The Weekly Weather and Crop Bulletin - Serving U.S. Agriculture

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Abstract

The *Weekly Weather and Crop Bulletin* (*WWCB*) provides an invaluable source of information pertinent to regional, national, and international agriculture. Since 1978, the *WWCB* has been produced by the Joint Agricultural Weather Facility (JAWF), a global agricultural weather and information center located within the United States Department of Agriculture (USDA) in Washington, D.C. The JAWF is jointly operated by the Department of Commerce's Climate Prediction Center (DOC/CPC), and USDA's World Agricultural Outlook Board (WAOB) and the National Agricultural Statistics Service (NASS). The publication is a shining example of how two major departments within the federal government can mutually cooperate, combining meteorology and agriculture to provide a service that benefits the economic well being of the nation. The *WWCB* highlights weekly meteorological and agricultural developments on a national and international scale. Written summaries of weather and climate conditions affecting agriculture are provided, along with detailed charts and tables of agrometeorological information that are appropriate for the season.

Agrometeorological Service and Success Story

Background

The *Weekly Weather and Crop Bulletin* (*WWCB*) is deeply rooted in the past. First published in 1872 as the *Weekly Weather Chronicle,* the publication has evolved over the past 129 years into one that provides a vital source of information on weather, climate, and agricultural developments worldwide. A brief history of the *WWCB* can be found in Table 1. Although the major

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emphasis of the *WWCB* is on U.S. weather and its impacts on agricultural production, the publication took on an international scope in 1978, with the creation of the Joint Agricultural Weather Facility (JAWF). The JAWF is an operational unit, monitoring worldwide weather conditions and preparing real-time agricultural assessments (Puterbaugh *et al*. 1997; Motha and Heddinghaus 1986). Information on U.S. agriculture is obtained for each state through a network of county extension agents, farmers, and volunteer crop reporters, and summarized at the NASS State Statistical Offices (SSOs). This information is then sent to NASS headquarters in Washington, D.C., and relayed to JAWF. Weather data and information for the United States and international areas are supplied by the National Weather Service (NWS). The international portion contains weather information from over 7,000 global observing stations obtained through the Global Telecommunications Network and managed by the World Meteorological Organization (WMO).

Regular Features in the *WWCB*

The *WWCB* contains observations of both physical and biological elements that are used to track the cumulative affects of weather on crop growth and development. Although the main emphasis of the *WWCB* is on current growing-season weather conditions and agricultural developments in the United States, summaries and charts for major international areas are included, as well as special articles and charts on episodic weather events. Table 2 lists the descriptive summaries, charts, and tabulations regularly published in the *WWCB*.

Weekly Text Products

The *WWCB* begins with a text of U.S. Weather Highlights, a descriptive summary of significant weather events (i.e., droughts, floods, freezes, temperature extremes, snowfall, severe weather, etc.) that affected agriculture during the preceding week (Sunday - Saturday). These highlights provide the framework for the National Agricultural Summary's section of the bulletin. This national summary contains information on field crop progress and condition that is obtained from detailed weather and crop summaries prepared by the SSOs and transmitted each Monday afternoon to the crop statistician at NASS in Washington, D.C. A shorter version of these individual state reports is published in the "State Summaries of Weather and Agriculture" section of the *WWCB*. The state reports usually discuss crop-weather conditions relating to fieldwork and crop development, pest and disease outbreaks, soil moisture levels, crop progress, and pasture and livestock conditions.

Table 1. 129 Years of Weather and Crop Reporting, 1872-2001

Title	Dates	Managing Department	Bureau or Office	Remarks
Weekly Weather Chronicle	November 1872- April 1881	War	Signal Corps	The *Chronicle* was a two-page release containing a general weather summary.
Weather Crop Bulletin	May (?) 1888- June 1891	War	Signal	The *Bulletin* was Corps issued weekly during the growing season (May to Sept.) and monthly during the other months.
Weather Crop Bulletin	July 1891- January 1896	Agriculture	Weather Bureau	The Weather Service of the Signal Corps was transferred from the War Department to the Department of Agriculture (USDA) on Jul. 1, 1891, creating the Weather Bureau.
Climate and Crop Bulletin	Feb 1896- August 1904	Agriculture	Weather Bureau	Title Change
Weather Crop Bulletin	August 1904- January 1906	Agriculture	Weather Bureau	Title change.
National Weather Bulletin	Feb. 1906- June 1914	Agriculture	Weather Bureau	Title change.
National Weather and Crop Bulletin	July 1914- December 1921	Agriculture	Weather Bureau	Title change. The *Snow and Ice Bulletin*, which had been issued

