions on the trend of yearly amount of snowfall, if there is a trend either way. Apparently there is no reason why snowfall should increase or decrease over a period of years, and considering the fact that our total winter snowfall ranges from as little as 8 inches to as much as 58 inches, it can readily be seen that it would take an extremely long period of years to show any real change in the average winter snowfall.

In the matter of extreme depths of snow on the ground, (whether falling in one storm or the accumulation of several storms) our record extends back to 35 years, and during the first half of that period there were four winters when a depth of more than 10 inches lay on the ground and the same number in the last half of the record. The greatest depth of snow on the ground in the first half of the record was only seven-tenths of an inch greater than in the last half. It appears from the above data that as far as snowfall is concerned winters of recent years are just as severe as they ever were.

Moderating Tendency in Temperature

Let us take next the element of temperature as shown by the average of the three winter months, December, January and February, for the entire period of record—1871 to 1928. This will show whether the average or mean temperature for the entire winter has a tendency to moderate or not. The temperatures used are those of Keokuk, Iowa, and while they might be representative of other sections as well, they actually show only local conditions. The 57 winters of record were averaged in groups of ten beginning with the winters of 1871 to 1880, making five

decades, with 7 years left over at the end of the record. The average for the winters by decades were as follows: first decade 27.9 degrees, second decade 26.9 degrees, third, 27.0 degrees, fourth, 27.5 degrees, fifth, 27.5 degrees, and the average for the last 7 winters 29.6 degrees.

It will thus be seen that the first ten winters averaged the highest temperature of any group except the last 7 which were decidedly higher than any other group. It is also evident that if we omit the first decade, the last 47 winters point toward a moderating tendency of average winter temperatures. If only the first two or three decades were considered the conclusions would have been that winters were growing colder. But taking the entire 57 year record, there is a slight upward trend in mean temperatures.

This is shown clearly when we divide the record into halves and it is found that the mean temperature of the first 28 years is 27.2 degrees, while that of the last 28 years is 28.1 degrees. (Since there was an odd number of years, the 29th year was omitted to make an equal division, and incidentally, the 29th year was exactly normal.)

The normal winter temperature for the three months is 27.7 degrees as determined from the 57 years record. During the first 28 years there were 16 winters below normal in temperatures and only 12 above normal, while in the last 28 years there were only 12 winters below normal and 16 above normal, which also indicates a moderating winter temperature. On the other hand we find both the coldest and warmest winters occurring in the first half of the record.

January Used as Gauge

Probably the severity of a winter might be gauged by the mean temperature of the coldest month, January. In considering the mean temperature of January over the 57 year period we find the average for the first 28 years is 23.7 degrees, while for the last 28 years it was 26.4 (the 29th year was omitted as above). In the matter of normal temperature we find in the first 28 year period 16 Januaries below normal and 12 above normal, while in the last 28 years there were 7 below normal and 21 above normal, which is strongly in support of the moderating tendency of our winters. But in direct contradiction we find that the warmest January of the entire record was in the first half of the period, 1880, and the two coldest Januaries in the 57 years were in the last half of the period, 1912 and 1918, each were a mean temperature of 12 degrees. These were exceptional months, however, and do not necessarily show average conditions.

Another indication of the severity of a winter is the number of days on which extremely low temperature occurs. In the 57 winters of record we find that the temperature fell to zero or lower on 489 days, and 283 of these days were in the first 28 year period, or an average of 10 days per winter in the last 28 years the temperature fell to zero or lower on only 198 days or an average of 7 days per winter. (The 29th winter was omitted as above). We find also that the winter with the greatest number of days with zero temperature occurred in the first period of 1884-5 with 34 days. Both periods had two winters in which temperature never reached zero.

Record Made in February

In the matter of extreme low temperatures, the lowest of the entire record, 27 degrees below zero, occurred in the last half of the record, but it also occurred in the month of February, which tends to show that it was an abnormal condition. We find that there were 7 winters in the first 28 when the temperature fell as low as 20 degrees below zero, while in the last 28 winters only 4 had temperatures of 20 degrees below zero.

In summing up our conclusions on temperatures, there does seem to be a real tendency toward moderation of our extreme winter temperatures, and there must be a definite reason for that tendency. It will be seen from the foregoing data that the tendency toward moderation is less pronounced when we consider mean temperatures for the entire winter, than it is when extreme low temperatures are considered, or temperatures over a shorter period such as the month of January. Undoubtedly the explanation of that is to be found in the reason for the moderation of temperatures.

Cold Waves Responsible

All temperatures in this section which approach zero or fall below zero are, what might be called abnormal, that is, they would not occur here under the average daily and seasonal fluctuations of temperature, and are always produced by a cold wave moving over this section from the colder areas to the north or northwest. If we can then find a cause which has moderated, even to a slight extent, the severity of cold waves, its result would be to show a more marked moderation when extreme temperatures are considered, and a less pronounced moderation when mean temperatures for the entire winter are considered. That is, the moderation would be more apparent on the extremely low temperatures, and this would tend to raise to a lesser extent the mean temperature for the entire winter, and that is exactly what has occurred over the 57-year period.

Civilization An Aid

The theory usually advanced for moderation of winters in the population and civilizing of the country and undoubtedly therein lies the explanation of it. When this record began, Iowa was largely an open prairie and the northwest winds swept, unhampered, across the plains, while in the last half century groves of trees have been planted on almost every farm in the State, and these in the aggregate must offer considerable resistance to the movement of cold air over the state. The theory that the heating of homes has an influence on severe winter temperatures has also been advanced, but it seems that such an effect would be very small, but whatever the influences are their effect has not been very great and it should not be expected that winter temperatures will continue to moderate to an appreciable extent.

It must not be overlooked that even a 57-year record is not necessarily a true indication of the tendency of the climate, and possibly a record of a hundred years would show an entirely different result, and it should not be assumed that modern winters will not be as severe as they were 50 years ago, for the conditions of any particular winter can not be predicted from the past winters or average winters.

MONTHLY STATE DATA FOR 1928

MONTH	Barometric Pressure Inches (Sea Level)			Temperature Degrees, F.			Rel. Humidity, Per Cent.			Precipitation, Inches			Number of Days			Sunshine			Wind					
	Mean	Highest	Lowest	Mean	Normal	Highest	Lowest	7 a. m.	7 p. m.	Normal	Average	Departure from normal	Greatest	Least	Snowfall	With or without more precipitation	Clear	Partly cloudy	Cloudy	Per cent of the possible amount	Departure from normal	Average hourly velocity	Prevailing direction	
January	30.11	30.59	29.23	28.2	+6.4	70	20	82.07	71	0.17	-0.90	1.04	0.0	0.0	15	15	15	0	0	83	+12	7.3	NW.	
February	30.11	30.30	29.56	28.6	+6.0	65	23	82.04	71	0.22	-0.15	2.97	4.4	4.4	15	15	15	0	0	83	+3	8.0	NW.	
March	30.00	30.51	29.31	36.9	+4.3	58	1	77.05	57	1.44	-0.22	2.75	3.0	3.0	9	9	9	0	0	83	+3	7.3	NW.	
April	30.30	30.43	29.34	44.3	+2.6	83	2	79.56	52	2.94	-0.72	4.37	0.22	4.9	6	6	6	0	0	83	+3	6.3	NW.	
May	30.30	30.33	29.50	62.6	+2.0	83	3	79.64	44	4.23	-0.11	3.55	0.31	0.31	12	12	12	0	0	83	+3	6.5	NW.	
June	30.28	30.31	29.63	71.0	+0.9	83	4	78.82	33	4.83	-0.31	3.23	0.65	0	10	10	10	0	0	83	+3	6.5	NW.	
July	30.28	30.31	29.63	71.0	+0.9	83	4	78.82	33	4.83	-0.31	3.23	0.65	0	10	10	10	0	0	83	+3	6.5	NW.	
August	30.00	30.37	29.30	72.7	+1.0	100	3	77.84	55	3.03	0.43	2.08	12.80	1.16	0	18	18	18	0	0	83	+3	6.1	N.
September	30.00	30.40	29.30	60.5	+3.8	93	3	74.81	48	4.92	3.06	-0.59	9.86	1.04	0	19	19	19	0	0	83	+3	6.1	NW.
October	30.05	30.69	29.39	54.7	+2.4	93	1	77.89	50	3.69	+1.22	7.38	1.48	0.1	6	6	6	0	0	83	+3	6.8	NW.	
November	30.10	30.78	29.38	38.7	+4.1	79	8	81.67	72	0.89	3.83	+2.28	6.58	0.72	6	15	15	0	0	83	+3	6.0	NW.	
December	30.11	30.37	29.45	28.7	+4.6	57	13	83.09	70	0.28	0.89	-0.25	1.58	0.12	3.3	6	6	6	0	0	83	+3	6.0	NW.
Means and extremes.	30.02	30.83	29.27	49.4	+1.4	100	50	79.57	62	35.96	+3.55	12.80	T.	T.	3.5	88	180	89	97	62	+3	7.0	NW.	
Normals and records.	30.02	31.06	28.09	48.0	...	...	...	...	...	32.13	...	19.50	0.04	10.7	85	100	101	88	59	...	...	...	...

†Local mean time. *Normal central time. †7 a. m. and 7 p. m. observations only. †And other dates.

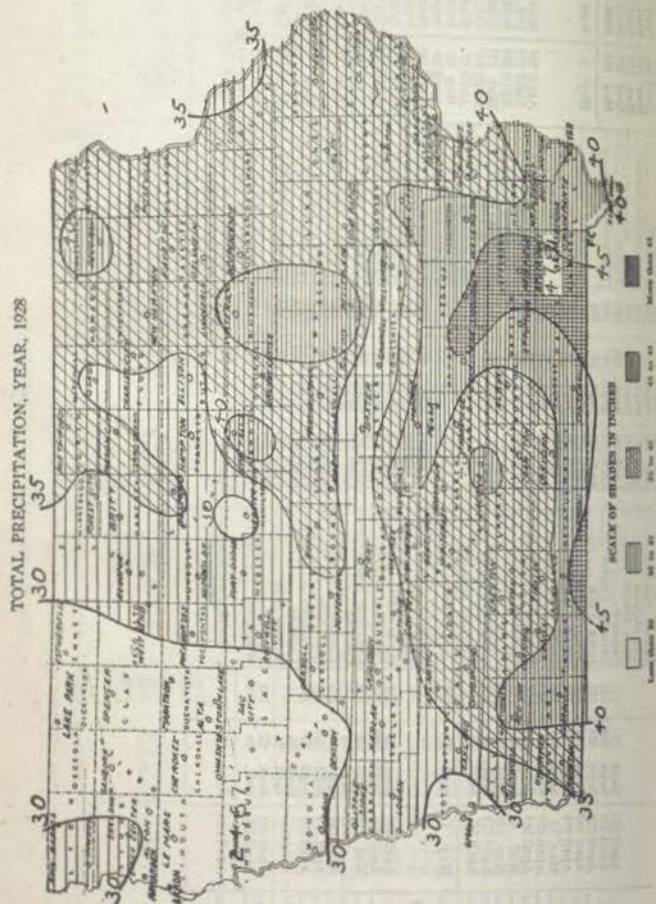
DATES OF KILLING FROSTS, 1928

Charles City, Davenport, Des Moines, Dubuque, Keokuk, Sioux City, Omaha and Marshalltown excluded from average because of city influences.

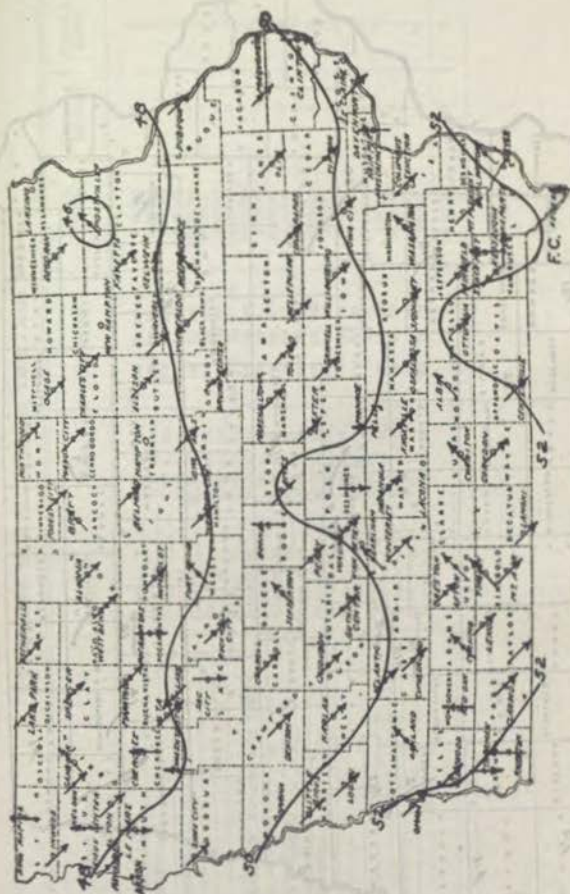
Northwest District				North Central District				Northeast District			
STATIONS	Last in Spring	First in Autumn	Days in growing season	STATIONS	Last in Spring	First in Autumn	Days in growing season	STATIONS	Last in Spring	First in Autumn	Days in growing season
Alta	April 27†	Sept. 25	151	Algona	April 27†	Sept. 23	149	Decorah	June 10†	Sept. 26	118
Alton	May 14	Sept. 25	147	Allison	April 28†	Sept. 25	150	Dubuque	April 20	Oct. 26	189
Cherokee	April 26†	Sept. 23	150	Belmond	May 12†	Sept. 25	136	Fayette	May 12†	Sept. 24	135
Estherville	May 12†	Sept. 25†	136	Britt	Sept. 25†	Sept. 25†	136	Independence	May 11	Sept. 25	148
Inwood	May 31	Sept. 23	145	Charles City	April 28	Sept. 27	152	New Hampton	April 28†	Sept. 26†	151
Lake Park (near)	May 11†	Sept. 23	135	Forest City	April 28†	Sept. 23†	145	Oelwein	May 12†	Sept. 25	139
Le Mars	May 12†	Sept. 23†	134	Hampton	May 12†	Sept. 25	136	Postville (near)	May 12†	Sept. 25†	136
Pocahontas	May 12†	Sept. 23†	134	Humboldt	May 12†	Sept. 26	137	Waterloo	May 12†	Sept. 25†	136
Rock Rapids	May 12†	Sept. 27†	133	Mason City	April 27†	Sept. 26†	151	Waverly	May 12†	Sept. 25†	136
Sanborn	May 12†	Sept. 23	134	Northwood	April 27†	Sept. 26†	151	Rural Average	May 14	Sept. 25	137
Sheldon	May 1†	Sept. 23	145	Osage	April 28†	Sept. 26†	145	East Central District			
Sioux Center	May 1†	Sept. 23†	145	Rural Average	May 2	Sept. 25	145	Belle Plaine	May 12†	Sept. 25	126
Spencer	May 12†	Sept. 23	134	Central District				Cedar Rapids	May 12†	Sept. 24	135
Storm Lake	April 27†	Sept. 25†	151	Ames	April 28†	Sept. 26†	151	Clinton	May 12†	Sept. 24	135
Washta	May 28†	Sept. 23	118					Davenport	April 15	Oct. 28	196
West Bend	May 12†	Sept. 23†	134								
Rural Average	May 8	Sept. 24	139								

