# Chapter 1. Global agroclimatic patterns

Chapter 1 describes the CropWatch Agroclimatic Indicators (CWAIs) rainfall (RAIN), temperature (TEMP), and radiation (RADPAR), along with the agronomic indicator for potential biomass (BIOMSS) in 105 global Monitoring and Reporting Units (MRU). RAIN, TEMP, RADPAR and BIOMSS are compared to their average value for the same period over the last fifteen years (called the “average”). Indicator values for all MRUs are included in Annex A table A.1. For more information about the MRUs and indicators, please see Annex B and online CropWatch resources at www.cropwatch.com.cn. Compared to the previous bulletin, some of the larger MRU with several different phenology and agroclimatic conditions have been subdivided. Thus, the number of MRU wad increased by 40 in this bullletin.

## 1.1 Introduction to CropWatch agroclimatic indicators (CWAIs)

This bulletin describes environmental and crop growth conditions over the period from January 2023 to April 2023, JFMA, referred to as "reporting period". CWAIs are averages of climatic variables over agricultural areas only inside each MRU and serve the purpose of identifying global climatic patterns. For instance, in the "Sahara to Afghan desert" MRU, only the Nile Valley and other cropped areas are considered. MRUs are listed in Annex B. Refer to Annex A for definitions and to table A.1 for 2023 JFMA numeric values of CWAIs by MRU. Although they are expressed in the same units as the corresponding climatological variables, CWAIs are spatial averages limited to agricultural land and weighted by the agricultural production potential inside each area.

We also stress that the reference period, referred to as "average" in this bulletin covers the 15-year period from 2008 to 2022. Although departures from the 2008-2022 are not anomalies (which, strictly, refer to a "normal period" of 30 years), we nevertheless use that terminology. The specific reason why CropWatch refers to the most recent 15 years is our focus on agriculture, as already mentioned in the previous paragraph. 15 years is deemed an acceptable compromise between climatological significance and agricultural significance: agriculture responds much faster to persistent climate variability than 30 years, which is a full generation. For "biological" (agronomic) indicators used in subsequent chapters we adopt an even shorter reference period of 5 years (i.e., 2018-2022). This makes provision for the fast response of markets to changes in supply.

Correlations between variables (RAIN, TEMP, RADPAR and BIOMSS) at MRU scale derive directly from climatology. For instance, the positive correlation between rainfall and temperature results from high rainfall in equatorial, i.e., in warm areas.

Considering the size of the areas covered in this section, even small departures may have dramatic effects on vegetation and agriculture due to the within-zone spatial variability of weather. It is important to note that we have adopted an improved calculation procedure of the biomass production potential in the bulletin based on previous evaluation.

## 1.2 Global overview

Europe had its warmest January and the second warmest winter on the 174 year record. Another record was set by tropical cyclone Freddy, which traversed the southern Indian Ocean for more than five weeks in February and March 2023. It was the longest-lasting and highest accumulated cyclone energy-producing tropical cyclone ever recorded worldwide. It had started on February 5, 2023, off the coast of Australia and

finally dissipated on March 14 over Mozambique. It caused flooding conditions in southeast Africa, mainly in Malawi.

## 1.3 Rainfall

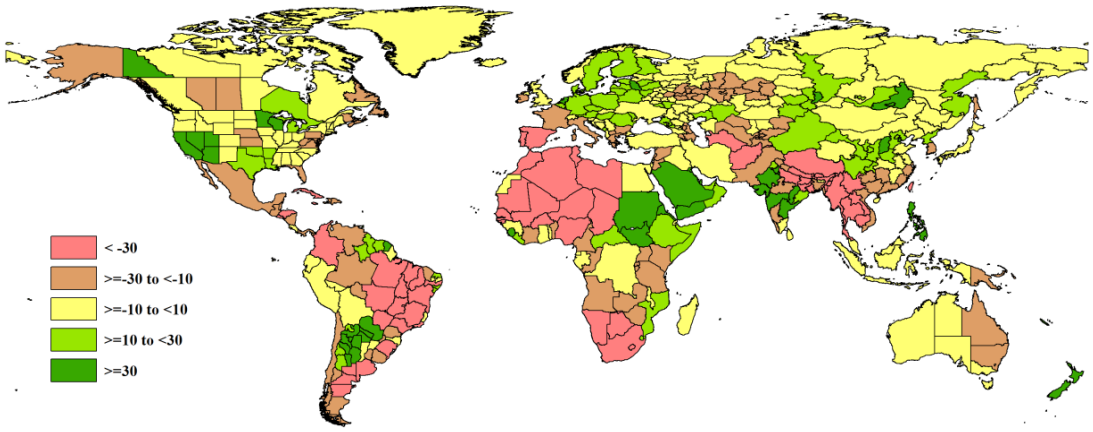


**Figure 1.1 Global map of rainfall anomaly (as indicated by the RAIN indicator) by CropWatch Mapping and Reporting Unit: Departure of January 2023 to April 2023 total from 2008-2022 average (15YA), in percent.**

