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.cn**.

1.1 Introduction to CropWatch agroclimatic indicators (CWAIs)

This bulletin describes environmental and crop growth conditions over the period from October 2021 to January 2022, ONDJ, 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 2021 ONDJ 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) but the BIOMSS indicator is nevertheless compared against the longer 15YA (fifteen-year average). This makes provision for the fast response of markets to changes in supply but also to the fact that in spite of the long warming trend, some recent years (e.g. 2008 or 2010-13) were below the trend.

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. The improved approach includes sunshine (RADPAR), TEMP and RAIN.

1.2 Global overview

2021 was the sixth warmest year on record. Temperatures were 0.84ºC above the average of the 20thcentury. A La Niña episode, which tends to cool global temperatures, helped slow the increase in temperature.

In October, much warmer than usual temperatures were recorded for the Eastern USA and northeastern Siberia. Eastern Europe and Central Asia recorded close to normal or even below average temperatures. Precipitation was above average in the north-west of the USA, East Asia and Scandinavia. The rest of Europe, from the west to the Ural, however experienced below average rainfall. A rainfall deficit was recorded for Central Asia and the Pampas in Argentina as well.

In November, temperatures were above average for most of north America, apart from the southeast of the USA. In Africa, above average temperatures were observed for the countries bordering the southern Sahara. Siberia also experienced above average temperatures. Most of the USA, as well as the near East and Central Asia experienced drier than usual conditions. Wetter conditions were observed for Eastern Asia, mainly the North China plain as well as for Eastern Australia.

In December, the South-East of the USA experienced strong positive temperature departures, whereas in the North-West of Canada, temperatures were below average. They were warmer than usual as well in Central and Eastern Asia. The strongest precipitation deficits were recorded for Southern Brazil, Paraguay and the south-east of the USA. The Maghreb also experienced far drier than normal conditions, together with Central and Eastern Asia.

In January 2022, temperatures were cooler than average for the eastern half of North America and the Indian sub-continent. North Africa also experienced below average temperatures. Precipitation was above average in the Horn of Africa, South Africa, South Asia and Southeast Asia, as well as Southern Australia. Drier than usual conditions were observed for the southern USA and Mexico, as well as Western Europe and the Maghreb.

Figure 1.1 shows unweighted averages of the CropWatch Agroclimatic Indicators (CWAIs), i.e. the arithmetic means of all 65 MRUs, which are relatively close to average. CWAIs are computed only over agricultural areas, and they display a relatively average situation, globally. During the monitoring period, temperatures were 0.4ºC above the 15YA, rainfall was below average, whereas solar radiation was near average.

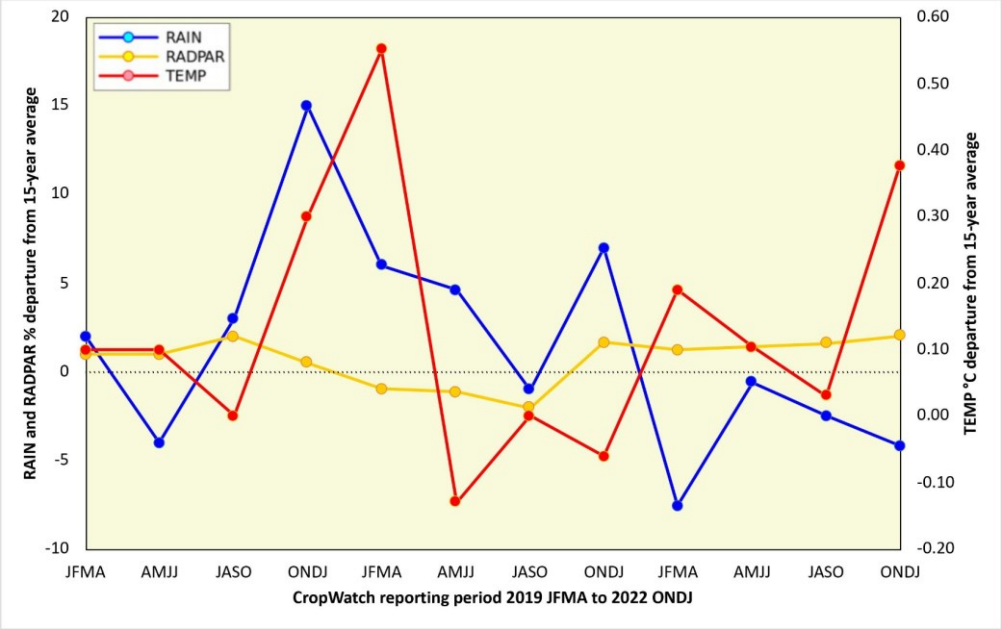

Figure 1.1 global departure from recent 15-year average of the RAIN, TEMP and RADPAR indicators. The last period covers October 2021 to January (ONDJ) 2022 (average of 65 MRUs, unweighted).