West Central District				South Central District				Southeast District			
STATIONS	Last in Spring	First in Autumn	Days in growing season	STATIONS	Last in Spring	First in Autumn	Days in growing season	STATIONS	Last in Spring	First in Autumn	Days in growing season
Audubon (near)	April 27†	Sept. 25	151	Afton	April 27†	Sept. 26†	152	Bonaparte (near)	April 28†	Sept. 26	151
Carroll	April 27†	Sept. 25†	151	Albia	April 27†	Oct. 25†	181	Burlington	April 27†	Oct. 28†	184
Denison	April 27†	Sept. 25†	151	Centerville	April 27†	Sept. 25	151	Columbus Junction	April 28†	Sept. 26†	151
Guthrie Center	April 28†	Sept. 25†	136	Chariton (near)	April 27†	Sept. 25	151	Fairfield	May 12†	Sept. 26	137
Harlan	April 27†	Sept. 25†	151	Corydon (near)	April 28†	Sept. 25	150	Keokuk	April 15	Oct. 29	197
Jefferson	May 12	Sept. 25†	136	Creston	April 28†	Sept. 25	150	Keosauqua	April 28	Sept. 26	151
Little Sioux	April 27†	Sept. 25	151	Earham (near)	May 28†	Sept. 25	130	Mt. Pleasant	May 12	Sept. 26	137
Logan	April 28†	Sept. 25†	150	Indianola	April 28†	Sept. 26	151	Oskaloosa	April 28	Sept. 26	151
Onawa	May 14	Sept. 25	144	Knockville	April 28†	Sept. 26†	151	Ottumwa	April 28†	Sept. 25†	151
Rockwell City	May 12†	Sept. 25†	136	Lamoni	April 27†	Sept. 25	151	Sigourney (near)	April 28†	Sept. 26	151
Sac City	April 27†	Sept. 25	151	Mount Ayr	April 27†	Sept. 25	151	Stockport (near)	May 12†	Sept. 26	137
Sioux City	April 17	Sept. 25	161	Tingley	April 27†	Sept. 25	151	Washington	April 28†	Sept. 25†	150
Rural Average	May 1	Sept. 25	147	Winterset	April 27	Sept. 23	149	Wever	Sept. 24	Sept. 24	150
Southwest District				Rural Average	April 27	Sept. 27	151	Rural Average	May 2	Sept. 28	150
Atlantic	April 27†	Sept. 25	151					State Average, 1928	May 5	Sept. 25	145
Clarinda	April 28†	Sept. 26†	151					State Normal	May 3	Oct. 5	155
Corning	May 12†	Sept. 25	136								
Cumberland (near)	Sept. 25	Sept. 25	136								
Glenwood	April 28†	Sept. 25	150								
Lemox	April 27†	Sept. 25†	151								
Oakland	April 28†	Sept. 25	150								
Red Oak (near)	Sept. 25	Sept. 25	136								
Riverton (near)	Sept. 25	Sept. 25	136								
Thurman	April 28†	Sept. 25	150								
Omaha, Neb.	April 19	Oct. 29	198								
Rural Average	April 30	Sept. 25	149								

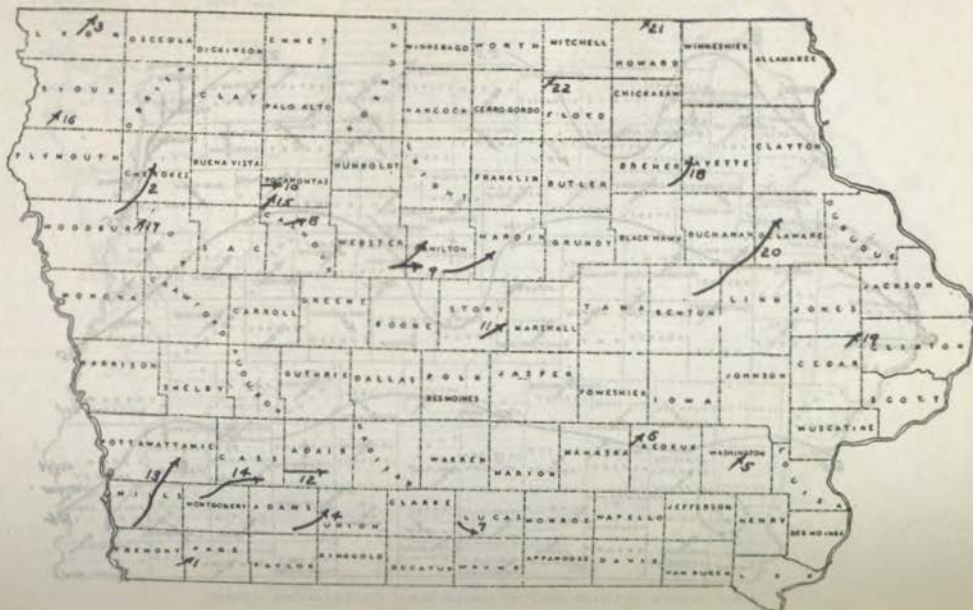
†Date of last temperature of 32° or lower in the Spring, or first temperature of 32° or lower in the Autumn (as the case may be) when frost was not reported.



MEAN ISOTHERMS AND PREVAILING WINDS, YEAR, 1928



TORNADO PATHS IN IOWA DURING THE YEAR, 1928



TORNADOES IN IOWA DURING THE YEAR 1928

Nearest Towns	Date	Time	Direction	Length of Path	Persons Injured	Persons Killed	Estimated Damage
1. Farragut to Shenandoah	April 4	3:45 p. m.	sw. to ne.	4 miles	0	0	\$ 4,500
2. Moville to Cherokee	May 2	7:30 p. m.	sw. to ne.	10 miles	4	0	450,000
3. Rock Rapids	June 12	3:00 a. m.	sw. to ne.	3 miles	0	0	3,000
4. Corning to Creston	June 18	7:30 p. m.	sw. to ne.	6 miles	0	0	135,000
5. Washington	June 22	10:30 a. m.	sw. to ne.	3 1/2 miles	0	0	2,000
6. What Cheer	June 22	1:30 p. m.	sw. to ne.	1 mile	0	0	7,500
7. Derby	June 28	4:00 p. m.	sw. to ne.	3 miles	0	0	3,000
8. Jolley	August 20	5:00 p. m.	w. sw. to e. ne.	5 1/2 miles	0	1	150,000
9. Stratford to Radcliffe; Stratford to Kamrar	August 20	6:00 p. m.	sw. to ne.	55 miles	6	1	110,000
10. Varina	August 20	4:00 p. m.	w. to e.	6 miles	0	0	15,000
11. Nevada	August 20	4:00 p. m.	w. to e.	10 miles	1	0	50,000
12. Bridgewater to Greenfield	August 26	6:00 p. m.	sw. to ne.	4 miles	0	0	2,000
13. Malvern to Oakland	August 26	8:00 p. m.	w. to e.	10 miles	4	0	415,000
14. Red Oak to Massena	August 26	5:30 p. m.	sw. to ne.	10 miles	4	4	210,000
15. Fonda	September 15	6:00 p. m.	sw. to ne.	4 miles	1	0	40,000
16. Ireton	September 15	5:00 p. m.	sw. to ne.	6 miles	0	0	20,000
17. Correctionville	September 15	6:00 p. m.	sw. to ne.	1 mile	0	0	7,000
18. Westgate	September 14	4:50 p. m.	sw. to ne.	17 miles	0	0	60,000
19. Lowden	October 4	8:00 p. m.	sw. to ne.	1 mile	0	0	4,000
20. Vinton to Manchester	November 14	5:00 p. m.	sw. to ne.	33 miles	9	1	300,000
21. Chester	November 14	5:30 p. m.	sw. to ne.	Short	0	0	3,000
22. Nora Springs	November 14	4:00 p. m.	sw. to ne.	Short	0	0	2,000
Total				208 miles	29	8	\$ 2,001,000

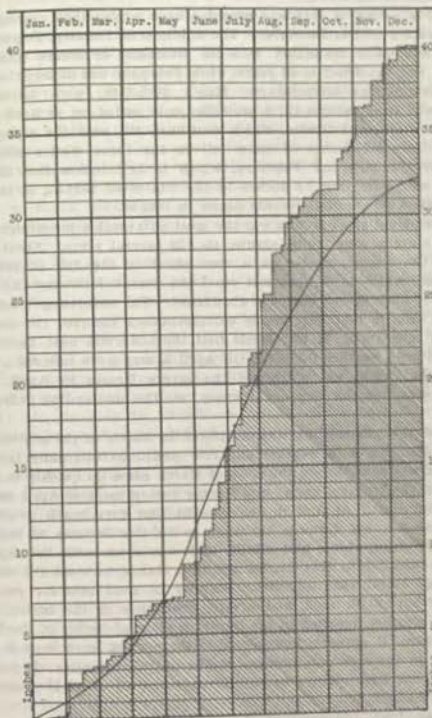
ANNUAL REPORT OF THE COMPARATIVE DATA FOR THE STATE—ANNUAL

Year	Temperature			Precipitation in Inches		
	Mean annual	Highest	Lowest	Annual	Greatest annual	Least annual
1873	46.1	100	August 31	—	—	—
1874	47.7	101	July 5	—	—	—
1875	45.3	97	July 16	—	—	—
1876	45.9	96	August 24	—	—	—
1877	48.4	100	—	—	—	—
1878	50.0	104	—	—	—	—
1879	48.9	103	—	—	—	—
1880	47.9	104	—	—	—	—
1881	47.5	104	—	—	—	—
1882	48.4	98	—	—	—	—
1883	44.8	100	—	—	—	—
1884	46.0	96	—	—	—	—
1885	44.7	102	July 30	—	—	—
1886	46.4	102	July 13	—	—	—
1887	46.6	105	July 29	—	—	—
1888	45.3	110	August 2	—	—	—
1889	45.0	104	August 30	—	—	—
1890	47.5	119	July 13	—	—	—
1891	47.3	106	August 9	—	—	—
1892	46.6	104	July 11	—	—	—
1893	45.7	102	July 3	—	—	—
1894	49.7	109	July 26	—	—	—
1895	47.2	104	May 28	—	—	—
1896	48.6	104	July 2	—	—	—
1897	47.8	106	July* 23	—	—	—
1898	47.7	103	August 30	—	—	—
1899	47.3	104	Sept. 6	—	—	—
1900	49.2	103	August 3	—	—	—
1901	49.0	113	July 22	—	—	—
1902	47.7	98	July 27	—	—	—
1903	47.2	102	August 14	—	—	—
1904	46.2	100	July 15	—	—	—
1905	47.3	104	August 11	—	—	—
1906	48.4	102	July 23	—	—	—
1907	47.4	102	July 2	—	—	—
1908	49.4	101	August 3	—	—	—
1909	47.4	103	August* 15	—	—	—
1910	48.6	108	July 16	—	—	—
1911	49.5	111	July* 3	—	—	—
1912	46.2	104	Sept. 8	—	—	—
1913	49.7	108	July 16	—	—	—
1914	49.1	104	July 12	—	—	—
1915	47.8	99	May 14	—	—	—
1916	47.2	100	August 4	—	—	—
1917	44.8	100	July 30	—	—	—
1918	49.2	113	August 4	—	—	—
1919	48.6	104	July* 30	—	—	—
1920	48.2	102	July 22	—	—	—
1921	52.2	104	July* 11	—	—	—
1922	50.2	104	June 23	—	—	—
1923	49.0	102	July* 22	—	—	—
1924	46.4	100	August* 31	—	—	—
1925	48.8	106	July* 1	—	—	—
1926	48.3	100	July* 19	—	—	—
1927	48.8	102	July 11	—	—	—
1928	49.4	100	August 1	—	—	—
M'n	47.7	—	—	31.85	—	—

*And other dates.

PRECIPITATION Des Moines, Iowa

Line bounding shaded area shows accumulated depth in inches, 1928
Smooth curve shows normal



Total for 1928, 40.15.

Normal, 22.08.

WEATHER AND CROP REVIEW, 1928

The following outstanding features of the crop season of 1928 in Iowa have been taken from the published reports and files of the Weather and Crop Bureau of the Iowa Department of Agriculture, and the Bureau of Agricultural Economics, and Weather Bureau of the United States Department of Agriculture.

The crop season of 1928 was preceded by a winter that averaged mild though rather cold in December. The mildness of January, February and March, was quite noticeable, with no prolonged or severe cold spells. January was the driest in 56 years, while February was among the wettest ones. Summerlike temperatures, March 20th-25th, were followed by rather mild temperatures till a prolonged cold period set in April 5, with severe and frequent freezes, which continued till near the close of the month. Only 9.7 inches of snow fell in the three winter months of December, January and February, which is 10.0 inches less than the normal, and, excepting 9.5 inches in the winter of 1921-22, is the least since State-wide snowfall records began in 1892-93.

This combination of factors was the most unfavorable for winter wheat, grasses, clovers, cane fruits, shrubs, etc., in several years. About 23 per cent of the acreage seeded to winter wheat in the fall of 1927, was abandoned, which is the greatest since the season following the winter of 1916-17, when 62 per cent was abandoned. The surprising thing about the 1928 crop is that our weekly correspondents reported the conditions good till into April. It is possible that the abnormal heat March 20th-25th, and mild weather following till April 5, may have induced a tender growth that could not withstand the severe freezes in April. These temperatures, and the very dry January, are the outstanding unfavorable features.

Much of the oats seeding was completed in March in the southern and western districts, with weather and soil conditions unusually favorable. Seed that was sown before the close of March came up quickly to a good stand, but the frequent snows and freezes during most of April gave the crop a bad start. At first it was thought that very much would have to be reseeded, but farmers hesitated to do this because of the large amount of grass, clover and alfalfa that was sown with the oats, and favorable weather in May caused the thin stands to stool till the crop turned out better than expected. Scarcity of good oats for reseeding, plenty of barley for seed, and greater resistance of the barley to unfavorable weather, resulted in the largest acreage of barley in the history of the State. It appears, however, that there must have been a strong intention to increase oats acreage at the outset, for after all was said and done, our later reports on oats acreage showed about the same area seeded as in 1927.

The cool June and moderate temperatures in July, with plenty of moisture, caused oats to make a wonderful recovery. The heads stood well, the season of growth was prolonged to a rather late harvest, and the estimated yield is placed at about 40 bushels per acre, which is 45 bushels above the average of the preceding 10 years, the largest since 1917, and exceeded but twice in the history of the State.

The yield of barley is estimated at 33.5 bushels per acre, which is 5.5 bushels above the average of the last 10 years, and has never been exceeded except in 1917, when the yield was 34.7 bushels per acre. On the 71 per cent of the acreage of winter wheat that was considered sufficiently promising to let grow, the yield per acre was about 19.5 bushels, which is near the 10-year average.

Rust, smut and other diseases of small grain, were notably scarce, though the weather at times seemed favorable for their development, and barley was considerably affected by scab. By some it is thought that the same unfavorable conditions that caused the unusual winter killing, may have destroyed the spores of the rusts and smuts.

Frequent and heavy rains in July made harvesting difficult, and a continuation of those conditions in August greatly damaged shocked grain. There was, however, a noticeable prevalence of rain at night, and of sunshine in the daytime. The high humidity and the intense sunshine caused an unusually large number of deaths of horses in harvest. This is, no doubt, partly due to the steady advance in the average age of farm horses resulting from decreased production of colts in recent years.

