Chapter 1. Global agroclimatic patterns

1.1 Introduction to CropWatch agroclimatic indicators (CWAIs)

This bulletin describes environmental and crop conditions for the period from January 2020 to April 2020, JFMA, 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 2020 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 2005 to 2019. Although departures from the 2005-2019 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. 2015-2019) 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, 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 a new calculation procedure of the biomass production potential in the August 2019 bulletin. The new approach includes sunshine (RADPAR), TEMP and RAIN. Readers are referred to the August 2019 bulletin for details.

1.2 Global overview

The northern winter season 2019/20 was the second warmest winter on record. Especially January was warmer: Never since 1880, when the reference data set starts, has Earth experienced such high temperatures during that month. The trend of abnormally high temperatures continued in February, March and April, when the second highest temperatures on record were observed. For Europe, this was the warmest winter on record. Temperatures were 1.4ºC above the previous winter record, set in 2015-16. In eastern Europe, temperatures were even relatively warmer, or rather, less cold: For the period from January to April, temperatures were 3.3ºC warmer than the previous 15-year average for the CropWatch MRU C58, which expands from the Ukraine to the Ural mountains.

Warmer winter temperatures generally hasten spring green-up of winter wheat. However, warmer temperatures do not prevent late season frosts. Untimely cold snaps in the Midsouth and Midwest of the USA caused some frost damage to wheat in mid-April and early May.

At a global scale, rainfall (RAIN) returned to close to average levels after the high positive deviation during the last monitoring period. Photosynthetically active solar radiation (RADPAR) was slightly below average.

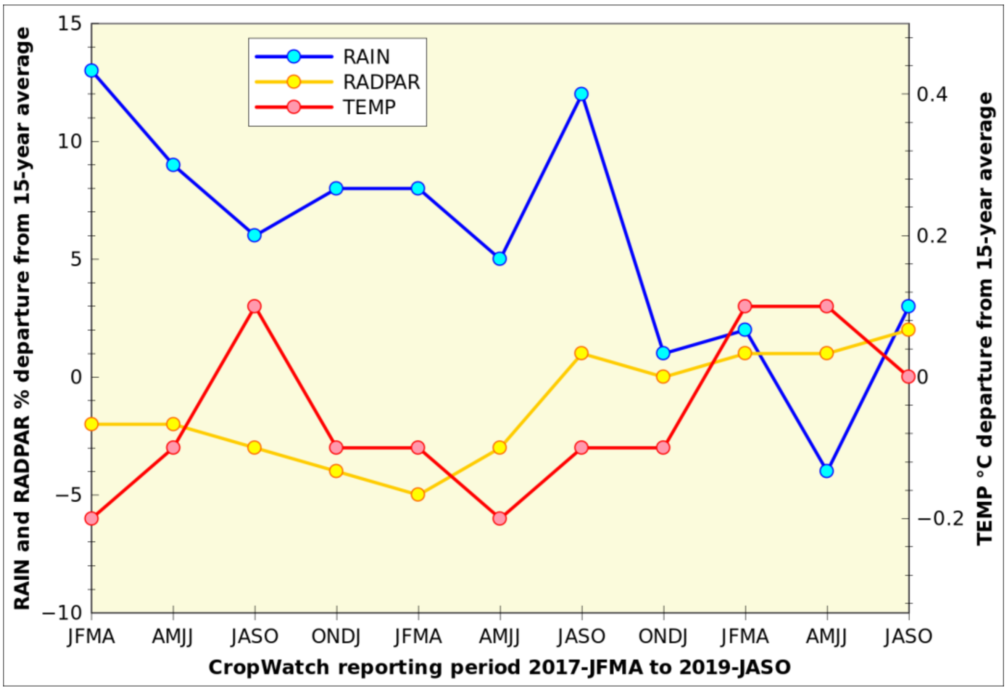


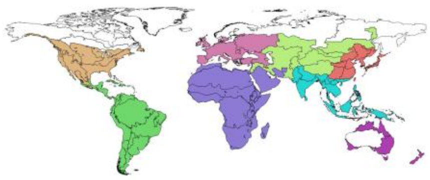
Figure 1.1 global departure from recent 15 year average of theRAIN, TEMP and RADPAR indicators since 2017 JASOperiod (average of 65 MRUs, unweighted)

Figure 1.1 shows unweighted averages of the CropWatch Agro-climatic Indicators, 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 (RAIN +3%, TEMP average, RADPAR +2% and BIOMSS +1%, as result of the combined positive departures of RAIN and BIOMSS).

When global MRU average departures are computed using agricultural area as a weighting factor, a positive rainfall departure of 0.4% is observed (Table 1.1), with average TEMP but RADPAR up 0.4%. BIOMSS is 0.2% below average.

Table1.1 Departures from the recent 15-year average of CropWatch agro-climatic indicators over regional MRU groups. Within each group, averages are weighted by the agricultural area of individual MRUs. "Others" include five non agricultural areas shown in white in the map. They are located mostly at high northern latitudes, and characterized by the largest positive TEMP departure. Some of them experienced unusually intense fires in their recent summer season.