				separately since 1894, was added during the winter from Dec. 1919 to Dec. 1921.
Weather, Crops, and and Markets	January 1922-December 1923	Agriculture	Weather Bureau	The publication was reduced in content consolidated with *Crops and Markets*.
Weekly Weather and Crop Bulletin	January 1924-June 1940	Agriculture	Weather Bureau	The publications were again separated. The *Bulletin* had its final name change, acquired much of its present content.
Weekly Weather and Crop Bulletin	July 1940-July 1965	Commerce	Weather Bureau	The WeatherBureau was transferred from USDA to the Department of Commerce (DOC) on Jul. 1, 1940.
Weekly Weather and Crop Bulletin	July 1965-May 1979	Commerce	Environ-ment Data Service	On Jul. 13, 1965, the Environmental Data Science Services Administration (ESSA) was created as an agency within DOC. The Environment Data Service (EDS) was established in ESSA. On Oct. 3, 1970, EDS moved into the newly created National Oceanic and Atmospheric

				Administration, and the Weather Bureau became the National Weather Service (NWS).
Weekly Weather and Crop Bulletin	May 1979-present	Commerce	Climate Analysis/ Prediction Center	The Climate Analysis Center (CAC) was established within The NWS in May 1979. The JAWF, comprised of NWS/ CAC and USDA employees, was created a few months earlier. Under a NWS reorganization in 1995, CAC became the Climate Prediction Center.

The "International Weather and Crop Summary" portion of the *WWCB* contains information on weather and crop developments in major crop growing areas worldwide. These international summaries provide an early alert of weather conditions that affect yield potential on a regional scale, and ultimately have an impact on United States supplies and prices for agricultural commodities. Areas that are covered in the international section of the *WWCB* year-round include Europe, Western former USSR, Eastern Asia, Southeast Asia, Australia, and South America. Areas with seasonal coverage include: Northwestern Africa, South Africa, the Middle East, the New Lands region of the former USSR, South Asia, Mexico, and Canada.

National and International Charts

High quality weather and climate data serve as the core for the continued success of the *WWCB*. Most of the various charts (maps) and tables in the *WWCB* are obtained from the NWS/CPC. For the United States, charts

Table 2. Regular Features in the Weekly Weather and Crop Bulletin

Regular Features in the Weekly Weather and Crop Bulletin (w = weekly, m = monthly, s = seasonal)	
Text:	
U.S. Weather Highlights	w/s
U.S. Weather and Crop Summary	m
National Agricultural Summary	w
Spring Wheat, Oats, and Barley (April - September)	w
Rice, Sorghum, Corn, Cotton, and Peanuts (April - November)	w
Soybeans (May - November)	w
Winter Wheat (September - November and April - August)	w
Sugar Beets (April - May and September - November)	w
Sunflowers (May - June and September - November)	w
U.S. Crop Production Highlights	m
State Summaries of Weather and Agriculture (April - November)	w
State Summaries of Weather and Agriculture (December - March)	m
Water Supply Forecasts for the Western United States (January – March)	m
International Weather and Crop Summary (major crop areas)	w/m
Special Articles and Charts	as needed
National Charts:	
Precipitation	w/m/s
Percent of Normal Precipitation	m/s
Average Temperature	m/s
Departure of Average Temperature from Normal	w/m/s
Extreme Minimum Temperature (September - April)	w
Extreme Maximum Temperature (April - September)	w
Snow Depth (December - March)	w

Regular Features in the Weekly Weather and Crop Bulletin (w = weekly, m = monthly, s = seasonal)	
Average Soil Temperature, 4-Inch Depth, Bare Soil (March - June)	w
Pan Evaporation (May - September)	w
Growing Degree Days (May - October)	w
Crop Moisture Index (April - October)	w
Palmer Drought Severity Index (April - October)	w
Additional Precipitation Needed to End Drought (April - October)	w
Drought Monitor	w
International Charts (major crop areas):	
Precipitation	w/m
Percent of Normal Precipitation	m
Average Temperature	m
Departure of Average Temperature from Normal	m
National Tabulations:	
Weather Data for Selected Cities	w
Weather Data for Selected Locations in the Delta and Bootheel	w
Precipitation and Temperature	m/s
Crop Progress: Planting, Development, Harvesting (April-November)	w
Crop Condition (April - November)	w
International Tabulation:	
Precipitation and Temperature	m

containing analyzed precipitation and temperature data are published each week, while charts of precipitation, percent of normal precipitation, average temperature, and departure of average temperature from normal are published for each month and season (December - February, March - May, June - August, and September - November). For international areas, charts of precipitation are published each week, while charts of precipitation, percent of normal precipitation, average temperature, and departure of average temperature are published monthly. The weekly charts provide information on weather

conditions currently affecting crop development. The monthly and seasonal charts provide an indicator of longer-term developments.