Preparation for corn planting made little progress till near the close of April, when it was done with a rush, and scattered planting was reported as far north as Marshall county in the closing days of the month. Warm, mostly dry and unusually sunny weather in the three weeks ending May 14, were exceptionally favorable for preparing the seed bed for corn and for planting, which was mostly done before the rainy week which followed. The average date of planting was May 12, two days earlier than usual, in contrast with the average date in 1927, which was May 21. On May 15, 63 per cent of the planting was completed, which is 12 per cent above the 10-year average and 35 per cent more than last year. Only two per cent remained to be planted at the end of May, compared with 22 per cent last year. The high quality of the seed and the warmth and moisture that followed planting, brought the corn up quickly to an excellent stand. Much had received the first cultivation by the close of May.

Though June was as cool as the record cool June of 1916, and was more rainy than usual, the rains were mostly at night, and were so spaced that cultivation was not greatly retarded. While the weeds did not make much growth, the corn grew well in spite of the coolness, due probably to its excellent start in May. By the close of June it averaged nearly knee high, with some waist high and laid by.

With both temperature and rainfall slightly above normal in July, for the first time in 56 years, and with both above normal in August, corn made the most luxuriant growth of stalks and leaves ever seen in Iowa. Cool weather predominated in September, with most of the rain from the 10th to the 14th, and general killing frosts 23d-26th, which caught only 10 per cent of the corn unprepared, though the frost came 10 days earlier than usual.

Southerly gales October 10th-11th blew down much corn, particularly in the western portion of the State. Wet weather after October 10th

and at intervals in November, with a heavy snowstorm on Thanksgiving day over a wide belt from southwest to northeast across the State, greatly interfered with corn husking. Fields were too soft to haul wagons or husking machines through.

For the first time, the Weather and Crop Bureau of the Iowa Department of Agriculture has made an extensive study of the moisture content of new corn in farmers hands. The average moisture content of 170 samples, from 94 counties, on an average date of about November 22, was 19.8 per cent, ranging from 18.6 per cent in the southwest district, to 22.8 per cent in the northeast district. A large number of the samples were well within the limits of Grade 3 in the western third of the State, and in the central portion. To place Iowa's corn crop on a No. 2 contract grade basis, it would be necessary to reduce the moisture content to 15.5 per cent. Theoretically, this would make the average yield 614 bushels per acre and the total production 451,789,000 bushels of No. 2 corn. It is the Bureau's intention and hope to be able to continue these studies so that we will be able to compare one year with another. So far as we know, no other State has attempted this work on so broad a scale. The samples were gathered by volunteer cooperators.

The average farm price of corn on December 1, 1928, is 67 cents per bushel, making a total value of \$318,928,000, or about 18 per cent more than the value of the 1927 crop. Iowa is very favorably situated this year in having a large crop, while most of the rest of the United States has about an average crop or less. Only five other large corn producing states, Illinois, Missouri, Kansas, Oklahoma and Texas, have a crop this year larger than their 5-year average.

The foreign demand for corn seems to be quite active; in fact so official reports have indicated that some Iowa corn has already (December 12) been shipped to the Atlantic seaboard for export. It is unusual that Iowa has corn of a quality suitable for foreign shipment at this time of the year.

The acreage of oats for 1928 is estimated to be exactly the same as was reported in 1927, but a somewhat higher yield per acre makes the total crop 240,040,000 bushels, which is 25 per cent greater than reported for 1927. The price on December 1, 36 cents is 6 cents less than the price on December 1, 1927, making the total value for 1928, \$86,414,000 compared to \$80,653,000 in 1927.

The total production of barley in 1928 is estimated at 27,068,000 bushels, which is 90 per cent greater than the 1927 crop. The price, however, is 12 cents per bushel less than last year. Some complaint has been received that hogs have become sick when fed whole barley from Iowa. Some of this complaint has come from as far away as Germany. However, it is believed that the bulk of the crop is of reasonably good quality, and the poorer quality can be fed to either cattle or hogs by grinding or cooking, without ill effects.

The total production of tame hay is estimated at 4,203,000 tons, a decrease of 19 per cent from last year. The total value of tame hay is estimated at \$54,639,000.

Spring wheat, flax seed, timothy seed, clover seed, tame hay, wild hay

and buckwheat, are the only crops showing a decrease in total production, most of which is due to a decrease in acreage. Nine other crops show substantial increases in total production, as does the total value of fruit, garden truck and miscellaneous crops. Practically all of the most important crops, except tame hay, show a lower price per unit than on December 1 last year.

Bulletin No. 1, April 10, 1928—

A wintry December with wheat fields and meadows blown bare of snow by high winds, the driest of 56 Januarys and drouth March 13th-25th, with summer temperatures, 21st-25th, killed winter wheat, alfalfa and newly seeded grasses and clovers to a greater extent than the mild temperatures since January 1st and the abundant moisture of February would indicate. Later reports are less favorable than earlier. Live stock wintered well, except some became rather thin in the eastern counties due to a shortage of concentrates in their rations. Rough feed was plentiful. There was considerable hog "flu" early in the winter. Until the latter part of March conditions were unusually favorable for young pigs, lambs and chicks. Bees wintered well.

Favorable weather in March gave spring work an unusually early start. By March 25th oats, barley, spring wheat and other spring seeding was nearing completion in many southern and western counties and a good beginning had been made as far north as Osceola and Kossuth counties. A large increase in barley acreage is indicated. Hauling manure, disking, plowing and other preparations for corn planting were making rapid progress. Then came the heavy rains and snows of March 26th and 29th which stopped field work and only a little was done on April 2d and 3d when a stormy period with heavy rains or snows set in over most of the state, except the extreme northwest counties followed by a severe freeze on the 8th and 9th.

While this moisture was beneficial to winter wheat which is a minor crop and to grasses, it and the frozen soil caused delay that more than offset the early start in preparation for Iowa's main, great crop—corn. Any heavy precipitation between April 1st and May 25th is detrimental to corn. Iowa's greatest crop more often suffers from too much than too little moisture in the spring.

During the past week the temperature ranged from abnormally warm at the beginning to abnormally cold at the close with the average 41.6 degrees, only 3.7 degrees below normal. On the morning of the 9th temperatures of 10 degrees above zero were general from Buena Vista to Webster counties and northeast to Hancock county. In a good many localities the temperatures were the lowest of record so late in the season. Ice two inches thick was reported. The heavy snow of the 6th-7th, amounting to from 6 to 10 inches, from the extreme southwestern counties northward to Buena Vista and Wright counties, had not disappeared when the severe temperatures came, and therefore afforded considerable protection, but in most of the state the snow had melted. Roads were blockaded in the area of heavy snow. Young animals suffered greatly from the inclement weather.

Oats were up and showing green in southern and western counties when the severe freeze came. No doubt considerable damage has been done. The problem of reseeded is complicated by the large amount of grass and clover sown with the oats. A good beginning has been made in spring seeding in the more backward northeastern counties and the work is from 50 to 35 per cent completed in the central and northwestern counties.

Seed corn testing shows an average of 93 per cent strong, slightly better than last year. The test is even better in the southeast and east central counties where the corn last year was belated and poor, which indicates unusual care and effort in selecting seed.

Apricot, peach and early plum blooms were open in the extreme southern

counties when the severe freeze came, and they are probably killed. Apple buds are generally dormant and believed to be safe. A good many gardens and some potatoes were planted in March.

Small tornadoes were reported on April 4th in Jasper, Page and Mahaska counties; and heavy hail was reported from many localities. The most severe hail reported was at Webster City where the tops of about 400 automobiles were ruined and roofs, windows and greenhouses were seriously damaged. Some of the hail stones measured two inches in diameter.

Bulletin No. 2, April 17, 1928—

Rain or snow on several days in all portions of the State with heavy blockading snows in the northern portion on the 12th, 13th, and abnormally low temperatures, made the past week one of the most unfavorable in several years. Temperatures on the mornings of the 14th and 15th were the lowest ever recorded so late in the season in much of the State. The lowest reported was 8 degrees above zero at Forest City on the 15th. The average temperature for the State for the week was 39.0 degrees or 11 degrees below normal.

Oats, Iowa's second largest crop, are probably in the worst situation since the spring of 1921. No one can accurately estimate the amount of damage, which varies according to the state of advancement. Some were lay uncovered on top of the ground when the snows, rains and freezes set in and some of these gathered up and tested showed a germination of only 25%. In the southern counties some of the oats were up and green and seem to have withstood the freezes pretty well. Much of the oats was just swelling and in the milky, early germination stage and believed to have been damaged most of all by the frequent freezing of the ground. A few days of warmer weather would enable farmers to judge the extent of damage so they could tell what to do about it, but the long continued freezing does not allow the oats to develop and is leaving them uncertain till it will soon be too late to do anything. Where there is a prospect of a 50% stand, reseeding will probably not be done, because of the expensive grass and clover seed that was sown with the oats. Conditions are backward in the northeast counties.

Preparations for corn planting are at a standstill and this condition is more general than last spring when it was confined largely to the eastern counties. The soil is too wet to plow in nearly all sections and has been frozen or snow covered much of the past two weeks. Winter wheat and such grasses and clover as survived the winter, are holding their own but not making much advancement. Alfalfa was frozen down considerably in the recent freezes.

Fruits continue dormant over most of the State but have been seriously damaged in some localities.

Young pigs, lambs and chicks have suffered seriously from the recent inclement weather and losses have been heavy. Feeding of live stock has been on a winter-time basis for two weeks.

Bulletin No. 3, April 24, 1928—

Another cold week with the ground frozen almost every morning over most of the State, was very unfavorable for crops and farm work. However, the precipitation was less than normal, except in some north central and northwest counties which favored plowing for corn.

Much reseeding of oats has been done but considerable seeding and reseeding remains to be done and this crop is generally belated with prospects of a poor stand. Drilled oats are doing better than broadcast seeding. In some localities good seed oats for reseeding are scarce. This is increasing the acreage of barley which seems to have stood the freeze better than oats. Some intended oats acreage will be plowed up and sown to corn. In a few favored localities, mostly on uplands, the oats are up and showing green but making slow progress. Most of the oats have lain in the ground ungerminated for three weeks or more.

Further reports of winter wheat being killed out are being received. Along the Missouri River from Woodbury county southward, the weather has been dry for nearly a month, the soil is being blown away from the roots of the wheat, there has been considerable recent damage by alternate freezing and thawing; and much will be plowed up and put in corn.

Plowing and preparations for corn planting made some progress in the southern and western counties; and in the extreme southwest counties a little planting would be done in the next few days if the weather would warm up. With favorable weather, preparations for corn planting would soon catch up to normal.

Alfalfa has been repeatedly cut down by the freezes so that the first cutting will probably be late and short. Clover has also been seriously set back. Grasses are slow, probably not much further advanced than a month ago.

Live stock are still generally on winter feed which is getting short in some localities. Losses of pigs, lambs and chicks have been heavy during the recent severe weather.

Fruits are generally in good condition, except some peaches and pears in the extreme southern counties. Cherries are in bloom in Lee county.

Bulletin No. 4, May 1, 1928—

Freezing temperatures continued every night till the close of the week. The ground was frozen in the mornings in the northern half of the State. With only sprinkles of rain and considerable wind the soil dried rapidly, and was in fine condition to plow. In fact the soil dried too rapidly for small grains in some of the western counties; the soil drifted badly and the air was filled with dust so as to dim the sunlight on Monday, April 30, over much of the State; and the dust and wind made field work disagreeable. The low temperatures made the work easier on horses. In the vicinity of Sioux City, April was the driest of record; and for the State it was among the colder Aprils.

Plowing for corn has made excellent progress and is 50 to 90 per cent completed except in a few localities and is fully up to normal. In the southern counties the ground is ready and awaiting a safe date for planting and some planting has been done. Planting has started as far north as Marshall county. Seed corn is of better quality than usual.

Oats generally show a poor stand and a late start. Seeding was generally finished this week. Considerable reseeding has been done. The outcome of a large acreage is still uncertain. It is getting late and most of the acreage that falls now will be plowed up and planted to corn or in the southern counties to soybeans. Oats, barley, spring wheat, meadows, pastures and winter wheat would be benefited by a good warm rain.

Bad reports on winter wheat continue. Occasional reports of Hessian fly probably indicate that this insect and not the weather may be responsible for much of the trouble, for the weather of the winter was not severe.

Grasses are no further advanced than they were a month ago, and will not afford much pasture for some time unless warm rains come soon. Feed is very short over much of the State. The abundant sunshine of the past week was good for pigs, lambs and chicks and the warmth of the last day or two was gratefully received.

Fruits have been beneficially retarded over most of the State though there has been some damage to early plums, cherries, peaches and pears in the extreme southern counties. Early plums are in bloom as far north as Des Moines. Gardening and gardens took a new start after being killed or lying dormant during the past month. Some sugar beets were planted in the Belmond sugar district.

Bulletin No. 5, May 8, 1928—

After four cold weeks, temperatures became normal or higher most of the past week. The average, 61.3 degrees, is 4.9 degrees above normal. Maximum temperatures well up in the 80's were general on the afternoon

of May 2, but in some localities were not as high as on March 21. Warm rains covered all but the southeastern one-third of the State on the 2d and 3d, amounting to more than two inches in several northwest counties. Rain is badly needed in the southeast counties. Sunshine was 11 per cent above normal. The rains were accompanied by violent local windstorms in localities in northwest Iowa. A tornado caused damage amounting to \$100,000 in and near Cherokee. There was also considerable damage near Moville.

Vegetation made a rapid advance. Trees and shrubs began leafing out rapidly. Plums are in bloom north of the center of the State and up into the Big Sioux Valley. Apples are opening in the central counties and in full bloom in the southern counties. Cherries are also blooming in the southern counties.

Preparations for corn planting made excellent progress with the soil in good condition, except in the southeast counties where it is too dry, breaking up cloddy, and cannot be worked down to a good seed bed till rain comes. Planting ranges from half done in a few localities in the extreme south to none planted in many northeastern counties. A beginning has been made in the Big Sioux Valley to Lyon county. The early planted corn has long sprouts and is about ready to burst through the ground in the southwestern counties. Further reports of seed corn testing show that the seed is of excellent quality.

Oats improved materially with the warmth and moisture over much of the State, but still show a poor stand on at least half of the acreage which will give the weeds a chance later. Barley has withstood the adverse conditions very well and is showing good stands generally. Winter wheat is patchy and of poor color though improved somewhat this week. Grasses and pastures showed marked improvement. In some localities the growth of pastures is sufficient to sustain live stock.

Gardens have been replanted and are up and making good progress.

Bulletin No. 6, May 15, 1928—

Mostly warm, dry weather made the past week the most favorable for corn planting in several years. From around the 90 degree mark in most of the State on the afternoon of the 9th temperature fell to freezing or lower with heavy frosts in much of the State on the morning of the 11th. Potatoes and tender garden truck were frozen to the ground or blackened and some strawberry blooms were damaged. Tree fruits were not injured. Apples are in bloom over much of the State.

Corn planting made excellent progress and now ranges from finished in some southern localities to half finished in the extreme north. In some localities in the northern tier of counties planting is 90 per cent completed. The earliest planted corn shows rows as far north as Wright county. In some counties, mostly in the eastern part of the State, the soil is too dry for germination, a good seed bed could not be prepared and planting has been deep to reach moisture. Showers on the 15th, though mostly light, will be beneficial.