1.3 Rainfall

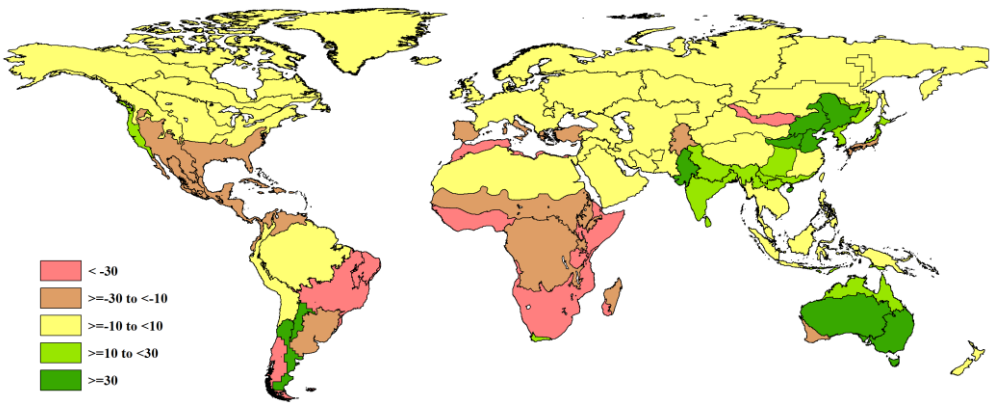

Figure 1.2 Global map of rainfall anomaly (as indicated by the RAIN indicator) by CropWatch Mapping and Reporting Unit: departure of October 2021 to January 2022 total from 2007-2021 average (15YA), in percent.

The rainfall departure map shows dryer conditions (< -30%) for most of the important crop production regions in Brazil, West Africa, Southern and Eastern Africa, as well as for the Maghreb. California, the Andes region in Argentina, Central Chile, South and Eastern Asia, together with most of Australia, were the only zones that received above average rainfall. In the remaining zones, conditions were drier than usual, mainly in the southern half of North America, southern Brazil and most of sub-Saharan Africa and Central Asia.

1.4 Temperatures

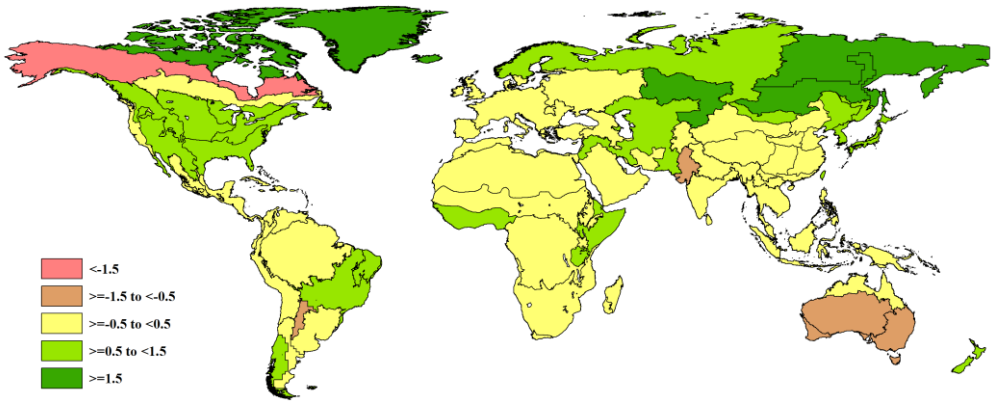

Figure 1.3 Global map of temperature anomaly (as indicated by the TEMP indicator) by CropWatch Mapping and Reporting Unit: departure of October 2021 to January 2022 average from 2007-2021 average (15YA), in °C.