The *WWCB* includes agricultural meteorological data and derived parameters, including soil temperature, pan evaporation, growing degree day (GDD) accumulations for corn, Western U.S. snow pack information, the Palmer Drought Severity Index, the Crop Moisture Index, and the Drought Monitor. A map of weekly average soil temperatures at a depth of 4 inches is published during the spring (March - June), providing guidance to farmers on when soil temperatures have reached high enough levels to begin planting field crops such as corn, soybeans, cotton, and sorghum. An U.S. map containing daily pan evaporation measurements averaged over the week from a standardized NWS Class "A" pan device is published for available locations from May - September. Pan evaporation measurements are used to estimate the amount of evaporation from lakes and reservoirs, to compute potential evapotranspiration and crop-water needs, and for irrigation scheduling.

Charts containing cumulative weekly GDDs for U.S. corn are featured during the growing season. Departure from normal GDD maps are also calculated in order to monitor the seasonal progress of the corn crop. The GDD index for corn was first introduced into the bulletin in 1969, as a more accurate measure of corn growth and maturity, instead of the accumulation of a certain number of calendar days. A description of the GDD concept for corn is given by Felch (1972) and Ramirez and Bauer (1974).

Drought monitoring and assessment is of paramount importance when determining the impact of weather on agricultural production. Furthermore, the severity and duration of drought determines the degree to which agricultural production is impacted. Since it takes weeks or months for drought conditions to develop, drought severity not only depends on current conditions, but antecedent weather as well. The Palmer Drought Severity Index (PDSI) was introduced into the *WWCB* in 1961 by Wayne Palmer, as an index of meteorological drought (Palmer, 1965). Today, the PDSI remains a vital portion of the publication, serving as a useful tool in U.S. drought monitoring. Weekly maps of drought severity are generated by computing the PDSI for each of the 344 climate divisions in the continental United States. The PDSI is calculated from long-term records of precipitation and temperature, the available water content of the soil, and the normal climate of an area. The PDSI provides spatial and temporal representations of historical droughts and indicates the availability of water supplies for irrigation, reservoir and pond

levels, range conditions, and potential for wildfires.

While the PDSI evaluates the scope of prolonged periods of abnormally dry weather, it does not evaluate short-term moisture conditions that are needed for agriculture. A period of rain for a couple of weeks could be very beneficial for crops, but would not be nearly enough to replenish depleted soil moisture reserves or restore low reservoirs to a near-normal level. In order to evaluate the short-term moisture conditions for agriculture during the growing season, Palmer (1968) developed a second index called the Crop Moisture Index (CMI). The CMI was first published in the *WWCB* in the April 15, 1968, issue. Each week, maps containing CMI values for each climate division in the continental United States as well as analyzed values of the CMI are published. The CMI index responds rapidly to changes in temperature and moisture conditions during the growing season. As a result, the CMI is not a good long-term drought-monitoring tool. Furthermore, the CMI is not applicable to germinating and shallow-rooted crops, or for cool season crops when temperatures are averaging below 55 degrees F.

In 1999, representatives from USDA, DOC, and the National Drought Mitigation Center met to discuss the need for a new national drought product. These discussions led to the creation of the U.S. Drought Monitor, which is assembled by a rotating team of nine lead authors, who look at a myriad drought indices, including the PDSI and CMI, to produce a national drought product that incorporates agricultural, hydrological, and wildfire concerns. The Drought Monitor, which is updated weekly, has appeared in the *WWCB* since March 2000.

National Tabulations

Each week during the growing season (April - November), tables containing state and national information on crop progress and condition are published in the WWCB. These tables are compiled at the NASS headquarters in Washington, D.C. and are based on information that is received each week from the SSOs. The crop progress tables contain information on the percentage of crops that were either planted or harvested during the week ending Sunday, and the percentage of crops in various phenological stages, such as silking of corn or heading of wheat. Crop progress tables are provided for each of the major field crops, including winter wheat, spring wheat, corn, sorghum, soybeans, barley, oats, peanuts, sunflowers, sugar beets, cotton, and rice. Each table contains information for only those states where a majority of the crop is

grown. Information on crop progress from the previous week, the previous year, and the 5-year average is included in the table. Each table contains a summary of national crop progress that is weighted by state, and based on either the planted (for planting progress table) or harvested (for harvest progress table) acres for the previous year. Statistics on crop and pasture condition are provided by crop reporters that are instructed to "report the conditions of the crop now, as compared with the normal growth and vitality you would expect at this time, if there had been no damage from unfavorable weather, insects, pests, etc.". The normal condition of the crop may vary from one location to another due to soil and climate differences, crop varieties, and cultural practices. There are five categories of condition: very poor, poor, fair, good, and excellent. Each table contains a summary of national crop conditions that are weighted by state, and based on planted acres for the previous year.

