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 sixty-five 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**.

1.1 Introduction to CropWatch agroclimatic indicators (CWAIs)

This bulletin describes environmental and crop growth conditions over the period from April to July 2022, AMJJ, referred to as "reporting period". In this chapter, we focus on 65 spatial "Mapping and Reporting Units"(MRU) which cover the globe, but CWAIs are averages of climatic variables over agricultural areas only inside each MRU. 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 and serve the purpose of identifying global climatic patterns. Refer to Annex A for definitions and to table A.1 for 2022 AMJJ 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 2007 to 2021. Although departures from the 2007-2021 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., 2017-2021). 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

2022 is well on track to rank among the 10-warmest years on record, according to the National Oceanic and Atmospheric Administration (NOAA) of the USA. The period from January to July ranks as the 6th hottest on record. The five warmest Julys on record have all occurred since 2016. Unusually high temperatures were recorded in the North China Plain, as well as in Europe. Apart from the high temperatures, Europe, as well as parts of China, were hit by severe drought conditions, causing not only damage to crops, but also limiting hydropower generation and shipping operations on the Rhine, Loire and Yangtze rivers. Thus, global warming is not only impacting agriculture, but the economy and well-being of people as well.

The analysis of the CropWatch Agroclimatic Indicators (CWAIs) at the global level showed that temperatures were 0.14ºC warmer, solar radiation was 0.7% above average, but rainfall was reduced by 2.6% when compared to the 15YA (Fig 1.1).

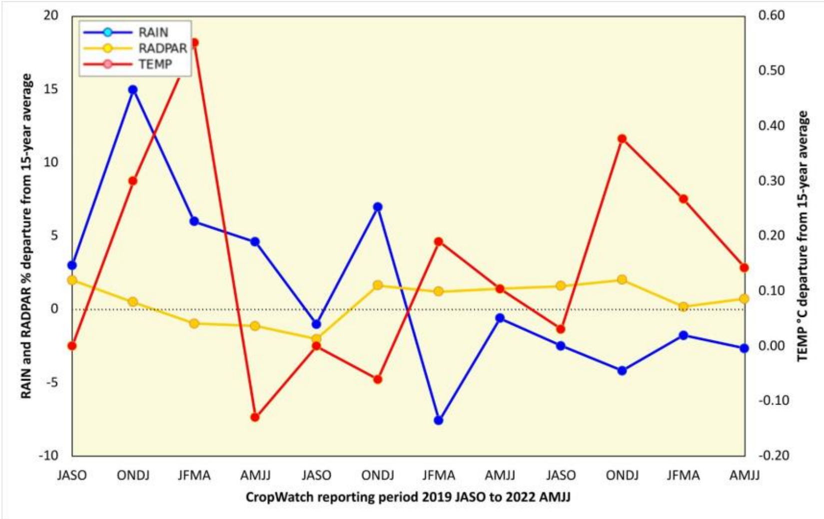

Figure 1.1 Global departure from recent 15-year average of the RAIN, TEMP and RADPAR indicators. The last period covers April to July (AMJJ) 2022 (average of 65 MRUs, unweighted).

1.3 Rainfall

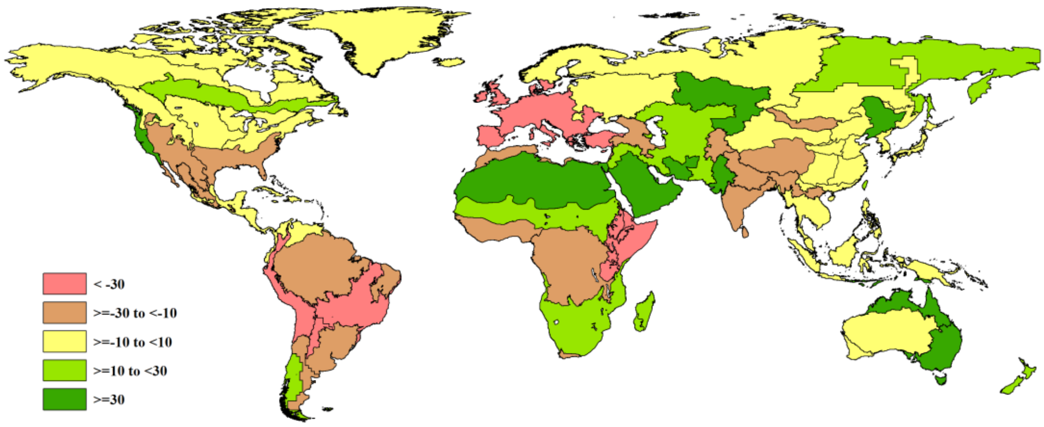

Figure 1.2 Global map of rainfall anomaly (as indicated by the RAIN indicator) by CropWatch Mapping and Reporting Unit: Departure of April to July 2022 total from 2007-2021 average (15YA), in percent.

