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 was 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 April 2023 to July 2023, AMJJ, 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

During this monitoring period, temperature records were broken in different parts of the world. However, the transition from La Niña to El Niño tended to somewhat smooth out conditions. It brought more rainfall to regions that had been drought-stricken, such as the Middle East and Eastern Africa and parts of South

America, such as Argentina. On the other hand, rainfall returned from above average to average levels in most of Australia.

1.3 Rainfall

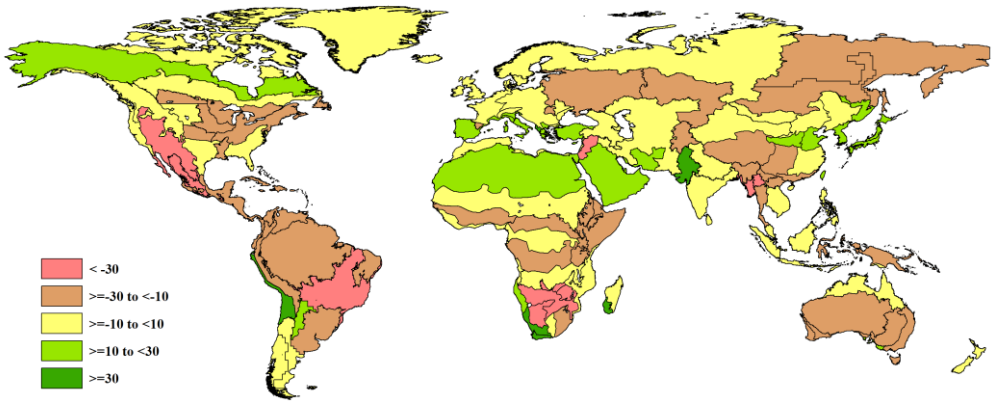

Figure 1.1 Global map of rainfall anomaly (as indicated by the RAIN indicator) by CropWatch Mapping and Reporting Unit: Departure of April 2023 to July 2023 total from 2008-2022 average (15YA), in percent.

As during the previous monitoring period, a general rainfall deficit was observed for South America. It was most severe in Central Brazil (<-30%). In the Pampas of Argentina, southern Brazil, the Amazon Basin and the Andes, the deficit was more moderate, ranging from -30% to -10%. It was also moderate in Central America and southern Mexico. The Mexican Highlands and the Rocky Mountains observed a severe rainfall deficit. A return to average rainfall is notable for California, the northern High Plains, Texas and the South East of the USA. The Midwest, Northeast, and Canadian Prairies experienced a moderate rainfall deficit. In most of Europe, rainfall was near average. Only Russia and Central Asia were affected by a moderate deficit. Severe dry conditions persevered in the Levant. In Africa, the countries bordering the Sahel desert experienced average rainfall. However, total rainfall amounts were still small, since this was just the start of the rainy season. The deficit was moderate in the zones with higher rainfall towards the equator. In Southern Africa, the southwest had above average rainfall, but more inland, Botswana and Mozambique had a severe rainfall deficit. In Asia, rainfall was more than 30% above average in Pakistan, whereas a severe deficit was observed for Myanmar. In Central China, Korea and Japan, rainfall was above average by 10% to 30%. Most of Australia experienced a moderate rainfall deficit.

1.4 Temperatures

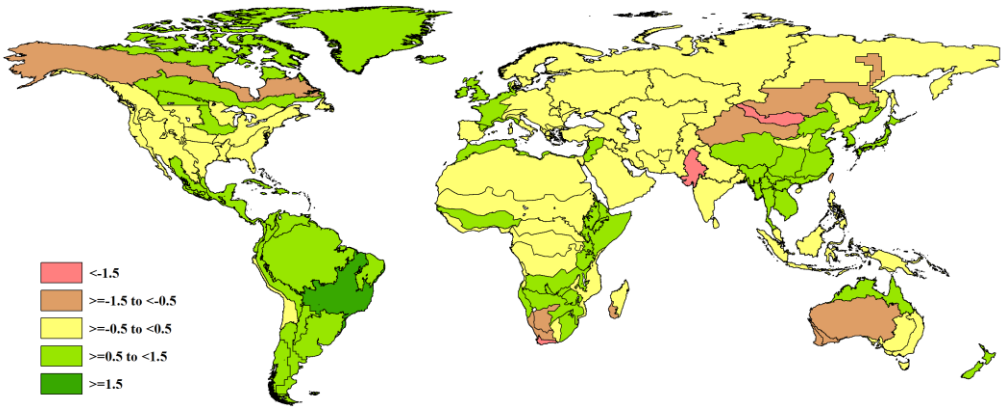

Figure 1.2 Global map of temperature anomaly (as indicated by the TEMP indicator) by CropWatch Mapping and Reporting , Unit: departure of April 2023 to July 2023 average from 2008-2022 average (15YA), in °C.

Temperatures were above average in almost all of South and Central America. The strongest positive departure by more than 1.5ºC was observed for Central and Eastern Brazil. In North America, temperatures in most regions were normal. The only positive departure by more than 0.5ºC was recorded for the Canadian Prairies and the northern Corn Belt. A similar positive departure was observed for most of Western Europe, while the rest of Europe experienced normal temperatures. The Maghreb, the region of the Gulf of Guinea, as well as Eastern and Southern Africa, were moderately warmer than usual, with the positive departures ranging from 0.5 to 1.5ºC. Only the southwestern tip of the African continent experienced cooler than usual temperatures. Pakistan, which had above average rainfall, was cooler by more than 1.5ºC. Southeastern Asia, most of China, Korea and Japan were moderately warmer. Below average temperatures were observed for Mongolia and Eastern Siberia. Temperatures were also cooler by 0.5 to 1.5ºC in Western Australia. All in all, temperature departures were moderate.