Oats have made good progress where moisture is sufficient, but are badly in need of rain generally. Over much of the State the stand of oats is thin and patchy and will not average more than 75 per cent of normal. Barley and spring wheat are in slightly better condition. Winter wheat reports continue unsatisfactory.

Pastures and hay are making poor progress. The ground is hard and dry and cracking. Grass looks more like mid-summer than May. Live stock finds thin picking. Feed is becoming very scarce. The water supply for live stock is becoming very low in many localities.

Bulletin No. 7, May 22, 1928—

Timely and highly beneficial rains covered the State, though in about one-third of the State, mostly in the central counties from the Missouri to the Mississippi rivers, amounts exceeding two inches delayed corn plant-

ing and caused considerable erosion on rolling land. The dry southeast counties were well supplied with rain, but more is urgently needed in the south central counties. Temperatures averaged higher than last week and higher than the normal, but were not extremely high nor extremely low at any time.

For the State as a whole, the corn planting season has been unusually favorable. Drouth in the southeast one-fourth of the State made it difficult to prepare a good seed bed, but this trouble was generally relieved by the rains of the week. Corn planting has been completed or is nearing completion throughout the State somewhat earlier than in recent years. The earliest corn is up to a good stand. The warm rains coming after the bulk of the planting had been done, were especially favorable for quick germination, thereby practically eliminating long exposure of the seed to rotting, maggots, squirrels and other enemies, and giving the plants a good start in the race with cutworms, wireworms and grubs all of which have been troublesome in recent years. The favorable conditions for corn have also been favorable for weeds which are getting a good start. A good many early cornfields have already been cultivated once and conditions are favorable for weed killing. Only a little replanting is now necessary as a result of flooding and erosion.

Some oats acreage probably less than 5 per cent, having failed to make a satisfactory stand and showing, was plowed up and put into corn during the last 10 days. The remaining acreage has improved greatly as a result of the recent warm rains and is stooling nicely, but no amount of stooling can cover the large bare patches in most of the oats fields which are rapidly filling up with weeds.

Pastures, hay, garden truck and all miscellaneous vegetation and fruits, made a rapid advance during the week. The set of apples is reported as rather light in the southwest counties.

Bulletin No. 8, May 29, 1928—

For the fourth consecutive week temperatures have averaged above normal, a thing which has not occurred in May in more than 10 years. However, the weather turned cooler Saturday and Sunday and by Monday morning, the 23th, freezing temperatures, with frost on the lowlands, were reported in many localities, with some damage to potatoes, tomatoes, beans, strawberries, and other tender truck.

Rainfall of agricultural importance was confined mainly to Dubuque county and adjacent counties, though light showers and sprinkles covered the eastern half of the State. Rain would be beneficial in nearly all portions of the State, particularly for hay and pastures, but the drouth is not serious, except in about 10 south-central counties. Damaging hail was reported at Dubuque, Reinbeck and Oskaloosa. At the latter place, tomato plants in the commercial fields were cut down.

Corn is getting off to an excellent start in most of the State. Reports from 131 farms well distributed over the State show the average date of corn planting this year as May 10, about three days earlier than the average of the last eight years, and 11 days earlier than last year. Later reports may bring this year's average down slightly. Planting is nearly completed in contrast with last year when planting was continued at least three weeks later, and some intended acreage was not planted because it became too late. The warm, moist soil in most of the State brought the corn up rapidly to unusually good stands.

While there are a few reports of damage by cutworms on new sod, and by wireworms, moles and squirrels, and by erosion, and a little complaint of poor seed, there will be less replanting of corn than for many years. The first cultivation is half done in many counties and well under way throughout the State; and a beginning has been made on the second cultivation in some localities. The weather has been favorable for weed growth as well as weed killing, and some uncultivated fields are getting grassy.

Oats show continued improvement generally, though rain is needed, and

badly needed in some sections. The remaining acreage of winter wheat is doing well, for its roots, being deeper than those of spring grains, reach the subsoil moisture. Rye is headed generally. Spring wheat and barley are doing fairly well but need rain.

Bulletin No. 9, June 5, 1928—

Cool and mostly dry weather prevailed in the larger portion of the State though there were some good showers in the western portion early in the week, and in the very dry southeast portion on the night of the 4th-5th. Sunshine was slightly below normal. The drouth is becoming serious in much of the eastern two-thirds of the State.

Corn made rather slow growth, but cultivation made excellent progress. Nearly all has been cultivated once and the second cultivation is far advanced. The fields are generally free from weeds and the soil is in good tilth. There are a few reports of late planted corn lying ungerminated in the dry soil. While there are a few reports of damage by cutworms and other pests, the damage of this kind is much less than usual, and the stand is unusually good and uniform. The unfavorable spring for oats and the unusually favorable planting time for corn will probably bring the corn acreage back to what it was in 1925 or 1926.

Reports from about 900 crop reporters of the combined Government and State crop reporting services show that the condition of corn June 1 was 95 per cent, 6 per cent above the 10-year average, and 22 per cent above last year. On May 15, 63 per cent of the planting was done, which is 12 per cent above the 10-year average, and 35 per cent above last year. On June 1, 98 per cent of the planting was done, which is 4 per cent above the 10-year average, and 20 per cent above last year.

Winter wheat is heading in the northern and extreme western counties, for which the cool weather of the week was favorable. The condition of this crop shows improvement.

Oats, barley and spring wheat need rain, though the cool and somewhat cloudy weather of the past week has been favorable for stooing, and the showers that are falling in half of the State as this is being written will be helpful.

Early potatoes are in bloom in a good many places and would be benefited by more rain. A few late potatoes were planted this week. There was slight frost damage to potatoes in some localities on June 1. Other truck crops and gardens are needing rain. Strawberries are seriously needing rain, particularly in the commercial producing areas in Lee county. Reports on tree fruits are not very good.

Pastures are falling and this is cutting down the milk flow. Hay crop need rain. The first cutting of alfalfa and sweet clover is under way.

Bulletin No. 10, June 12, 1928—

Temperatures averaged 62.2 degrees or 5.4 degrees below normal and lower than three weeks ago. The drouth was broken in south central and southeast Iowa by generous to excessive rains on the night of the 11th-12th, and timely rains covered most of the rest of the State either on that date or on the night of the 11th-12th. As usual, the rains were excessive in localities where much damage was done by erosion and washing out the corn, but in general the rains were beneficial. Heavy hail storms, with hailstones as large as baseballs in some cases, were reported from many localities, but the damage to crops was rather small, tree fruits being the principal sufferers. Squall winds damaged trees, buildings and wires in many sections.

Corn made rather slow progress due to the low temperature, and in some sections to lack of rain. Cultivation went forward steadily. The earliest is being cultivated the third time while the latest has generally been cultivated once. The general condition, stand and advancement of the crop is very good to excellent and fields are generally clean of weeds. The tallest is 8 to 10 inches high, while a very little has been slow to germinate in

the dry soil and is scarcely showing through the ground. Some fodder and silo corn was planted this week.

Oats have badly needed rain in much of the State and it is questionable how much the recent rains will bring them out. They are heading short in some southern counties and are generally short everywhere. However, the cool weather has been favorable for stooing.

Winter wheat is headed generally and reports on conditions vary from very good to rather poor. The recent cool rains will be helpful.

Barley is beginning to head and looks fairly good.

Much alfalfa and sweet clover hay has been cut under favorable conditions for curing. The yield is only fair, having been reduced somewhat by the frequent freezes in April. Other hay will be short, for the rains came too late.

Strawberries were injured by the drouth in much of the State, yet the rains may help the late crop some, particularly in northern Iowa where they are just beginning to ripen. Blackberries are in full bloom in the east central district and the outlook for cane fruits is fairly good, though there was much winterkilling.

Early potatoes are in full bloom in the south half of the State and there are a few reports of potatoes big enough to use.

Bulletin No. 11, June 19, 1928—

With temperatures but slightly below normal and generous, well distributed rains, the past week was generally favorable for all crops. In some sections, particularly in the southwest and south-central districts, rains were excessive and locally damaging, and on the afternoon and night of June 12, there were many damaging windstorms and a few small tornadoes. The rain was needed, so most of it was absorbed by the soil and there was very little flooding or overflow but some erosion.

Corn made satisfactory progress. The average height is 6 to 12 inches, with a little knee high, and some late planted and replanted just up. The second cultivation is practically finished and the third is far advanced but was somewhat delayed by rains and has not been pushed vigorously because not necessary for weed killing, the fields being generally clean.

Oats have been greatly benefited by the recent rains and moderate temperature. They are heading short in most of the State though some counties report that the straw lengthened surprisingly the past week. It is probable that no amount of favorable weather can overcome the handicap of unfavorable conditions at the beginning of the season. Winter wheat is filling well and the crop has improved somewhat.

Alfalfa and sweet clover haying made some progress but the rains made curing difficult. Clover and timothy are taking on renewed growth and may yet make a fair crop. Pastures have revived greatly.

Potatoes, gardens, and truck crops, raspberries and blackberries, are thrifty and promise good yields. Strawberries were cut short in midseason by drouth but the late ones in northern Iowa may yet be returned to good bearing by the recent rains.

Bulletin No. 12, July 26, 1928—

Generous, well distributed rains again visited all portions of the State during the past week, and as usual, some localities suffered from excesses causing erosion and overflow. Temperatures were slightly above normal at the beginning of the week but considerably below at the close. Sunshine, though considerably below normal, was ample in most of the State for good growth and color of vegetation.

Corn made satisfactory progress. It averages nearly knee high with some waist high and laid by, and a little only a few inches high, and cultivated once. Though frequent rains delayed cultivation, weeds have not yet become troublesome, except in a few localities. The general condition of the crop is very good to excellent, though a little shows poor color from excessive rains and lack of sunshine.

Winter wheat, spring wheat, oats and barley, have been much benefited by the recent cool, moist weather. Oats have lengthened more than seemed possible a few weeks ago, and are heading nicely. Barley, which has increased in recent years till it is Iowa's fourth most important crop, is in excellent condition. Winter wheat ripening has been beneficially delayed, giving it time to fill nicely.

Truck crops and potatoes are thrifty and cane fruits have a heavy setting of berries. Strawberries improved somewhat in the northern counties. Pea canning was in progress last week in the Radcliffe district. Commercial tomatoes in the Oskaloosa district were favored by the recent rains, after a serious setback by hail a few weeks ago. Linden is giving a good honey flow.

Pastures and hay have improved considerably though there was much difficulty in curing alfalfa and sweet clover. The milk flow has improved but flies are becoming troublesome in the southwestern counties.

Bulletin No. 13, July 3, 1928—

Another week of frequent, well distributed rains interfered greatly with field work. Temperatures were much below normal till the close of the week when the weather suddenly turned warmer, with afternoon temperatures in the 90's on Monday afternoon.

Corn made satisfactory growth over most of the State in spite of the low temperatures. The crop now averages well above knee high, with the tallest too high to cultivate, a little shoulder high and a little only a few inches high. On wet lowlands the color is not good but the bulk of the crop looks fine. About one-third of the fields, mostly of the later, smaller corn, are getting weedy, but most of the fields are fairly clean. About one-fourth of the crop has been laid by. In general, the crop is fully up to the average and in remarkably good condition considering that June was one of the coolest Junes of record, with rainfall considerably above normal in most of the State.

The cool, wet June has been favorable for all small grain. Oats straw has lengthened, the scant heads have thickened decidedly, and the grain have become plump. On low, wet ground some of the oats are lodging. Winter wheat and barley are beginning to turn color in the south half of the State and are filling nicely. Some fields of winter wheat in the extreme southern counties are nearly ready to cut. Spring wheat is also doing well. Rust and smut are less prevalent than usual, though smut is appearing in some oats fields where the seed was not treated.

Alfalfa hay has been greatly damaged by the rains. Some has lain on the ground for three weeks without curing sufficiently to put up in bales or stacks. Second crop alfalfa is making rapid growth. Clover and timothy, though somewhat improved, are still thin and short from the bad start in the spring. Pastures improved greatly.

Raspberries and blackberries that survived the winter are bearing heavily. Garden truck is doing especially well, and potatoes are the best crop in years, though there are a few reports of rotting because of the excessive wet soil. The honey flow was exceptionally heavy toward the close of the week.

Bulletin No. 14, July 10, 1928—

Abundant moisture, sunshine and warmth made all vegetation grow rapidly. Afternoon temperatures were in the 90's part of the week and the nights averaged the warmest of the season. The mean temperature was 77.3 degrees or 3.9 degrees above normal. In many localities, about 9 p. m. to 10 p. m. of July 3, a loud and continuous roar was heard high aloft and local rains and hail occurred, but no severe storms struck the ground. Later in the night, mostly between 2 a. m. and 4 a. m. of July 4, violent windsqualls occurred in many portions of the State, particularly in the southwest and west-central districts. Much corn was broken off or laid flat and small grain was lodged. Farm buildings were damaged.

One insurance company reports 200 farms nearly swept clear of buildings, mostly in the northwest corner of Carroll county, the northeast corner of Crawford county and adjacent territory in Sac county.

Corn made wonderful progress where not injured by storms. It now averages about waist high; about three-fourths has been laid by; a little is five to six feet high and showing tassels; and the shortest is about a foot high. Serious damage by worms and plant lice is reported in the northeast portion of Tama county where replanting has been necessary. In Lyon county an average growth of three inches per day was reported by a careful observer. The heat and humidity were so oppressive that horses and men suffered greatly while cultivating corn, frequent rests were necessary and the work went forward slowly. Most of the fields are fairly clean of weeds. Cultivation continues in the late, weedy fields.

The humid heat of the past week would be generally considered unfavorable for small grains, yet reports are mostly favorable. Rust, smut and other diseases usually thrive under these conditions, but aside from a few reports in Polk, Dallas, Madison and Hardin counties, not much has been heard of these diseases.

Winter wheat and rye harvest is progressing rapidly in the southern third of the State, a week or ten days later than usual, with a fair yield and quality reported. Hessian flies are reported by the State Entomologist in Page and Harrison counties.

Oats have shown considerable improvement except where blown down by storms. Early oats are turning color in many localities. The kernels appear plump and of good quality, though the thin stand generally will cut down the yield.

Barley is ripening and will soon be ready to cut. The heads are well filled and the general condition very good.

The continued rainy weather is making haying difficult. Pastures show continued improvement. Live stock is doing well but flies are becoming troublesome as a result of the warmth and moisture. Many new outbreaks of hog cholera are reported by the Eastern Iowa Veterinary Association, and there are a few such reports from correspondents in other portions of the State. Vaccination of pigs is going forward rapidly. With the weather favorable for cholera, prompt vaccination will be the only means of averting large losses.

Truck crops, particularly potatoes, are doing especially well. Commercial tomatoes have made excellent growth.

Bulletin No. 15, July 17, 1928—

After four weeks with the rainfall averaging above normal, little or no rain occurred during the past week in most of the State. Only in the localities of Des Moines, Clarinda, Decorah, Le Grand, Keokuk, and a few other places, was the rainfall of importance. Temperatures were mostly a little below normal and sunshine was somewhat above normal. These conditions were excellent for crops and farm work. However, there was considerable damage by hail on the 10th and 12th in portions of Polk, Story, Marshall, Floyd, O'Brien and Tama counties. In Washington township, Story county, the damage is estimated at \$25,000.

Corn made excellent progress. The tallest is six to eight feet high, the average about shoulder high, and even the latest is generally laid by. Tassels are showing in the early fields in all portions of the State. In some cases the corn is tasseling rather low. A little shooting and silking is reported.