The rainfall departure map continues to reflect the current La Niña conditions. The largest rainfall deficits, exceeding more than -30%, as compared to the 15YA, were observed for Central-Eastern Brazil, the Central-northern Andes, most of Europe and the Horn of Africa. In addition, most of South America, as well as the Southern USA and Northern Mexico, the Maghreb, Central and Western Africa and the Indian subcontinent and SouthWestern of China also experienced rainfall deficits between -10% to -30%. The strongest positive departures were observed for Pakistan, Ural to Altai mountains, northeast of China and Eastern Australia. Only few regions, such as the northern half of the USA, Russia west of the Ural, South-East China and South-East Asia experienced normal rainfall, with a departure range of -10% to +10%.

1.4 Temperatures

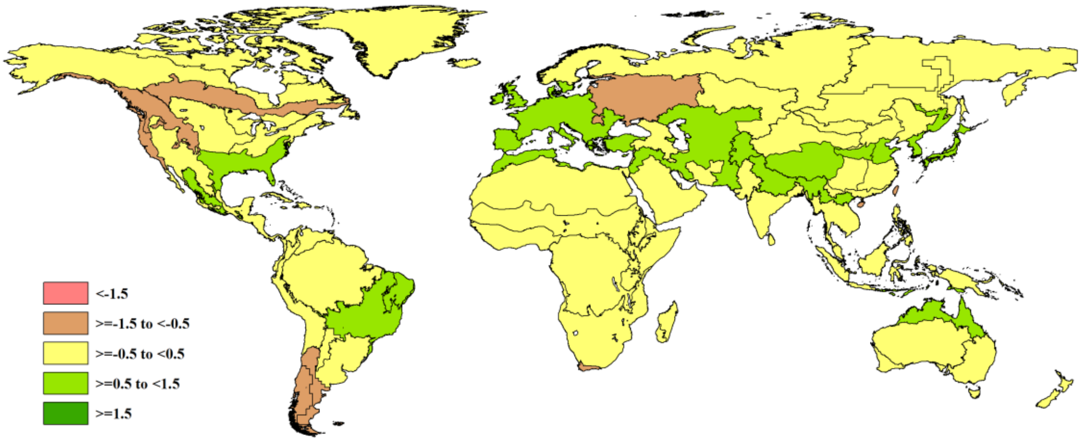

Figure 1.3 Global map of temperature anomaly (as indicated by the TEMP indicator) by CropWatch Mapping and Reporting Unit: departure of April to July 2022 average from 2007-2021 average (15YA), in °C.

Cooler temperatures, in the range of -1.5ºC to -0.5ºC as compared to the 15YA, were observed in the southern tip of South America, California and Pacific Northwest, the Canadian Prairies and Russia west of the Ural. Warmer temperatures (+0.5ºC to 1.5ºC) were observed for most the crop production region of Brazil, the South and East of the USA, most of Europe, the Maghreb, Central Asia and Himalayas, as well as the North China Plain. For all other regions, the average departures were minimal, in the range of +0.5ºC to -0.5ºC.