1.5 RADPAR

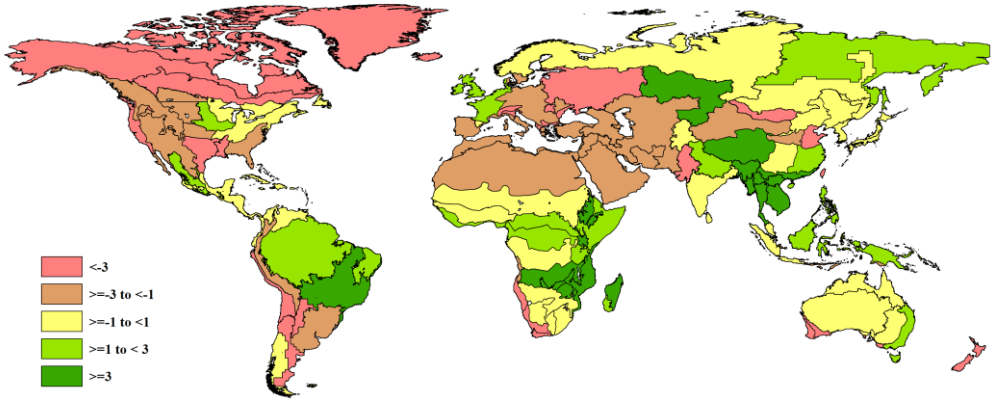

Figure 1.3 Global map of photosynthetically active radiation anomaly (as indicated by the RADPAR indicator) by CropWatch Mapping and Reporting Unit: departure of April 2023 to July 2023 average from 2008-2022 average (15YA), in percent.

In South America, solar radiation was above average by more than 3% in Central Brazil and the Amazon basin. In southern Brazil, Uruguay and most of the crop production regions of Argentina, and the Andes, solar radiation was below average by -1 to -3%. In Central America, conditions were average. The western half of the USA and most of Canada had less sunshine than usual. The strongest negative departures had been recorded for California and the southern High Plains. The Corn Belt and the Northeast of the USA experienced above average or normal solar radiation. In Europe, sunnier conditions were recorded for France, Benelux and the UK. Southwest, Central and Eastern Europe received below average solar radiation.

The strongest negative departures were recorded for Russia west of the Ural. Africa north of the Sahel and the entire Middle East experienced a slightly negative departure from the 15YA. In Central, East, and parts of southern Africa, solar radiation was above average. The only exception was the southwest coast, where solar radiation was below average by more than -3%. The strongest negative departures in Asia were observed for Pakistan, Mongolia and the North China Plain. For most Southeast Asia, a strong positive departure by more than 3% was recorded. In Australia, solar radiation ranged from strongly below average in the southwest to average and moderately above average along the east coast.

1.6 BIOMSS

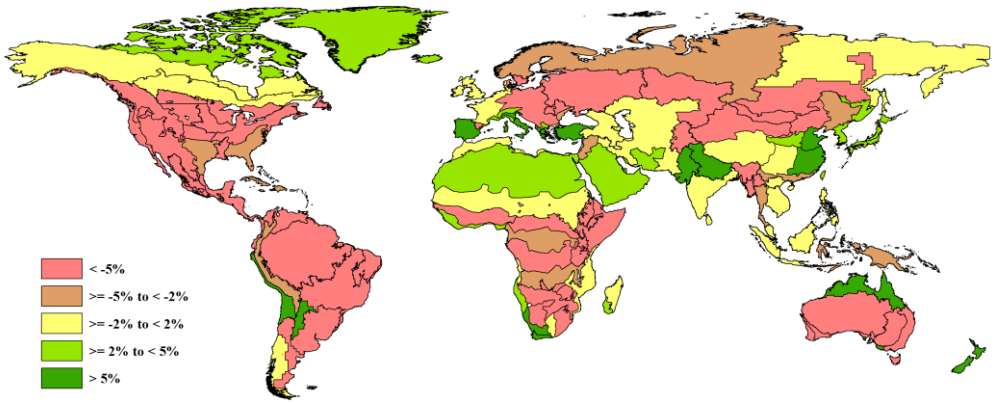

Figure 1.4 Global map of biomass accumulation (as indicated by the BIOMSS indicator) by CropWatch Mapping and Reporting Unit: departure of April 2023 to July 2023 average from 2008-2022 average (15YA), in percent.

Estimated biomass production was by more than 5% below average in almost all of the Americas. This was either due to a rainfall deficit, as in most of South America or less solar radiation, as in the western half of North America. Only for the coastal region of Peru, a positive departure by more than 5% was estimated. In southern Europe and Türkyie, biomass production was above average. In Central and Eastern Europe, it was below average. It was also below average in most of Africa south of the Sahara, whereas a positive departure by more than 5% was estimated for the southwest. In Pakistan and the Gangetic Plains, the North China Plains and southern China, a positive departure by more than 5% was estimated. For most of the crop production regions in Australia, biomass production was estimated by more than 5% below average.