Small grains filled and ripened splendidly during the comparatively dry weather and moderate temperature of the past week. Lodged grain recovered considerably and the development of rust, smut and other diseases was arrested somewhat. Winter wheat and rye are mostly cut, though some winter wheat remains to be cut and threshed with combines. Some shock threshing of winter wheat has already been done, which showed fair yields and good quality, while in other localities reports were adverse.

Barley harvest is far advanced in the south half of the State. In some cases it is being cut a little green for fear the heavy heads will cause it to go down in rain or wind storms. Oats harvest is half done in the extreme south and beginning in the central counties, a little later than usual. The condition and yield are better than seemed possible during the spring.

Haying is being pushed vigorously with weather generally favorable. The crop is rather light, but of fair quality. Second crop alfalfa is heavier than the first crop. Timothy is the lightest of the hay crops. A few oats have been cut green for hay.

Pastures are in good condition, and live stock on pastures are looking well. Flies are becoming serious enough to reduce the milk flow. Later reports show many deaths of horses as a result of the hot, humid weather of the preceding week. In one locality in Fremont county about 40 dead horses were taken to the rendering plant, besides many others that could not be hauled in, in time.

Commercial tomatoes and sweet corn are making good progress, early potatoes show good yield and quality, and gardens are producing well.

Bulletin No. 16, July 24, 1928—

Warm, humid weather with daily rains continued till near the close of the week when the weather became more settled, less humid and not quite so warm. Excessive rains occurred on the 19th, 20th and 21st in the southwest district and portions of the south central and west central districts. Grain and hay in shocks or cut and lying on the ground, were flooded and washed away, cornfields flattened and eroded, highway and railway bridges and embankments taken out, and considerable live stock drowned. At Sioux City the rate of rainfall was the most rapid of record for all short periods of time up to two hours. At Bedford, Taylor county, 5.35 inches of rain fell on the 20th and 21st, sending all streams out of banks. One boy was drowned and many persons narrowly escaped.

Harvest progressed as rapidly as the heat and frequent rains would permit. Many horses were injured or killed by the humid heat. Early oats, barley and winter wheat, are mostly in shock. In favored localities harvesting is finished, but late oats, spring wheat and late barley have been beaten down by the winds and rains and permanently damaged. Some damage to shocked grain is reported. Not much threshing has been done except by combines.

Corn made excellent progress except where beaten down by storms or flooded and washed out. However, the down corn has straightened rapidly and the area damaged by storms is relatively small. Tasseling is becoming general and early fields are shooting ears and showing silks in many sections. Most of the corn shows a rank growth and dark green color.

Haying has been done with much delay and difficulty. However, the drier, sunny weather at the close of the week helped materially. Second crop alfalfa is yielding well.

Pastures, truck crops and potatoes, are in fine condition. The yield of early potatoes is exceptionally good and the quality excellent. Commercial tomatoes and sweet corn are doing well. The rains have hindered the canning of beans in Marshall county.

Bulletin No. 17, July 31, 1928—

Normally warm weather at the beginning of the week was followed by much cooler the last four days. Rain was generally light and unimportant, though on the 26th there was considerable rain in the central counties, accompanied by wind squalls and some hail. In many western and a few eastern counties no rain occurred. Sunshine was ample.

Corn made very good progress. Most of it has tasseled and about half is showing silks. Considerable was blown down in the central counties on the 26th and hail damage was serious in limited areas. The greatest damage so far reported is \$25,000 in Liscomb township, Marshall county, and about the same amount in Grant township, Franklin county. The corn

that was blown down last week has about all straightened up without serious damage.

Harvest is about finished throughout the State, with the weather generally favorable, except in the central counties, where there is considerable complaint of grain in shock damaged by wind and rain which caused rotting or molding. Threshing has been delayed somewhat to allow the shocked grain to dry and cure. Meager threshing returns show good quality of all grains except where damaged by rain in shock, with yields of barley very good, oats fair to very good, and winter wheat fair to excellent.

Recent cool, dry weather has been excellent for haying and this work has made good progress. Some timothy has been cut for seed but the acreage cut for seed in the principal producing south central counties will be somewhat decreased, due to indicated low yields and to the low price of seed paid to producers.

Truck crops have generally done well but will soon be needing rain in much of the State. Sweet corn is furnishing roasting ears for table use. Tomatoes are maturing rather slowly. The recent cool weather has been favorable for potatoes.

Pastures are holding out well, though more rain would be beneficial. Flies and mosquitoes are quite troublesome to live stock.

Bulletin No. 18, August 7, 1928—

Copious to excessive rains throughout the State, except in a few localities, with temperatures averaging above normal, caused excellent plant growth but interfered greatly with farm work. The rains exceeded four inches from Wright and Worth counties eastward and in portions of Van Buren and Henry counties. The largest amount reported was 7.46 inches at Stockport, mostly on Friday and Saturday, August 3d-4th.

Corn made excellent progress generally, where not beaten down by winds, rain and hail. Roasting ears are reported in the earlier fields in all sections, and the crop is about two weeks ahead of last year. In most of the State there is sufficient moisture in the soil to mature the corn crop, but much depends on future temperatures. It is too soon to say that "the corn crop is assured."

Threshing has been greatly delayed by the soaking rains. Shocked grain has been much damaged by saturation, molding and sprouting, though frequently spread out to dry and reshocked. Threshed grain is heating in the bins. Some late oats remain to be cut in the northeast district where the ground has been too wet for binders to operate. In several counties streams were out of banks and shocks of grain were washed away. Yields and quality of all small grains are mostly very good to excellent, but the quality is rapidly deteriorating as a result of the wet, warm weather.

Much alfalfa has been seeded with unusually favorable conditions for germination. Newly seeded grasses and clovers in small grain stubble are making excellent growth. Pastures were never better at this season.

Corn cribs are generally empty and new oats are being fed as a substitute. There is much demand for stocker and feeder cattle but the supply is very inadequate. The Eastern Iowa Veterinarian Association advises caution in changing from old to new feeds; and that every device should be employed to kill flies which are carried from farm to farm on the horses when exchanging work during the threshing season. The flies are active carriers of animal diseases, particularly hog cholera.

Bulletin No. 19, August 14, 1928—

Hot, humid weather at the beginning of the week was followed by dry, cool weather at the close. Sunshine averaged 94 per cent of the possible which is 23 per cent above normal. There was no rain in the week ending Tuesday, except a few light showers in the northeast district.

Small grain in shock, which was saturated and spoiling at the close of last week, dried rapidly and threshing made excellent progress toward the close of the week, though delayed by the wet shocks and the excessive heat

at the beginning. About one-half to three-fourths of the threshing has been completed in most of the State, though in some localities the shocks have not dried sufficiently for rapid progress. Considerable of the grain has been damaged or discolored in shock. Yields of oats, barley, spring wheat and winter wheat, run from fair to excellent, with good weight per bushel. The abrupt fall in the price of oats to about 30 cents per bushel will just about pay the rent on about one-third of the acreage leaving nothing for the renter. Farmers having plenty of live stock find it more profitable to buy oats than to raise them at that price.

Corn made good progress in most of the State, though in the Missouri River counties and in a few dry localities elsewhere, there is considerable complaint of firing as a result of the extreme heat at the beginning of the week. Probably one-third of the acreage has reached the roasting ear stage, though there is some complaint that the ears are not as large as they should be. The tremendous growth of stalks with ears as high as a man's head have a tendency to make people overoptimistic. If temperatures should be below normal for the next six weeks, the State might not have much merchantable corn.

Third crop alfalfa is about ready to cut, with prospects for good yields. Considerable new alfalfa has been seeded and is germinating well. The abundant soil moisture has given second growth clover a good start and conditions are favorable for a good crop of seed.

Pastures are very good for the time of year but will soon be needing rain. Truck crops are all doing well, though tomatoes are ripening slowly.

Bulletin No. 20, August 21, 1928—

Temperatures averaged 4.5 degrees above normal with abundant sunshine. While the rainfall averaged 0.5 inch above normal, it was poorly distributed, ranging from 5.22 inches at Carroll to almost none at stations in the north-central district.

Damaging wind and hailstorms occurred in many localities, the worst being in portions of Sioux, Plymouth, Crawford, Hamilton, Story and Hardin counties, though reports are incomplete. Washington township, Plymouth county, reported \$150,000 damage.

Threshing made good progress and is now 75 to 85 per cent completed generally and finished in a few localities. Yields and quality of small grains vary from fair to excellent, with a few rather poor reports as usual.

Corn made good to excellent progress. Firing in the Missouri river counties and a few other localities was generally relieved by showers, though more rain is needed in these limited dry areas. Practically all of the corn has reached or passed the roasting ear stage, much has reached the hard dough stage, and a little early corn in the northern half of the State has begun to dent. There is about the usual complaint of barren stalks, but a little more than usual complaint of small or abortive ears and suckering.

Many early potatoes were dug the past week, and the yield and quality are excellent. Commercial sweet corn canning has begun generally with the yield and quality good. Commercial tomatoes are doing well in the northern portion of the State but not so well in the southeastern district. Large quantities of cucumber pickles were put in the brine. Onion blight in Mitchell county has reduced the output about 200 cars. The harvest of early cabbage and onions is well along in that county. A good yield of melons is reported in Lee county and shipping is in progress; also early grapes.

Hog cholera has broken out in a number of counties, but vaccination has been active so an epidemic is not probable.

Bulletin No. 21, August 28, 1928—

Rains of the week were about normal in the south-central district but heavy over other southern and western districts and very excessive in the central, north-central and northeast districts. During the past 14 days

more damage has been done by excessive rains, hail, wind squalls and tornadoes than in any similar period in the past three years. In addition to the damage reported last week, severe storms occurred in Mitchell, Worth, Ida and Mills counties and in numerous other localities. Some of these were major tornadoes attended by large property losses, injury and deaths. Reports are coming in slowly by mail. Those already received indicate losses of \$1,000,000 to \$1,500,000 in the last 10 days. The losses to corn and shocked grain, though total and appalling in local areas, will, after all, amount to only a small fraction of one per cent of the total crop values of the State. Many of the smaller streams have been out of banks.

Temperatures were considerably below normal till Monday, 27th, when for a single afternoon they were in the 90's, quickly followed by cooler. There were scattered reports of light frosts in the northern and western portions of the State on the morning of the 24th, but little, if any, damage.

Corn made fair progress, but the condition is somewhat variable. In a few localities early corn is well dented and almost safe from frost, while in others it is still in the roasting ear stage. The bulk of the crop has reached the hard dough stage. While considerable corn was destroyed by storms of the week in local areas, the amount so destroyed is a very small part of the total crop. Much was blown and beaten down by wind and rain. The tangled stalks will make harvesting by machinery difficult and wasteful; and will interfere with seeding winter wheat and other crops between the rows.

Threshing was greatly retarded by the rains of the week and is but little further advanced than a week ago. Grain in shocks has been further damaged and the straw is of little value except for fertilizer. The small amount of grain that was stacked has come through in fine condition, and it is this stacked grain that will furnish safe seed for another crop. Much of the grain that has been threshed has heated in the bin, which will destroy its value for seed. In general, the oats and barley crops have greatly deteriorated since harvest. Second crop clover and timothy; also pastures; are making excellent growth and late cuttings of alfalfa promise good yields. The recent heavy rains are not considered favorable for filling the heads of clover with seed.

Commercial canning of sweet corn is making fair progress. The ears are clean and free from ear worm. Some of the factories are reporting good yield and quality, while others report small ears and small pack per ton of ears. Commercial tomatoes are a poor crop. Part of the truck crop district around St. Ansgar, Mitchell county, was hit by hail, which further reduced the already stricken onion and cabbage crops. Potato digging is active, yield and quality excellent, though a little complaint of rotting due to heavy rains.

Over much of the State the soil has been too wet for fall plowing the past week, though this work has made good progress in previous weeks where the grain was stacked and out of the way.

Bulletin No. 22, September 4, 1928—

The past week was cool with scattered showers and a few heavy local rains, mostly in the central and northern counties. Scattered light frosts were reported on the morning of September 4th.

Corn made fair progress. Much is dented; a little of the earlier varieties has been saved for seed, and considerable is ready for the silo but silo filling has not begun generally due to wet fields. A little is already safe from a moderate frost. As usual some localities are late, with a little corn in the milk stage.

Shocked grain was too wet for rapid progress of threshing but not much remains to be done. Most of the stacked grain is yet to be threshed, but only a small per cent of the grain was stacked. Some of the stacked grain is reported as too damp to thresh.

Sweet corn canning is progressing steadily under generally favorable

conditions. Late potatoes and truck crops are making good growth. Fall fruits are abundant.

Pastures are unusually good and livestock is doing well. There is considerable complaint that hogs will not eat barley which was raised in unusual abundance this year. Third crop alfalfa has been harvested with unusual difficulties due to wet weather.

Much fall plowing has been done where the soil is dry enough but a good deal is too wet to plow. Preparations for winter wheat seeding are going forward rapidly for rains have not been so heavy in the main winter wheat producing counties. Winter wheat seeding will probably be somewhat earlier than usual. In fact, a beginning has already been made in Woodbury county.

Bulletin No. 23, September 11, 1928—

Only light scattered showers occurred till moderate rains covered most of the State at the close of the week, with heavy amounts at a few places. The week began cool but closed warm. Sunshine was 17 per cent above normal and there was considerable wind. Light frost occurred in a few localities on the 4th and 5th.

These conditions favored the maturing of corn. On the 10th, when most of the reports left the farms, 37 per cent of the corn was safe from frost, ranging from none in some localities to 90 per cent in others. Estimates made on September 1 by hundreds of township reporters of the combined Federal and State crop reporting service, indicated that with normal weather 61 per cent of the crop would be safe by September 20; 78 per cent September 30; and if frost holds off till October 15, 92 per cent would be safe. From this it appears that corn is ripening at about the normal rate. While the indicated yield per acre is not the largest, the large acreage with good yields, will probably make this the largest corn crop Iowa ever produced. Silo filling got a good start this week; a little was cut for fodder; some new corn was fed to hogs and "hogging down" was started. Considerable has been selected for seed.

Threshing made better progress in the wet northeast counties and is nearing completion in all of the backward counties. On September 1 the more backward counties, having one-fourth or more of threshing to be done, were Monona, Harrison, Worth, Mitchell, Howard, Winneblesh and Allamakee. For the State as a whole, 93 per cent of the threshing had been completed on September 1, which is 3 per cent more than the average of the last ten years. Further complaints are being received of threshed grain heating in the bins.

Third crop alfalfa harvest continues with good yields and in some localities a fourth crop is coming on rapidly. In some places new seedings of red clover are giving a fair crop of hay. Clover hulling is beginning but in some counties that are generally large producers, there is little or no seed in the heads, probably due to the long continued rains.

Preparations for winter wheat seeding continue and seeding is being done slowly for fear of Hessian fly. Some rye is up.

Fruits and melons are abundant in most of the State, though apples are a very poor crop in about six extreme southwest counties.

Pastures continue good as a result of favorable weather and shortage of cattle. Hog cholera is serious in portions of Pottawattamie county.

Bulletin No. 24, September 18, 1928—

Rains of the week were heavy in most of the state, with temperature and sunshine averaging above normal and considerable wind. Violent local windstorms and some tornadoes were reported in Woodbury, Plymouth, Cherokee, Fayette, Cass and other counties.