Much cooler than average (<-1.5ºC) departures were observed for northern Canada and Alaska. Below average temperatures in the range of -1.5 to -0.5ºC were recorded for most of Pakistan and Australia. Most of South America, apart from Brazil, most of Africa, Europe and South and Southeast Asia experienced average temperatures. Warmer than usual temperatures were recorded for the USA, Siberia, Korea and Japan.

1.5 RADPAR

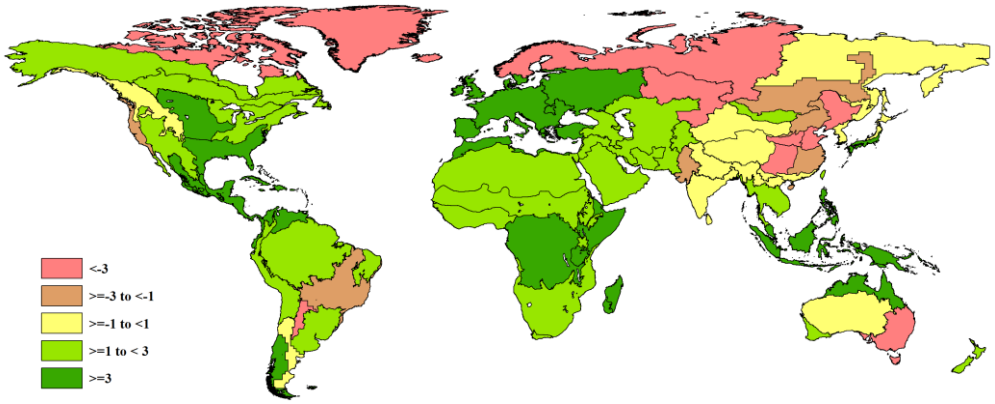

Figure 1.4 Global map of photosynthetically active radiation anomaly (as indicated by the RADPAR indicator) by CropWatch Mapping and Reporting Unit: departure of October 2021 to January 2022 total from 2007-2021 average (15YA), in percent.

Solar radiation was above average for most of the Americas, except for the crop production region in Brazil. It was also above average for all of Africa, Europe, apart of the Scandinavian countries and the middle of Russia. Below average radiation was observed for Eastern China and the southeast of Australia.

1.6 BIOMSS

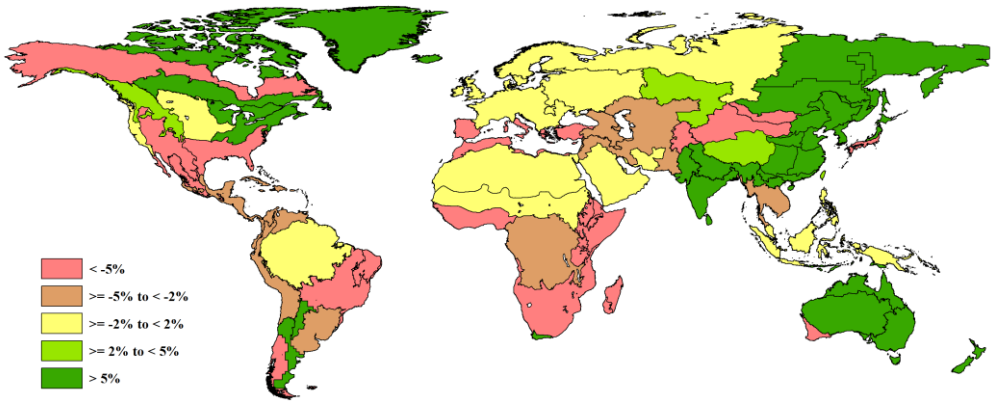

Figure 1.5 Global map of biomass accumulation (as indicated by the BIOMSS indicator) by CropWatch Mapping and Reporting Unit: departure of October 2021 to January 2022 total from 2007-2021 average (15YA), in percent.

Potential biomass production, which is calculated by taking rainfall, temperature and solar radiation into account, was more than 5% below the 15YA for the southern USA, the crop production region in Brazil, western, southern and eastern Africa, as well as Central Asia. It was also below average for the drought-stricken Maghreb and Mediterranean coast. Above average production was estimated for the Northeastern of USA, South and East Asia, Australia ,and the main production zones of Canada.