Many important crop production regions around the globe suffered from moderate (-10 to -30%) or severe (<-30%) rainfall deficits, as compared to the 15YA. The most severe rainfall deficits were recorded for Central, Eastern and the Northeast of Brazil, the Caribbean and the Mexican Highlands in the Americas. Moderate deficits were observed for the Amazon basin and the Andes north of Argentina, as well as Central America. In the USA, only one region, the north of the High Plain, suffered from a rainfall deficit that was greater than 10%. In the other regions of the USA, conditions were average to above average. In Canada, parts of the Prairies also had a rainfall deficit. It is noticeable that the long lasting droughts in the west and southwest of the USA as well as in Argentina, have come to an end. Almost all regions bordering the Mediterranean continued to experience a rainfall deficit. The most severe ones with deficits greater than 30% were recorded for the Maghreb, Northeast Spain and southern France. The drought conditions also continued for the Levant and Central Asia, the Hindukush and Himalayas. Southern Africa also experienced severe or moderate rainfall deficits. The multi-year drought conditions in East Africa continued as well. All the mainland countries in Southeast Asia also had a severe rainfall deficit, whereas, in Southeast China, a moderate deficit was recorded. Most of the crop production regions of Australia also suffered from a rainfall deficit. Conditions were average or above average in Central and Eastern Europe and South Asia.

## 1.4 Temperatures

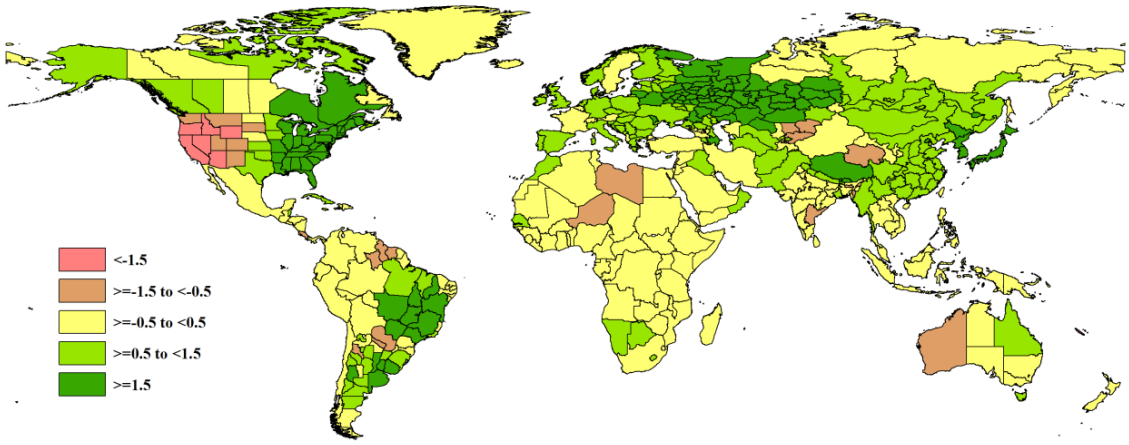


**Figure 1.2 Global map of temperature anomaly (as indicated by the TEMP indicator) by CropWatch Mapping and Reporting , Unit: departure of January 2023 to April 2023 average from 2008-2022 average (15YA), in °C.**

Temperatures were more than 1.5ºC warmer in Central and Eastern Brazil, the Eastern half of the USA, Russia west and east of the Ural, as well as Northeast China, the Koreas and Japan. Cooler than average temperatures in the range of -1.5 to -0.5ºC were recorded for the coastline along the Pacific Ocean in South America and the Western half of the USA. The strongest negative departures, exceeding -1.5ºC were recorded for the entire West coast of the USA. South West Australia also experienced cooler than normal temperatures.

