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 July to October 2022, JASO, 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 2022 JASO 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

Temperatures keep setting new records. During this monitoring period, Europe experienced the hottest summer on record, accompanied by a prolonged drought. The Yangtze river basin in China also experienced an extremely hot and dry summer. Extreme rainfall anomalies were recorded as well in other parts of the world: Pakistan experienced devastating floods, while the South of the USA, Argentina, southern Africa and the Horn of Africa were affected by severe droughts. These conditions can be partly blamed on La Niña, which is entering a rare 3rd consecutive northern winter. Thus, the outlook for the upcoming months is rather dire for some regions.

1.3 Rainfall

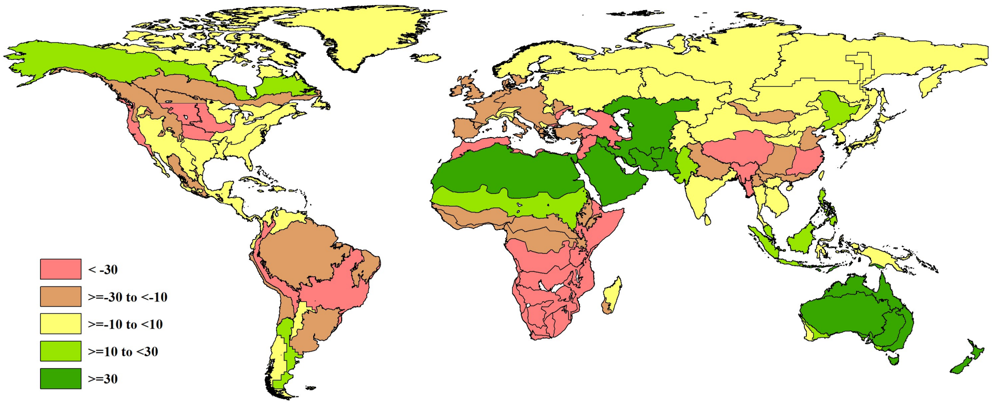

Figure 1.1 Global map of rainfall anomaly (as indicated by the RAIN indicator) by CropWatch Mapping and Reporting Unit: departure of July to October 2021 total from 2007-2021 average (15YA), in percent.

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, California, the northern Plains, Southern and eastern Mediterranean area, the Caucasus region, Africa south of the equator, Tibet and South-East China. Rainfall deficits in the range of -10 to -30% were observed for the Pampas, southern and north-east of Brazil, the Amazon basin, the Mexican Highlands, most of Canada's crop production regions, most of Europe and Türkiye, Central Africa and Gulf of Guinea, northwest India, the North China Plain and Southern China. Only few summer crop production regions in the northern hemisphere received above average rainfall. These were most of Iran and Central Asia, Arabian Peninsula, Sahara, Pakistan and the North-East of China. In the southern hemisphere, the Malay Archipelago, as well as Australia and New Zealand experienced above average rainfall conditions.

1.4 Temperatures

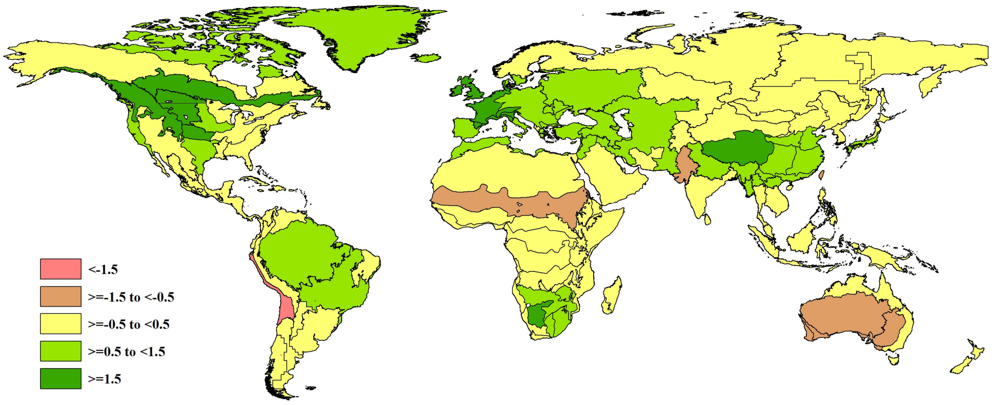

Figure 1.2 Global map of temperature anomaly (as indicated by the TEMP indicator) by CropWatch Mapping and Reporting Unit: departure of July to October 2021 average from 2007-2021 average (15YA), in ° C.