Corn made satisfactory progress and now averages 58 per cent safe from frost. Windstorms and heavy rains beat down considerable corn, making it difficult to operate corn binders, so farmers were obliged to resort to cutting by hand. However, silo filling and fodder cutting made fair prog-

ress. In some places the corn is down so badly that "hogging" is the only possible means of harvest, and fodder cutting and silo filling are impossible. Some seed corn was gathered but there is danger that too much confidence will be placed in the maturity of the crop. It sometimes happens that in the best corn years the poorest seed is obtained because of this overconfidence. In general, the reports of indicated yield are not so optimistic as they were a few weeks ago.

Early seeded winter wheat is up and looking well, but for the past ten days the ground has been too wet for preparation and seeding in most of the wheat area, though a little seeding has been done.

Late crops of alfalfa, red clover and sweet clover are being cut or are ready to cut, but the weather has been unfavorable. Second crop clover has very little seed in it and clover seed is very scarce. The recent wet weather made clover hulling difficult. Sweet clover in small grain stubble is yielding a good crop of hay. Pastures are excellent.

Hog cholera continues to be serious in Pottawattamie county. Farm animals generally are suffering greatly from the unusual number of flies and mosquitoes, brought on by the wet and relatively warm weather. In the north central district the outbreak of mosquitoes is the worst in many years, causing horses in some cases to run away.

Bulletin No. 25, September 25, 1928—

Temperatures averaged 55.2 degrees or 7.2 degrees below normal with light frosts on the 21st and heavy to killing frosts in most of the state on the 23d and 25th, about three weeks earlier than in 1927, and about a week earlier than normal. Rainfall was light and sunshine averaged 78 per cent of the possible amount or 17 per cent above normal.

Corn matured and dried rapidly and 81 per cent is safe or has escaped frost damage, with some on high ground not yet frosted that will probably escape. In the last five years only 70 per cent has escaped frost damage on the average; and in the last 10 years, 83 per cent. There are a good many soft ears even in the milk stage in fields that are generally safe and mature. Silo filling and fodder cutting progressed rapidly and have been completed in some localities. Less acres than usual are required to fill the silos due to the luxuriant stalks and leaves.

Some oats and barley in stacks, mostly in the northern and western counties, are yet to be threshed. Winter wheat seeding made good progress and is somewhat farther advanced than in recent years. The earliest is up and looking fine.

Sweet corn canneries were busy during the week and some finished with a fair pack of good quality. Tomatoes were killed by frost in much of the State. Onion harvest has been completed in Mitchell and Harrison Counties. Recent frosty nights and sunny days have been favorable for increasing the sugar content of sugar beets. Potato digging has been active and reported yields and quality are mostly excellent, but the price is only about 50 cents per bushel. Soybeans have mostly been harvested and in the southern counties the yields have been good.

Bulletin No. 26, October 2, 1928—

The week was mostly dry and cool with frequent frosts and deficient sunshine.

Most of the immature corn was stopped in growth and to some extent damaged by killing frosts, though a little remains green in favored spots, mostly along the Mississippi river. Not more than 15 per cent of the crop was damaged, and the damage to that 15 per cent ranges from slight to a reduction of half in the value per bushel from what it would have been if fully mature. Most of the frosted corn is in areas that were hailed or late replanted. Silo filling and fodder cutting continues in some localities but the work had to be suspended in the afternoons because of the loss of the dry and shattering leaves. A little husking has been done but only for feeding. With favorable weather cribbing may become active by the 15th

CROP SEASON WEATHER, 1928, BY WEEKS

Week Ending	Rainfall (Inches)		Temperature (Deg. F.)		Sunshine	
	State Average	Depart- ure	Mean	Depart- ure	Per Cent	Depart- ure
April 10.....	1.2	+0.6	41.6	-3.7	45	-12
April 17.....	0.7	0.0	39.0	-9.3	50	+1
April 24.....	0.3	-0.4	43.2	-7.9	55	-1
May 1.....	T	-0.8	49.7	-4.3	81	+25
May 8.....	0.7	-0.2	61.3	+4.9	79	+25
May 15.....	0.1	-0.9	62.1	+3.1	71	+12
May 22.....	1.5	+0.4	63.9	+2.8	55	-4
May 29.....	T	-1.2	64.1	+0.8	87	+2
June 5.....	0.2	-0.9	61.8	-3.8	61	-2
June 12.....	1.0	-0.1	62.2	-5.4	54	-20
June 19.....	1.8	+0.7	68.1	-1.3	59	-1
June 26.....	1.3	+0.8	65.2	-5.7	46	-25
July 3.....	1.1	+0.2	70.5	-1.8	71	-1
July 10.....	1.2	+0.3	77.2	+3.9	80	+7
July 17.....	0.3	-0.6	72.5	-1.5	78	+7
July 24.....	2.1	+1.3	75.8	+1.8	64	+1
July 31.....	0.3	-0.5	70.8	-3.2	72	+1
August 7.....	2.4	+1.6	75.3	+1.4	58	-11
August 14.....	T	-0.8	76.1	+3.5	84	+25
August 21.....	1.3	+0.5	73.9	+4.5	70	+1
August 28.....	2.3	+1.5	68.2	-1.8	70	+1
September 4.....	0.6	-0.2	61.4	-4.0	69	+1
September 11.....	0.6	-0.2	68.5	+0.9	79	+17
September 18.....	2.1	+1.2	66.5	+1.9	70	+4
September 25.....	0.2	-0.6	55.2	-7.2	78	+17
October 2.....	0.1	-0.6	52.2	-7.8	58	-1
For Season.....	23.4	+0.6	63.5	-1.5	68	+1

T.—Not more than 0.05 inch.

or 20th of October, and a beginning will be made in Harrison and Webster counties in a few days. A field sample from the south central district September 30, showed 27 per cent of moisture.

Seeding of winter wheat and rye is progressing slowly for the ground is getting too dry for preparation and germination in the principal winter wheat counties.

Lifting of sugar beets has begun with indication of good yield per acre and fair sugar content. The factories will be busy in a few days. Some canning factories are looking forward to a good run on pumpkins, which have largely escaped frost, especially in cornfields that have not been cut. Fall and winter apples are ripening and coloring nicely.

WEEKLY NOTES ON WEATHER AND CROPS IN IOWA

Week Ending October 9, 1928—

With temperatures averaging 62.9 degrees or 5.9 degrees above normal, sunshine averaging 80 per cent of the possible amount, or 19 per cent above normal, and rain confined to two days, 4th-5th, the week was mostly of the "Indian summer" type, ideal for drying the corn and for harvesting late minor crops.

However, there were numerous violent local windstorms late in the afternoon or early in the night of October 4, in southern and eastern Iowa, with a well defined tornado at Oskaloosa and possibly near Tipton and in some other places. Much corn, both standing and in shock, was blown down and scattered about and numerous houses and out buildings demolished. It is impossible at this time to make satisfactory estimate of the damage. Reports are coming in slowly by mail from our township crop reporters and others, from which damage estimates will be compiled.

Corn has dried out better up to this date than for several years. A beginning has been made in cribbing in many counties, though as yet it is necessary to spread the corn out thinly on the bottom of the crib. It will probably be unsafe to crib rapidly for two weeks yet, even with the most favorable weather. Corn picking machines are being demonstrated and many new machines will probably be sold, as conditions are generally favorable for their use. Ears are so high on the stalks as to make hand husking difficult. New corn is being fed rapidly and hogging down is active, with the ground dry, which reduces the wastage to the minimum.

Rains of the week were normal or above in many eastern counties, which will help pastures, winter wheat and fall plowing, but in the Missouri river counties very little rain has fallen during the past month; considerable winter wheat lies in the ground ungerminated, pastures are falling, except sweet clover, and plowing is impossible. Rain is badly needed in the principal winter wheat counties in the southern part of the State.

Hogs are fattening nicely in the corn fields and they are generally in good health, though there have been many local outbreaks of cholera, which were promptly checked by vaccination. Cattle look fat and sleek on pastures which were unusually luxuriant throughout the season until a few weeks ago, when the rainfall became deficient. The deficiency in pastures is being made up by the unusual yield of fodder corn. A late crop of alfalfa is being cut in some places; also late soybeans are making a good hay crop.

Late potatoes are being dug and mostly good yields and quality are reported. Prices realized by farmers are in some cases as low as 25 cents per bushel. Apples are being harvested and the results are satisfactory in orchards that were well cared for.

Week Ending October 16, 1928—

The weather was hot with record breaking high temperatures in the 90's on October 10, in northwest Iowa, followed by cooler. The weekly mean temperature for the State, 63.4°, is 10.1° above normal. Rains fell in most of the State on the 12th, 13th and 16th, being heavy in the western and northern counties. Sunshine was deficient. Southerly gales on the 10th and 11th blew down much corn in western Iowa, and in some localities blew half the ears off on the ground where the heavy rains that followed, are damaging them. In much of northwest Iowa the corn is down so badly that husking machines cannot be used. In some counties cribbing is becoming active.

Corn dried rapidly during the hot, windy days, but scarcely dried at all during the recent damp, cloudy days. Samples of corn, so far tested, show a great variation in moisture content, ranging from 15 to 34 per cent. In a few localities a little new corn has been shelled and marketed, grading about No. 3 and brings 63 cents per bushel.

Fall plowing was made easier by the rains. Winter wheat that has laid in the dry soil ungerminated, came up rapidly with the heat and moisture of the week, and that which was up, made good growth. Pastures and meadows improved greatly.

Potato digging continues. Sugar beet lifting is active and the factories are getting under way. Apple picking is going forward, though the weather has been most too warm for storing either apples or potatoes.

Week Ending October 23, 1928—

Weather conditions were mostly unfavorable for all farm work during the past week. Heavy rains were general in nearly all portions of the State and high winds occurred on the 17th. The wet weather interfered with corn husking and about all that was gathered was for immediate use. Plowing was also interrupted and many fields are now too wet.

The wind blew down a great deal of corn and knocked off a large number of ears. The fields are mostly too wet and gathering with machines will be almost impossible on account of the large amount that is down,

and hand picking will be difficult. The ears knocked off, or down, are moldy or sprouting and some ears are covered with dry mold. The corn is still generally too wet to crib in large quantities.

The wet weather was beneficial for winter wheat and all that has been seeded has germinated and shows a good stand. Pastures have been greatly benefited and are generally in good condition. The wet weather interfered with the gathering of sugar beets the fields being too wet for wagons to enter, and the stock on hand at some factories is about exhausted, and it may be necessary to close down temporarily. Some potatoes are still being dug and show a good yield and quality. Stock is generally in good condition, though there is hog cholera with locally heavy losses.

Week Ending October 30, 1928—

The week was cool, particularly toward the close, when froozes were general. In many localities flowers and tender plants continued to grow till the 28th and 29th. Rainfall was mostly light except in the extreme southwest and extreme southeast portions.

Corn husking made excellent progress in the northwest and west-central districts, where an extra effort is necessary to save the large amount of corn which has been blown off the stalks onto the ground, where it will soon be covered by snow if not saved. About one-third to one-half of the husking is done in the northwest counties. Fair progress in husking was made in the north-central and central districts, and some adjacent counties, but in the extreme eastern and extreme southern counties the corn is too wet to crib safely.

The yields reported are mostly good and the quality the best in five years. The superior feeding value as compared with recent years is noticeable. Considerable has been shelled and marketed, grading No. 1 or No. 4 and bringing about 70 cents per bushel.

Fields were dry enough so sugar beet harvest went forward rapidly and the factories are again running at a capacity rate. Reports of yield and sugar content of the beets continue good.

Winter wheat is making good growth, but there is some complaint of fly damage in the extreme southeast portion of the State. Pastures are unusually good, in many cases supporting livestock without supplemental feeds up to this date. Outbreaks of hog cholera are very numerous but through care and vigilance are soon checked.

Week Ending November 6, 1928—

Corn husking made good progress till stopped by the storm which started November 1 and continued for three days, with a considerable change to colder. In the northwest and portions of the west-central and north-central districts the snow was unusually heavy for so early in the season, amounting to from four to ten inches. Scores of automobiles and trucks were abandoned in the snowdrifts in northwest Iowa and bus service was suspended.

It was in this area of heavy snowfall that so much of the corn had been blown from the stalks in previous storms, particularly the southerly gales of October 10-11th. This down corn is being damaged by the snow and the mud. In some counties in this area about half of the husking was done when the snow came, and a few farmers had finished.

For the State as a whole, 23 per cent of the husking had been finished on November 1, which is about 3 per cent more than the 10-year average. In the southern and eastern portions of the State, the heavy rains made the fields too soft and the shanks too tough for husking. The large amount of down corn that will be lost or saved by hogs and cattle will probably cause the yield per acre to be reported as less than actually produced.

Winter wheat is looking very good, though there are some reports of damage by fly. Pastures are still good.

With the coming of the first wintry storm, there was the usual outbreak of hog flu, with a considerable number of deaths. Outbreaks of hog cholera continue to be numerous, but mostly of short duration.

Week Ending November 13, 1928—

Considerable rain fell on the 7th in northern Iowa, followed by light snow on the 9th that reached to the south line of the State. Temperatures averaged above normal.

Corn husking has proceeded slowly on account of the soft fields and the tough condition of the husks and shanks. Full loads of corn could not be hauled through the muddy corn fields and husking machines could not be used much. Down corn suffered further damage from mud and dampness. The corn that has remained on the stalks is of good quality and is being cribbed with more safety than for several years. New corn is moving to market in unusual volume for so early in the season, and the market is absorbing it well on account of the general shortage of old corn. Winter wheat is looking well and pastures are still good in southern Iowa.

Hog cholera has continued to increase from week to week, though general vaccination has prevented an epidemic. Hog flu has subsided somewhat.

Week Ending November 20, 1928—

Warm, cloudy, wet weather prevailed during the past week, with heavy rains in the south and east portions of Iowa, and long continued drizzling rains in the northwest portion. Light snow fell in most of the State. The rainfall of the week averaged 2.1 inches, and some stations in the southeast portion reported as much as 4.0 inches. Many small streams are bank full or overflowing.

Corn husking was further delayed though in the northwest portion husking was done in the rain, and in some counties 95 per cent of the husking is done. For the State as a whole, probably little more than half of the husking is done. Gales blew more corn off onto the ground. Much more than the usual amount of corn is lying on the ground and is being considerably damaged.

Wheat and pastures have shown unusual growth for the time of year, due to the abundant warmth and moisture.

Many new cases of hog cholera are reported but the outbreaks are soon subdued. It is probable that the total losses will be somewhat greater than last year. Some further outbreaks of hog flu are reported.

Week Ending November 27, 1928—

Dry, sunny weather with mild temperatures at the beginning and severe froozes toward the close, and considerable wind, made the past week the best of the season for husking corn, though soft fields bothered considerably till the ground froze. Temperatures between 10 and 15 degrees were general in western Iowa on the morning of the 25th.

Husking is finished in the extreme northwest counties but only about half finished in the southern counties. Considerable excess corn above crib capacity is being shelled and marketed, though the soft and rough condition of dirt roads has retarded marketing.

Livestock is being pastured in the fields where husking has been completed. There is much more than the usual amount of down corn to be salvaged in this manner. If heavy snows do not come too early most of this corn will be saved.

Sugar beets have all been taken to the factories and the factories will have them all worked up and be ready to shut down within a week.