1.5 RADPAR

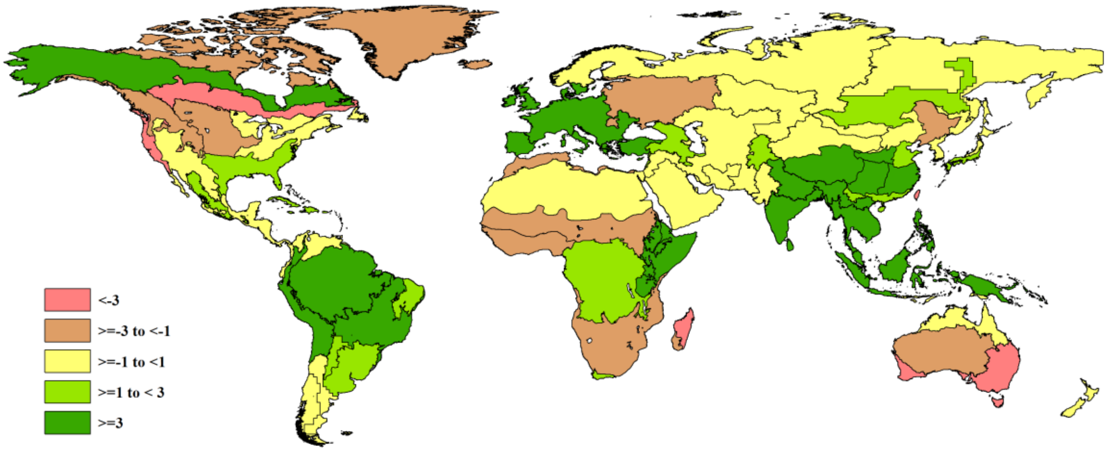

Figure 1.4 Global map of photosynthetically active radiation anomaly (as indicated by the RADPAR indicator) by CropWatch Mapping and Reporting Unit: departure of April to July 2022 total from 2007-2021 average (15YA), in percent.

The strongest negative departures (<-3%) in solar radiation were observed for California, the Canadian Prairies and the wheat production regions of Australia. The Northern Great Plains in the USA, Russia west of the Ural, north-east of China, Africa north of the equator as well as southern Africa had below average solar radiation, in the range of -1% to -3% below average. Solar radiation was normal to above-average for most of the Americas. Most of Europe, apart from Russia west of the Ural, the Horn of Africa, South and South-East Asia and Southern China experienced radiation levels that were more than 3% above average. Higher solar radiation, in combination with warm temperatures, increases potential evapotranspiration, and thus crop water demand. This in turn exacerbates drought conditions.

1.6 BIOMSS

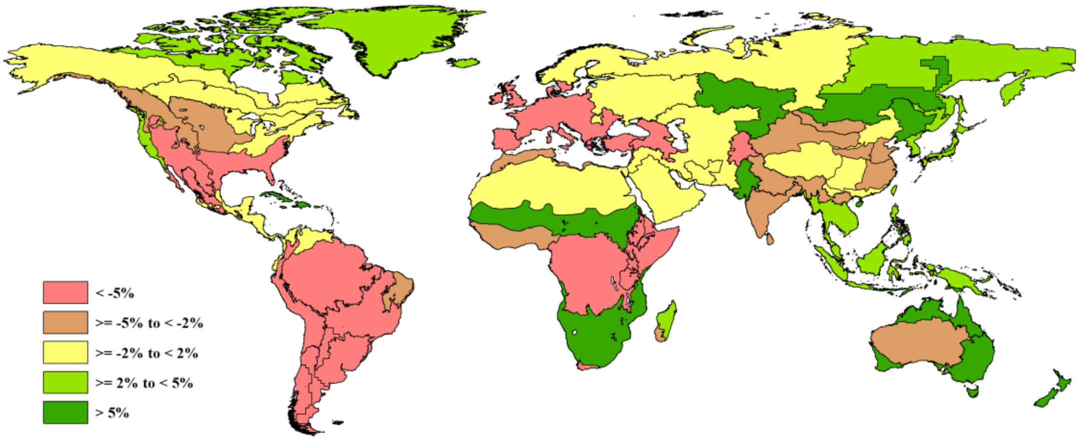

Figure 1.5 Global map of biomass accumulation (as indicated by the BIOMSS indicator) by CropWatch Mapping and Reporting Unit: departure of April to July 2022 total from 2007-2021 average (15YA), in percent.

Potential biomass production, which is calculated by taking rainfall, temperature and solar radiation into account, was more than 5% below the 15YA for most of South Africa, southern USA, as well as central and northern Mexico. Central Africa and the Horn of Africa, most of Western and Central Europe, as well as drought plagued Afghanistan also experienced strong negative departures (<-5%). Negative departures (-5% to -2%) were observed for the north-west of the USA, the Maghreb , South Asia with the exception of Pakistan, as well as Eastern China, including the North China Plain. Northeastern United States, Eastern Canada, Central America and most of Russia generally experienced average biomass production. Siberia and the north-east of China had generally favorable conditions for biomass production, with a positive departure that was greater than +5%.