Cooler temperatures, exceeding the 15YA by more than -1.5ºC were observed along the coast of northern Chile and Peru. The Sahel, Pakistan and most of Australia experienced temperatures that were 0.5 to 1.5ºC below average. The Cerrados, Pantanal and Amazon basin in Brazil, the Southern Plains, California, Maghreb, Central and Eastern Europe, the Middle East, north of India and most of China south of Beijing experienced temperatures that were 0.5 to 1.5ºC above average. The strongest positive departures (greater than +1.5ºC) were recorded for the Northern Plains, most of Canada's crop production region, Western Europe, the Tibetan Plateau and Southern Africa.

1.5 RADPAR

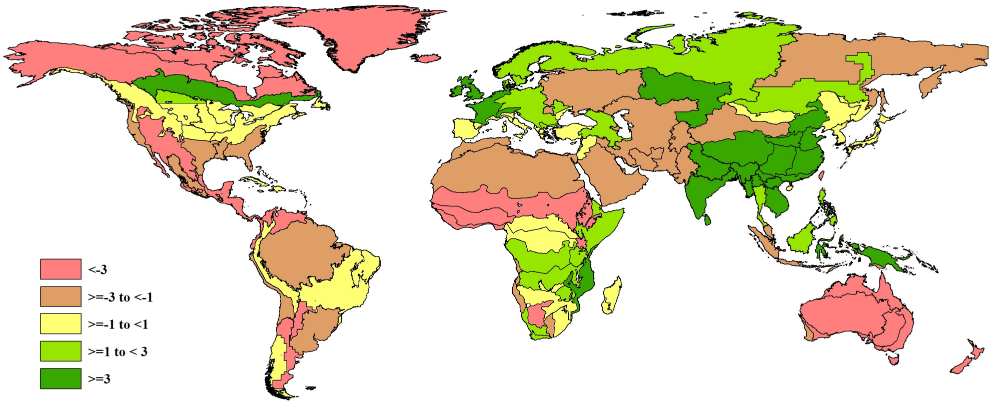

Figure 1.3 Global map of photosynthetically active radiation anomaly (as indicated by the RADPAR indicator) by CropWatch Mapping and Reporting Unit: departure of departure of July to October 2021 total from 2007-2021 average (15YA), in percent.

The strongest negative departures (<-3%) in solar radiation were observed for the northwest and southeast of Argentina, Central America, the Rocky Mountains, the Sahel and Western Africa, as well as Australia. The Pampas, southern Brazil, the Amazon basin, the Pacific coast of South America, California, South of the USA, Africa north of the Sahel, Middle East and Central Asia, Eastern Europe as well as Indonesia had below average solar radiation, in the range of -1% to -3% below average. Above average solar radiation was recorded for parts of southern and eastern Africa and Central Europe. A stretch ranging from the Canadian Prairies to its East Coast recorded strong positive departures exceeding +3%. Similarly, Western Europe, Mozambique, South- and Southeast Asia as well as most of China experienced much sunnier conditions than usual.

1.6 BIOMSS

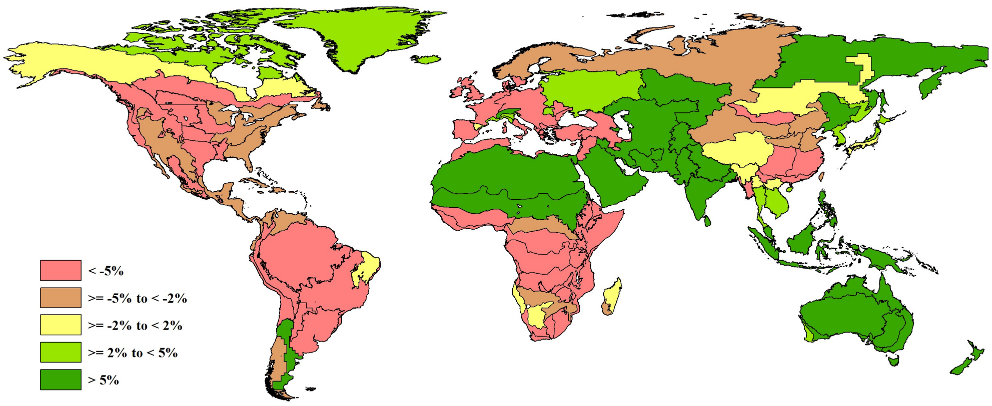

Figure 1.4 Global map of biomass accumulation (as indicated by the BIOMSS indicator) by CropWatch Mapping and Reporting Unit: departure of July to October 2021 from 2007-2021 average (15YA), in percent.

In the Americas, potential biomass production, which is calculated by taking rainfall, temperature and solar radiation into account, was above average only in Central Chile and the south-east coast of Argentina. In the other parts of the Americas, it was strongly or slightly below average. A similar situation was observed for Western Africa and most of Africa south of the Equator. The Maghreb and Europe, apart from Russia and the Alps also had a strong negative departure. Most of China, apart from its Northeast, had below average biomass production. Conditions were more favorable for Central and South Asia, the Malay Archipelago, Australia and New Zealand.