Week Ending December 4, 1928—

One of the heaviest November snowstorms of record extended from southwest to northeast across Iowa on the 25th and 30th. A narrow belt having ten inches to a foot of snow extended from Pottawattamie county northeast to Buchanan and the south part of Fayette. In northern Iowa there was none or very little.

The snow stopped husking and buried much down corn, which will probably be nearly a total loss. More snow is falling and this will add to the difficulties. The rains and muddy fields in the southern portion have continued to delay husking. In the southeast one-half of the State from one-third to one-half of the corn remains in the field, while in the northwest counties husking is nearly completed, and in this drier portion of the State shelling and marketing is active.

Sugar factories have closed. The beets yielded a large tonnage of good sugar content.

MONTHLY PERCENTAGE CONDITIONS OF CROPS AND YIELD PER ACRE, 1928

Crops	April 1	May 1	June 1	July 1	Aug. 1	Sept. 1	Oct. 1	Yield Per Acre
Corn			95	90	95	93	93	41.6 bu.
Oats			83	84	88	89		40.0 bu.
Winter wheat	77	70	68	75				19.5 bu.
Spring wheat			85	86	88	85		17.3 bu.
Barley			88	89	93	90		25.5 bu.
Rye	87	79	79	83				18.0 bu.
Flax seed					88	84	87	19.4 bu.
Potatoes			88	94	96	95	97	135.0 bu.
Tame hay		73	71	66	78	81		1.31 tons
Wild hay			79	72	80			1.14 tons
Alfalfa hay			81	82	90	91		2.82 tons
Pastures	88	96	75	76	85	89	89	

FINAL CROP REPORT, DECEMBER 1, 1928

A value of \$574,376,000 is placed upon the estimated production of twenty important crops in Iowa in 1928. This is an increase of 10.2 per cent over the value of the crops produced in 1927. Average prices on December 1, upon which these valuation figures are based, decreased in comparison with the average prices reported a year ago as follows: corn decreased two cents per bushel; oats, six cents; winter wheat, seventeen cents; barley, eight cents; and potatoes, forty-nine cents. Prices for timothy seed increased 50 cents per bushel; clover seed, \$1.90 per bushel; and tame hay 50 cents per ton over average prices a year ago. Price data per unit and total value of production data for the various crops produced in 1928, comparable with data for 1927 are given on the following page.

Corn—The total production of corn in Iowa is estimated at 476,012,000 bushels, or 89,000,000 bushels more than the harvest of 1927. The crop produced in 1928 ranks as the second largest crop ever produced in Iowa. The acreage of corn this past season was 2.5 per cent greater than in 1927, and the yield per acre, 42.6 bushels, was about 20 per cent higher than the average yield of 1927.

Weather conditions affecting the progress of husking corn were somewhat similar to conditions a year ago. Early in November husking advanced rapidly in nearly all sections of the State. Delays were caused by snow and rains in late November and early December which covered corn in the fields or made it nearly impossible to haul with wagons. Reports of corn being blown from the stalks and covered by mud and snow were quite numerous this season, more so than last year, although in both seasons complaints of the stalks breaking over and ears broken off were fairly prevalent.

Conditions in the growing season favored early maturity and high quality, 91 per cent of the crop being estimated as of merchantable quality as compared with 87 per cent for the average of the past ten years. The quality is more uniformly good in all parts of the state than for a number of years.

Oats—The total production of oats this year is estimated at 240,040,000 bushels as compared with 192,032,000 bushels in 1927, an increase in total production of 24.5 per cent. The acreage remained the same as a year ago but there was a difference in yield per acre of eight bushels in favor of the 1928 crop, 32.0 bushels per acre in 1927 and 40.0 bushels in 1928.

Wheat—The production of winter wheat is estimated as 7,664,000 bushels, at the rate of 19.5 bushels per acre on 393,000 acres harvested. The production in 1927 amounts to 7,600,000 bushels on 400,000 acres. Spring wheat acreage has been shrinking quite rapidly in Iowa and in 1928 only 35,000 acres were harvested, producing an average of 17.3 bushels per acre or a total of 606,000 bushels. A year ago the production on 41,000 acres was 636,000 bushels.

Barley—A phenomenal increase of barley acreage has taken place in recent years. In 1924 the Federal Census reported 136,000 acres of barley harvested in Iowa. Estimates of harvested acreage in 1928 are placed at 808,000 acres. Increased popularity as a feed grain for live stock is partly responsible for this growth. The acreage harvested in 1928 shows

a return of 27,065,000 bushels, an average yield of 33.5 bushels. A year ago the acreage was 454,000 acres or slightly more than half as much as the 1928 acreage. Production a year ago totaled 14,256,000 bushels.

Tame Hay—The crop of tame hay in Iowa was about 19.0 per cent smaller than in 1927, due to a shrinkage in total acreage cut and also in average yield per acre. An acreage of 2,786,000 acres, with an average yield of 1.51 tons per acre produced 4,203,000 tons this season, while a year ago 3,135,000 acres produced 5,197,000 tons. The yields and production of the different kinds of tame hay are as follows: mixed clover and timothy hay, 1,386,000 acres, 1,732,000 tons; alfalfa, 328,000 acres, 935,000 tons; clover alone, 443,000 acres, 709,000 tons; timothy alone, 436,000 acres, 447,000 tons; grains cut for hay 36,000 acres, 58,000 tons; and other miscellaneous hay crop, 101,000 acres, 177,000 tons.

Potatoes—The potato crop in 1928 is estimated at 10,935,000 bushels as compared with 6,150,000 bushels harvested in 1927. The acreage harvested this season was 81,000 acres or eight per cent larger, and yields averaged at 135 bushels per acre compared with 82 bushels per acre in the 1927 crop.

Production of minor crops this season is given as follows: clover seed, 96,000 bushels; timothy seed, 592,000 bushels; sweet clover hay, 66,000 tons; flaxseed, 198,000 bushels; peaches, 50,000 bushels; pears, 47,000 bushels; grapes, 6,225 tons; apples, 2,740,000 bushels; sorghum sirup, 180,000 gallons; sweet potatoes, 369,000 bushels; buckwheat 102,000 bushels; cabbage 10,800 tons; cucumbers for pickles, 31,000 bushels; sweet corn for canning, 91,700 tons; onions, 616,000 bushels; water melons, 523 car loads (cars of 1,000 melons each); cantaloupes, 130,000 crates; asparagus, 14,000 crates; strawberries, 3,072,000 quarts; tomatoes 24,900 bushels.

IOWA CROPS 1927 AND 1928 COMPARED
Acreage, Average and Total Yield, Average and Total Value

Crop	1927 Final Revision					December 1, 1928 Estimates*				
	Acreage	Average Yield	Total Yield	Average Price Dec. 1	Total Value	Acreage	Average Yield	Total Yield	Average Price Dec. 1	Total Value
Corn	10,601,000	33.5 Bu.	356,289,000	\$ 0.99	\$37,020,000	11,171,000	42.5 Bu.	476,012,000	\$ 0.67	\$25,518,025,000
Wheat	6,001,000	32.0 "	192,032,000	0.12	59,033,000	6,007,000	40.9 "	249,000,000	0.36	90,414,000
Barley	41,000	15.5 "	7,220,000	1.15	5,271,000	37,000	19.3 "	7,098,000	1.00	7,098,000
Rye	484,000	33.4 "	14,256,000	0.68	9,409,000	896,000	33.3 "	27,008,000	0.54	14,617,000
Flax seed	43,000	12.0 "	645,000	0.86	555,000	54,000	18.9 "	972,000	0.86	15,468,000
Timothy seed	19,000	4.39 "	1,082,000	1.05	1,190,000	19,000	10.4 "	198,000	1.98	39,591,000
Clover	126,000	4.39 "	1,082,000	1.05	1,190,000	141,000	4.30 "	592,000	2.13	1,271,000
Hay (all)	3,135,000	1.51 Tons	6,150,000	1.00	6,150,000	3,135,000	1.51 Tons	4,750,000	0.43	2,075,000
Potatoes	6,150,000	1.65 Tons	10,137,000	10.00	10,137,000	10,935,000	1.16 "	12,687,000	10.00	12,687,000
Hay (tame)	2,786,000	1.51 Tons	4,203,000	10.00	4,203,000	2,786,000	1.51 Tons	4,203,000	13.00	54,639,000
Hay (wild)	10,222,000	3.57 "	367,000	5.95	60,827,000	10,108,000	3.16 "	313,000	5.98	3,130,000
Pasture and grazing	30,311,000	1.00 Lbs.	30,311,000	9.00	271,000	40,000	8.3 Lbs.	336,000	9.75	3,270,000
Sweet corn (con'l crop)	15,000	13.0 Bu.	195,000	0.85	165,000	7,000	14.5 Bu.	102,000	0.80	81,600
Buckwheat	115,000	13.0 Bu.	1,495,000	0.85	1,260,000	115,000	13.0 Bu.	1,495,000	0.80	936,000
Fruit crop					5,000,000					5,000,000
Garden truck					4,000,000					4,000,000
Miscellaneous					4,000,000					4,000,000
Total	109,925,000		1,013,800,000		109,925,000					1,013,800,000

Total value, not including live stock products, for the year 1928.
1927

*Subject to revision when assessors' figures become available.

AVERAGE FARM PRICE OF IOWA'S PRINCIPAL CROPS AND PER CENT OF CORN HUSKING DONE DECEMBER 1, 1928, BY COUNTIES

ANNUAL REPORT OF THE

IOWA WEATHER AND CROP BUREAU

Districts and Counties	Corn		Oats per bushels of 56 lbs.	Wheat per bushel of 60 lbs.	Spring wheat per bushel of 60 lbs.	Barley per bushel of 56 lbs.	Rye per bushel of 56 lbs.	Kia seed per bushel of 60 lbs.	Buckwheat per bushel of 60 lbs.	Thinley seed per bushel of 60 lbs.	Clover seed per bushel of 60 lbs.	Pop corn per pound in ear of 60 lbs.	Hoy beans per bushel of 60 lbs.	Taine hay (loose) per ton of 2,000 lbs.	Wild hay (loose) per ton of 2,000 lbs.	White potatoes (fresh) per bushel of 60 lbs.	Sweet potatoes per bushel of 60 lbs.	Apples per bushel of 48 lbs.	Bergham strap, per gallon	Honey (per lb.)							
	Per bushel of 70 lbs. in December 1	Per bushel of 56 lbs.																		Combs in sections	Extract (less cost of containers)						
Northwest—																											
Buena Vista.....	50	67	58	41	50	52	48	31	27	17	35	57	67	22	40	10	4	18	2	14	11	11	11				
Clarke.....	50	67	58	41	50	52	48	31	27	17	35	57	67	22	40	10	4	18	2	14	11	11	11				
Crawford.....	50	67	58	41	50	52	48	31	27	17	35	57	67	22	40	10	4	18	2	14	11	11	11				
Franklin.....	50	67	58	41	50	52	48	31	27	17	35	57	67	22	40	10	4	18	2	14	11	11	11	11			
Grant.....	50	67	58	41	50	52	48	31	27	17	35	57	67	22	40	10	4	18	2	14	11	11	11	11	11		
Hamilton.....	50	67	58	41	50	52	48	31	27	17	35	57	67	22	40	10	4	18	2	14	11	11	11	11	11	11	
Jefferson.....	50	67	58	41	50	52	48	31	27	17	35	57	67	22	40	10	4	18	2	14	11	11	11	11	11	11	
Osceola.....	50	67	58	41	50	52	48	31	27	17	35	57	67	22	40	10	4	18	2	14	11	11	11	11	11	11	
Polk.....	50	67	58	41	50	52	48	31	27	17	35	57	67	22	40	10	4	18	2	14	11	11	11	11	11	11	
Worth.....	50	67	58	41	50	52	48	31	27	17	35	57	67	22	40	10	4	18	2	14	11	11	11	11	11	11	
For District.....	50	67	58	41	50	52	48	31	27	17	35	57	67	22	40	10	4	18	2	14	11	11	11	11	11	11	
North Central—																											
Carroll.....	50	67	58	41	50	52	48	31	27	17	35	57	67	22	40	10	4	18	2	14	11	11	11	11	11	11	
Clayton.....	50	67	58	41	50	52	48	31	27	17	35	57	67	22	40	10	4	18	2	14	11	11	11	11	11	11	11
Franklin.....	50	67	58	41	50	52	48	31	27	17	35	57	67	22	40	10	4	18	2	14	11	11	11	11	11	11	11
Franklin.....	50	67	58	41	50	52	48	31	27	17	35	57	67	22	40	10	4	18	2	14	11	11	11	11	11	11	11
Humboldt.....	50	67	58	41	50	52	48	31	27	17	35	57	67	22	40	10	4	18	2	14	11	11	11	11	11	11	11
Keokuk.....	50	67	58	41	50	52	48	31	27	17	35	57	67	22	40	10	4	18	2	14	11	11	11	11	11	11	11
Keosauqua.....	50	67	58	41	50	52	48	31	27	17	35	57	67	22	40	10	4	18	2	14	11	11	11	11	11	11	11
Winneshago.....	50	67	58	41	50	52	48	31	27	17	35	57	67	22	40	10	4	18	2	14	11	11	11	11	11	11	11
For District.....	50	67	58	41	50	52	48	31	27	17	35	57	67	22	40	10	4	18	2	14	11	11	11	11	11	11	11
West Central—																											
Adair.....	50	67	58	41	50	52	48	31	27	17	35	57	67	22	40	10	4	18	2	14	11	11	11	11	11	11	
Adair.....	50	67	58	41	50	52	48	31	27	17	35	57	67	22	40	10	4	18	2	14	11	11	11	11	11	11	
Adair.....	50	67	58	41	50	52	48	31	27	17	35	57	67	22	40	10	4	18	2	14	11	11	11	11	11	11	
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Adair.....	50	67	58	41	50	52	48	31	27	17	35	57	67	22	40	10	4	18	2	14	11	11	11	11	11	11	
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Adair.....	50	67	58	41	50	52	48	31	27	17	35	57	67	22	40	10	4	18	2	14	11	11	11	11	11	11	
Adair.....	50	67	58	41	50	52	48	31	27	17	35	57	67	22	40	10	4	18	2	14	11	11	11	11	11	11	
Adair.....	50	67	58	41	50	52	48	31	27	17	35	57	67	22	40	10	4	18	2	14	11	11	11	11	11	11	
Adair.....	50	67	58	41	50	52	48	31	27	17	35	57	67	22	40	10	4	18	2	14	11	11	11	11	11	11	
Adair.....	50	67	58	41	50	52	48	31	27	17	35	57	67	22	40	10	4	18	2	14	11	11	11	11	11	11	
Adair.....	50	67	58	41	50	52	48	31	27	17	35	57	67	22	40	10	4	18	2	14	11	11	11	11	11	11	
Adair.....	50	67	58	41	50	52	48	31	27	17	35	57	67	22	40	10	4	18	2	14	11	11	11	11	11	11	
Adair.....	50	67	58	41	50	52	48	31	27	17	35	57	67	22	40	10	4	18	2	14	11	11	11	11	11	11	
Adair.....	50	67	58	41	50	52	48	31	27	17	35	57	67	22	40	10	4	18	2	14	11	11	11	11	11	11	
Adair.....	50	67	58	41	50	52	48	31	27	17	35	57	67	22	40	10	4	18	2	14	11	11	11	11	11	11	
Adair.....	50	67	58	41	50	52	48	31	27	17	35	57	67	22	40	10	4	18	2	14	11	11	11	11	11	11	
Adair.....	50	67	58	41	50	52	48	31	27	17	35	57	67	22	40	10	4	18	2	14	11	11	11	11	11	11	
Adair.....	50	67	58	41	50	52	48	31	27	17	35	57	67	22	40	10	4	18	2	14	11	11	11	11	11	11	
Adair.....	50	67	58	41	50	52	48	31	27	17	35	57	67	22	40	10	4	18	2	14	11	11	11	11	11	11	
Adair.....	50	67	58	41	50	52	48	31	27	17	35	57	67	22	40	10	4	18	2	14	11	11	11	11	11	11	
Adair.....	50	67	58	41	50	52	48	31	27	17	35	57	67	22	40	10	4	18	2	14	11	11	11	11	11	11	
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Adair.....	50	67	58	41	50	52	48	31	27	17	35	57	67	22	40	10	4	18	2	14	11	11	11	11	11	11	
Adair.....	50	67	58	41	50	52	48	31	27	17	35	57	67	22	40	10	4	18	2	14	11	11	11	11	11	11	
Adair.....	50	67	58	41	50	52	48	31	27	17	35	57	67	22	40	10	4	18									