Each week, a data table containing precipitation (in inches) and temperature (in degrees Fahrenheit) for selected cities in each of the 50 U.S. states is published in the *WWCB* for the period ending on Saturday. These data are provided by the NWS/CPC. This "Selected Cities" table provides a closer look at weather conditions that are locally affecting agriculture. In addition to temperature and precipitation data, the table contains information on relative humidity and episodic weather events. Around the beginning of each month, tables containing precipitation and temperature data for the previous month are published for selected cities in both the United States and some international locations. For the United States, the data are in English units and consist of calculations of average monthly temperature, departure from normal monthly average temperature, total monthly precipitation, and departure of monthly precipitation from normal. Data for selected cities in international countries are in metric units. The monthly temperature information (in degrees Celsius) consists of calculations of average maximum temperature, average minimum temperature, extreme maximum and minimum temperatures, monthly average temperature, and the departure from normal monthly average temperature. Precipitation data (in millimeters) includes the total observed monthly precipitation and its departure from normal (based on 1961-1990 data).

While the information contained in the "Selected Cities" table is highly useful, these sites do not provide satisfactory coverage for some agricultural areas. Such areas are found in the Mississippi Delta and the Missouri Bootheel region, where agricultural weather data collection sites exist, but are beyond

the responsibility of the current NWS basic reporting network. In order to establish a linkage between these two networks, a table containing "Weather Data for Selected Locations in the Delta" was added to the *WWCB* in February 1999. Additional data for the Missouri Bootheel region was added in August 2000. Data contained in the table is provided weekly by the Mississippi State Delta Research and Extension Center, the Southern Regional Climate Center, and the University of Missouri. The table contains weather data similar to that found in the NWS "Selected Cities" table, except values of soil temperature (at the 4-inch depth in degrees F) are substituted for the relative humidity values.

Economic Benefits

Meteorological conditions influence important farming operations such as planting and harvesting, and greatly influence yield at critical stages of crop development. As a result, the statistics contained in the *WWCB* keep crop and livestock producers, farm organizations, agribusinesses, state and national farm policy-makers, government agencies, and foreign buyers of agricultural products apprized of worldwide weather-related developments and their effects on crops and livestock. The *WWCB* provides critical information to decision-makers formulating crop production forecasts and trade policy. Furthermore, tracking weather and crop developments in countries that are either major exporters or importers of agricultural commodities keeps the agricultural sector informed on potential competitors. The bulletin also provides timely weather and crop information between the monthly *Crop Production* and *World Supply and Demand Estimate* reports, issued by NASS and WAOB, respectively.

Crop and weather reports are especially important in farming areas. A wet planting season may prompt farmers to switch to another crop. A poor grain harvest may affect livestock feeding patterns. A regional drought can boost planted acres elsewhere to offset the expected production decline, and government policymakers may adjust farm programs to accommodate changing conditions. Thus, agricultural statistics contained in the *WWCB* keep farmers, consultants, public agencies, and private organizations aware of changing crop developments within each state and across the nation. Another important user of agricultural statistics is the analyst. The analyst uses statistics on crop progress and crop condition to make crop-yield projections, and to determine the local and national economic impacts of changes in crop developments, including their potential impacts on U.S. agricultural commodity prices.

Other Important Issues

The main emphasis of the *WWCB* is on macro-scale (regional) applications of agricultural meteorology, as opposed to micro-scale field applications. While the *WWCB* was originally designed to maintain a current awareness of weather and crop conditions both nationally and internationally, the long history of the publication makes it an excellent climatological record. This extensive history provides a reference source that is rich in climate and agricultural information, which is essential for episodic-events monitoring and analog-year comparisons. The value of information provided to data users depends on the speed of delivery. Although the *WWCB* is available by subscription, quicker access to the information can be obtained through the JAWF Web site at http://www.usda.gov/agency/oce/waob/jawf/wwcb.html. Both NASS and WAOB maintain an archive of reports and databases on the Internet at http://usda.mannlib.cornell.edu.

Conclusion

For over a century, the *Weekly Weather and Crop Bulletin* has provided a current and reliable source of information on meteorological and agricultural developments within the United States. The expansion of coverage into international areas in the 1970's, along with the creation of the Joint Agricultural Weather Facility in 1978, made the *WWCB* an invaluable source of information on global weather and agriculture, further increasing the economic benefit of the publication.

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