## 1.5 RADPAR

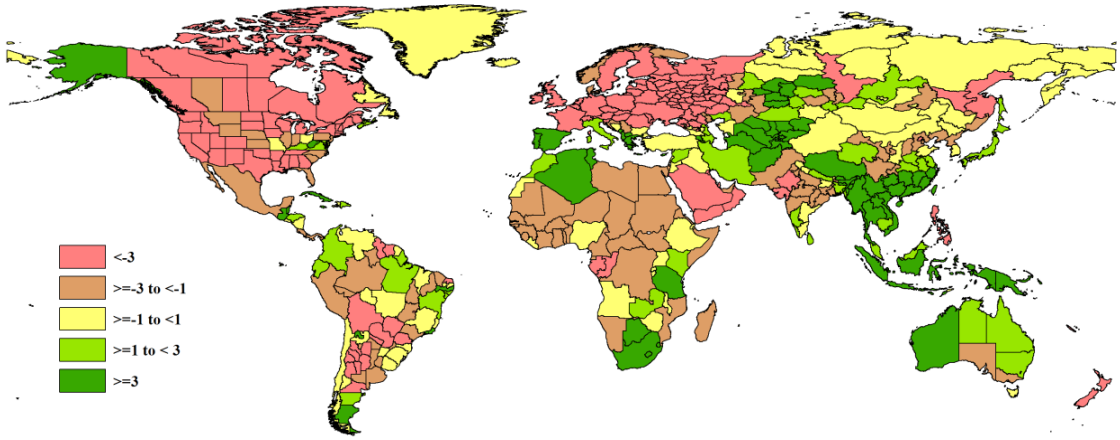


**Figure 1.3 Global map of photosynthetically active radiation anomaly (as indicated by the RADPAR indicator) by CropWatch Mapping and Reporting Unit: departure of January 2023 to April 2023 average from 2008-2022 average (15YA), in percent.**

In the important crop production regions of South America, photosynthetically active solar radiation (RADPAR) was below average. The strongest deficits were recorded for the Andes in Argentina and the coastlines of Chile and Peru. Conditions on Central America were average, whereas in most of Mexico and the entire USA, as well as the crop production regions of Canada either a severe negative departure exceeding -3% or a moderate departure in the range of -1 to -3% was observed. A strong positive departure was observed for the regions bordering the Mediterranean Sea. The other regions of Europe had a strong negative departure. In Africa, most regions south of the Equator had normal to above normal solar radiation, apart from the coastal zones in South-west Africa. Pakistan also had below average solar

radiation. The weather was sunnier than usual in most of Central and southern China, as well as Southeast Asia and most of Australia.

## 1.6 BIOMSS

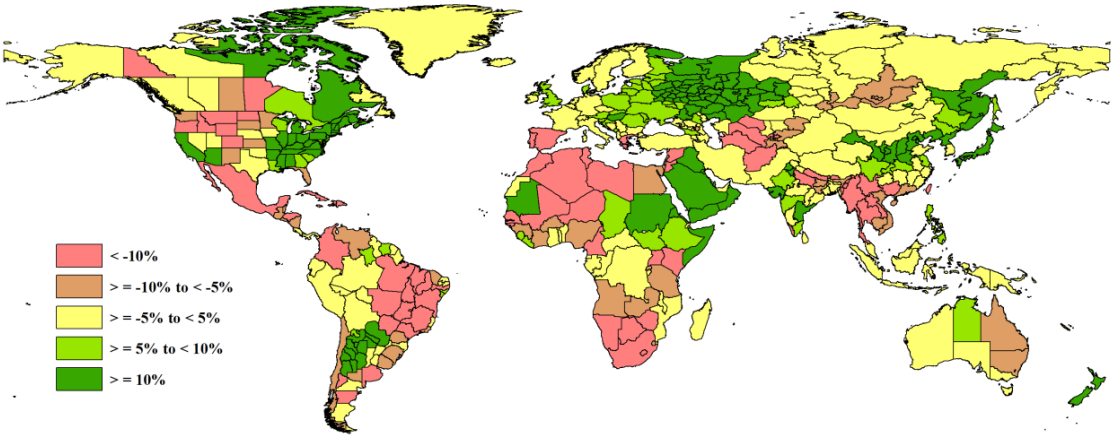


**Figure 1.4 Global map of biomass accumulation (as indicated by the BIOMSS indicator) by CropWatch Mapping and Reporting Unit: departure of January 2023 to April 2023 average from 2008-2022 average (15YA), in percent**

The most severe negative departure in estimated biomass, exceeding -5%, was observed for Central and northern Brazil, Central America and the Mexican Highlands as well as the High Plains in the USA. For the drought stricken Mediterranean basin, the Hindukush, Himalayas and Southeast Asia as well as the crop production regions in Australia, moderate (-2 to 5%) or severe (<-5%) departure was observed. In Africa, most regions south of the Sahel also had a moderate or severe negative departure. The west coast of the USA, as well as the eastern half of the USA, Central and Eastern Europe, South Asia and Northeast China, the Koreas and Japan, had above average biomass production, exceeding +5%.