UNITED STATES CROP SUMMARY, DECEMBER 1, 1923
 (Revised)

Crop and Year	Acreage	Production			Farm Price Dec. 1 Per Unit	Total Farm Value Based on December 1 Farm Price
		Per Acre	Total	Unit		
Corn	98,398,000	28.1	2,768,093,000	Bushels	\$.732	\$1,007,759,000
1928	100,761,000	28.2	2,839,969,000	"	.751	2,139,590,000
Winter wheat	37,723,000	14.7	552,747,000	"	1.167	645,238,000
1928	36,179,000	16.0	578,964,000	"	1.606	600,367,000
Durum wheat (4 states)	5,484,000	14.4	79,100,000	"	1.606	79,201,000
1928	6,711,000	13.8	92,770,000	"	.719	46,739,000
Other spring wheat, U. S.	15,577,000	15.8	246,527,000	"	1.604	254,236,000
1928	14,834,000	15.6	231,015,000	"	.912	210,437,000
All wheat	58,784,000	14.9	878,874,000	"	1.112	979,510,000
1928	57,728,000	15.6	902,749,000	"	.972	877,190,000
Oats	41,941,000	28.2	1,182,594,000	"	.450	531,762,000
1928	41,733,000	24.7	1,449,531,000	"	.489	392,673,000
Barley	9,476,000	28.1	265,882,000	"	.678	180,300,000
1928	12,539,000	28.5	356,868,000	"	.552	197,129,000
Rye	3,648,000	15.9	58,164,000	"	.803	49,800,000
1928	3,444,000	12.1	41,766,000	"	.964	36,067,000
Buckwheat	810,000	19.5	15,755,000	"	.835	11,102,000
1928	760,000	17.6	13,367,000	"	.876	11,225,000
Flaxseed	2,837,000	9.1	25,847,000	"	1.369	48,979,000
1928	2,721,000	7.1	19,321,000	"	2.011	38,337,000
Rice, 5 states	1,012,000	44.2	44,774,000	"	.929	41,826,000
1928	965,000	43.4	41,881,000	"	.718	39,077,000
Grain sorghums*	6,732,000	39.4	137,358,000	"	.610	81,414,000
1928	6,497,000	21.9	142,531,000	"	.621	88,471,000
Cotton	49,138,000	114.5	13,955,000	Bales	*1.196	1,399,285,000
1928	45,836,000	113.1	14,373,000	"	*1.180	1,291,369,000
Cottonseed			5,759,000	Tons	36.80	211,528,000
1928			6,390,000	"	36.29	231,222,000
Hay, tame	69,885,000	1.74	106,001,000	"	11.25	1,200,262,000
1928	57,776,000	1.61	93,081,000	"	12.31	1,148,220,000
Hay, wild	14,815,000	1.17	17,226,000	"	6.29	114,596,000
1928	13,144,000	1.28	13,292,000	"	7.86	96,978,000
All hay	75,698,000	1.69	123,227,000	"	30.56	1,317,137,000
1928	70,919,000	1.49	106,953,000	"	11.74	1,542,239,000
Cloverseed	1,214,000	1.42	1,727,000	Bushels	15.22	26,290,000
1928	718,000	1.53	1,106,000	"	16.31	16,029,000
Beans, dry edible*	1,571,000	10.3	16,181,000	"	7.88	46,412,000
1928	1,577,000	10.5	16,598,000	"	4.01	66,420,000
Soy beans*	1,162,000	13.6	15,770,000	"	1.80	25,474,000
1928	1,122,000	14.5	16,305,000	"	1.80	25,322,000
Potatoes, white	3,476,000	115.9	402,741,000	"	*.953	282,741,000
1928	3,825,000	121.0	462,943,000	"	*.540	226,040,000
Sweet potatoes	933,000	100.9	94,112,000	"	.825	77,013,000
1928	810,000	95.9	77,061,000	"	.992	72,680,000
Tobacco	1,584,900	765	1,211,909,000	Pounds	*.212	259,261,000
1928	1,912,100	718	1,373,501,000	"	*.185	291,723,000
Sugar beets	721,000	39.8	7,735,000	Tons	*7.67	59,455,000
1928	646,000	10.9	7,040,000	"	*7.18	50,525,000
Cane sirup	114,000	182.8	20,839,000	Gallons	.812	16,294,000
1928	113,000	192.8	21,783,000	"	.762	16,206,000
Sorghum sirup	366,000	82.7	30,268,000	"	.850	26,718,000
1928	348,000	77.5	28,072,000	"	.815	24,453,000
Apples, total			123,696,000	Bushels	1.001	185,136,000
1928			184,220,000	"	1.286	177,894,000
Apples, commercial			28,017,000	Barrels	3.99	109,860,000
1928			28,308,000	"	3.81	99,287,000
Peaches, total			45,463,000	Bushels	*1.181	59,494,000
1928			68,374,000	"	*.987	67,867,000
Pears, total			18,373,000	"	*1.222	24,528,000
1928			23,783,000	"	*1.019	24,746,000
Grapes, total*			2,605,238	Tons	*26.53	65,322,000
1928			2,636,076	"	*19.75	49,961,000
Commercial Truck Crops						
Cabbage	143,790	8.4	1,202,800	"	15.97	19,251,000
1928	136,850	7.1	976,900	"	24.94	23,424,000
Cantaloupes	105,780	142	15,014,000	Crates	1.49	21,404,000
1928	100,400	155	15,521,000	"	1.31	20,301,000

 UNITED STATES CROP SUMMARY, DECEMBER 1, 1923—Continued
 (Revised)

Crop and Year	Acreage	Production			Farm Price Dec. 1 Per Unit	Total Farm Value Based on December 1 Farm Price
		Per Acre	Total	Unit		
Corn, sweet (canning)	215,430	1.9	396,000	Tons	12.05	4,806,000
1928	280,180	1.9	536,400	"	12.96	6,806,000
Cucumbers	95,500	88	8,256,000	Bushels	1.14	9,425,000
1928	111,740	76	8,335,000	"	1.05	8,968,000
Onions	76,440	308	23,525,000	"	.80	18,751,000
1928	77,480	246	19,025,000	"	1.19	22,574,000
Strawberries	187,200	1,711	320,499,000	Quarts	.15	47,743,000
1928	202,580	1,604	324,999,000	"	.14	44,440,000
Tomatoes	397,430	4.1	1,641,300	Tons	26.89	44,063,000
1928	401,820	5.3	1,405,400	"	29.13	40,940,000
Watermelons	182,510	218	57,652,000	No.	*186.00	10,741,000
1928	210,450	224	61,773,000	"	*177.00	10,968,000
Total*	357,161,500					\$8,322,563,000
1928	360,952,920					8,456,062,000

*Principal producing states. *Pounds. *Per pound. *Total except hay. *Price other than December 1. *Production is the total for fresh fruit, juice and raisins, including grapes not harvested. *Per car of 1,000 melons. *Acreage and total value of all crops, including several minor crops not listed in the table.

 IOWA CORN MOISTURE STUDY, 1928
 (October)

Districts	Average Date Gathered	Average Date Tested	Total Number of Samples Tested	Total Number of Fields From Which Samples Were Gathered	Total Number of Ears Used in Samples	Average Moisture Content (Per Ct.)	Weights Used (Per Ct.)
Northwest No. 1	11	13	15	145	1,250	18.7	16
North Central No. 2	11	13	15	149	1,236	25.9	9
Northeast No. 3	12	14	16	125	880	27.4	6
West Central No. 4	11	14	19	161	1,362	20.5	18
Central No. 5	11	13	19	139	1,215	21.1	16
East Central No. 6	10	12	10	76	524	24.5	9
Southwest No. 7	11	13	12	122	661	30.4	11
South Central No. 8	11	14	18	131	805	21.7	7
Southeast No. 9	12	15	12	106	946	22.8	7
State	11	13	139	1,153	8,975	*21.77	100

*Weighted according to percentage of acreage husked in 1927.

The 139 samples tested for the October summary were obtained from 93 counties. The total number of ears in the samples was 8,975, or 7.78 ears per field, 64.5 ears per sample and 8.3 fields per sample. Fifty-five (55) samples gathered after October 15 were tested but not used in the summary. The mailing cartons used showed a loss of moisture of about 0.83 per cent per day, therefore the above State average should be increased about 1.66 per cent to arrive at the actual moisture at the time samples were gathered.

IOWA CORN MOISTURE STUDY 1928
(November)

Districts	Average Date Gathered	Total Number of Samples Tested	Total Number of Fields or Crib From Which Samples Were Gathered	Total Number of Ears Used in Samples	Average Moisture Content (Per Ct.)	Weighted Dist
	Nov.					
Northwest	21	22	113	1,228	13.8	10
North Central	21	22	184	1,961	22.1	7
Northeast	21	15	81	585	22.8	4
Central	22	25	144	1,538	19.0	23
East Central	21	22	127	1,321	19.6	20
Southwest	21	14	76	519	21.0	3
South Central	21	15	99	758	18.6	1
Southeast	21	18	117	837	19.2	1
	22	17	117	826	20.1	1
State	21	170	1,068	8,733	19.8	100

*Weighted according to percentage of acreage husked in 1927.

The 170 samples used in the November summary were obtained from 34 counties. The average number of fields or cribs in each sample was 6.1; the average number of ears in each sample was 51.4; the average number of ears per field, or crib, was 8.25. Eleven (11) of the above 170 samples were dry enough to be placed in Grade 3.

The final estimate, as of December 1, 1928, showed an average yield of 42.6 bushels per acre, which, according to this study, had a moisture content of about 19.8 per cent. To place this on a No. 2 contract grade basis it would be necessary to reduce the moisture content to 15.5 per cent, which would leave a yield of 40.4 bushels of No. 2 corn per acre.

Tin containers were used in obtaining these samples, so that no loss of moisture occurred between the time samples were gathered and the time they were tested.

CORN, BY STATES*

State	Acreage Harvested		Yield Per Acre		Production		Farm Price Per Bushel December 1	
	1,000 Acres		Bushels		1,000 Bushels		Cents	
	1927	1928	1927	1928	1927	1928	1927	1928
Maine	14	13	37.0	40.0	518	520	110	115
New Hampshire	15	14	41.0	40.0	615	560	105	120
Vermont	54	50	32.0	44.0	1,756	2,200	105	110
Massachusetts	46	45	41.0	42.0	1,886	1,890	120	130
Rhode Island	10	10	38.0	39.0	380	390	120	125
Connecticut	56	55	38.0	42.0	2,090	2,310	120	130
New York	663	650	34.0	34.0	22,542	22,100	96	99
New Jersey	179	181	40.0	38.5	7,160	6,968	85	97
Pennsylvania	1,270	1,288	39.5	39.0	50,165	50,037	77	78
Ohio	3,376	3,646	32.5	37.5	109,730	136,725	81	83
Indiana	4,205	4,882	31.5	35.2	132,458	161,322	65	69
Illinois	8,469	9,570	30.0	28.4	254,070	267,488	71	70
Michigan	1,418	1,461	37.5	35.0	53,995	51,135	85	84
Wisconsin	2,100	2,121	32.5	43.0	68,250	91,203	84	78
Minnesota	4,173	4,089	30.5	35.0	127,246	143,115	64	62
Iowa	10,901	11,174	35.5	42.6	386,986	476,012	69	67
Missouri	5,796	6,200	29.0	32.0	168,084	191,540	75	73
South Dakota	669	997	25.0	24.5	23,975	24,436	62	61
North Dakota	4,655	4,469	29.0	21.0	134,965	93,849	37	63
Nebraska	8,805	8,037	33.1	23.8	291,446	212,701	62	71
Kansas	5,897	6,634	30.0	27.0	176,910	179,118	61	65
Delaware	135	136	35.0	33.0	4,725	4,488	80	88
Maryland	515	530	44.0	38.5	22,660	19,343	80	83
Virginia	1,030	1,044	25.6	27.5	42,967	45,155	62	100
West Virginia	441	459	33.5	36.0	14,774	16,524	100	103
North Carolina	2,332	2,305	22.8	18.5	53,626	42,642	91	107
South Carolina	1,497	1,422	17.0	12.0	25,449	17,064	90	106
Georgia	3,895	3,620	14.0	10.5	54,592	38,010	81	105
Florida	573	607	13.0	13.0	7,449	7,891	97	109
Kentucky	2,885	3,029	26.0	22.0	75,010	66,633	82	96
Tennessee	2,944	2,915	34.0	19.5	79,656	56,842	83	100
Alabama	2,800	2,650	16.0	11.5	44,800	30,475	92	100
Mississippi	1,918	1,765	17.8	13.0	34,140	22,945	93	102
Arkansas	1,925	2,002	19.0	16.5	36,575	33,033	87	91
Louisiana	1,161	1,242	17.5	17.0	20,318	21,114	90	94
Oklahoma	3,177	3,050	26.5	22.0	84,190	70,150	59	68
Texas	5,189	4,722	23.0	21.0	119,347	99,162	65	78
Montana	205	274	23.5	19.0	7,165	5,200	72	82
Idaho	76	53	41.0	46.0	3,116	2,488	82	92
Wyoming	178	167	30.0	18.0	5,320	3,006	74	75
Colorado	1,284	1,423	15.5	13.0	19,900	18,694	68	69
New Mexico	166	190	15.0	17.5	2,490	3,282	92	89
Arizona	44	39	32.0	26.0	1,408	1,014	115	125
Utah	19	18	27.0	29.0	515	482	110	120
Nevada	2	2	22.0	22.0	50	44	115	112
Washington	43	46	37.0	39.9	1,601	1,704	90	99
Oregon	51	82	36.0	36.0	1,816	2,923	95	100
California	77	75	32.0	32.0	2,464	2,400	108	105
United States	96,303	100,761	28.1	28.2	2,765,065	2,850,950	72.5	75.1

*This table covers corn for all purposes, including hogged and siloed corn, and that cut and fed without removing the ears, as well as that husked and snapped for grain. In most states the yield for grain is applied to the total acreage to obtain an equivalent production of "all corn."

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State of Iowa

1927

REPORT OF THE

STATE APIARIST

FOR

The Year Ending December 31, 1927

and Report of the Commission of the Iowa Beekeepers' Association to
June, November 17-18, 1927

V. H. PAINOKE, STATE APIARIST

Iowa, 1928

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