	RAIN (%)	TEMP (℃)	RADPAR (%)	BIOMSS (%)
Africa	-5	-0.1	2	-6
America S+C	-4	-0.3	2	-3
America N	12	-0.9	-4	0
Asia center	11	0.7	-4	12
Asia East	10	0.8	-3	8
Asia South	-2	-0.1	2	2



Europe	-3	0.8	2	1
Oceania	-23	0.4	4	-21
Others	7	2.2	0	18
World	**0.4**	**0.0**	**0.4**	**-0.2**

1.3 Rainfall (Figure 1.2)

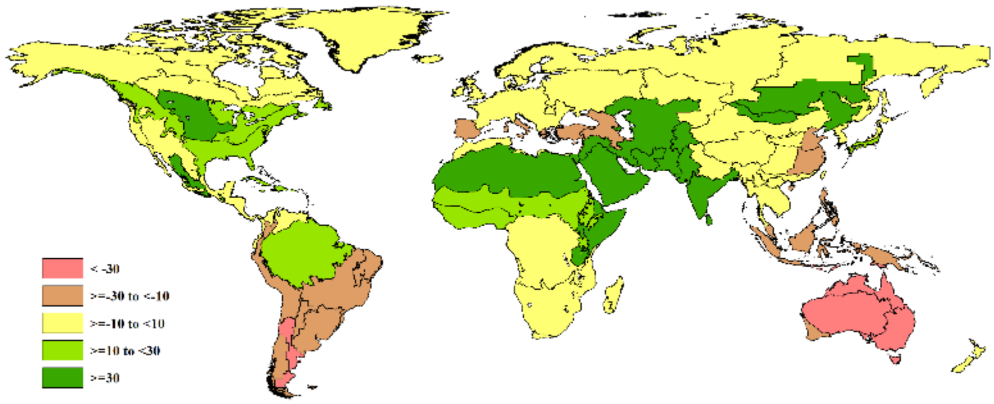


Figure 1.2 Global map of rainfall anomaly (as indicated by the RAIN indicator) by CropWatch Mapping and Reporting Unit: departure of January to April 2020 total from 2005-2019 average (15YA), in percent.

During the previous CropWatch monitoring period, which lasted from October to January, above average rainfall was reported for North and East Africa, southern Mexico and South Asia. Back then, the Maghreb already experienced below-average precipitation. Drought in that region continued during this monitoring period, which was detrimental for wheat growth in Morocco and Algeria. Italy, South-Eastern Europe and especially the region north of the Black Sea also experienced below-average rainfall between January and April of this year. Most of South America, with the exception of the Pampas in Argentina and the North-East of Brazil, also suffered from rainfall levels that were 10% or more below average. The precipitation deficit was larger than 30% in southern Brazil, Venezuela and Colombia and some islands in the Caribbean. Dryer-than-usual conditions were also observed for Central America, California in the USA and most of Central Africa. South and Eastern Australia had recovered from the very dry conditions observed during the last monitoring period. However, conditions remained dry in Western Australia.

The Midwest and South-East of the USA experienced above-average rainfall. High rainfall, even causing local flooding, continued in East Africa. A belt spreading from the Eastern Mediterranean to Bangladesh and then into the East and North of China and Mongolia also experienced rainfall that was generally more than 30% above average. Winter in Kazakhstan and the northwestern half of Russia was also wetter than usual.

1.4 Temperatures (Figure 1.3)

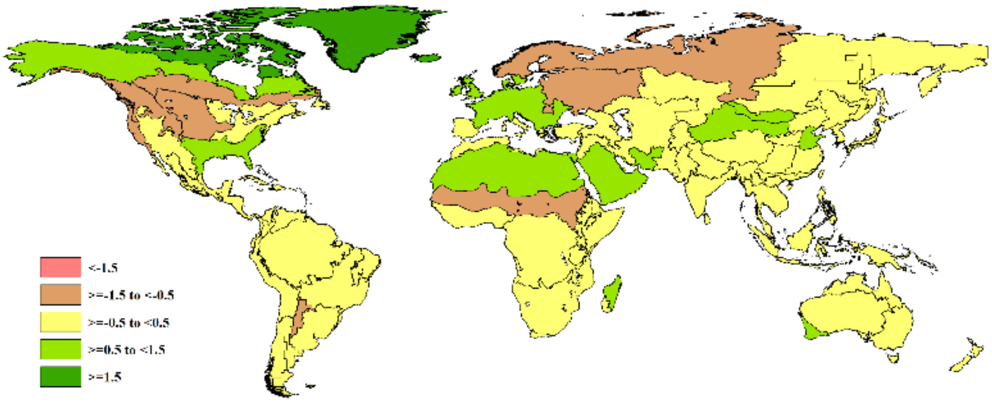


Figure 1.3 Global map of temperature anomaly (as indicated by the TEMP indicator) by CropWatch Mapping and Reporting Unit: departure of January to April 2020 average from 2005-2019 average (15YA), in °C .

As mentioned in the introduction, the regions bordering the Himalayas experienced cooler temperatures, as compared to the 15YA, during this monitoring period. This was favorable for wheat production in the Indo-Gangetic Plains. Wheat production in the northern Nile Valley and the Levant also benefitted from warmer-than-average temperatures. Apart from that, average temperatures were cooler than the 15YA in South-East Australia as well. All in all, only few regions experienced below-average temperatures during this monitoring period.

An entire belt of Eurasian Continent stretching from Western Europe to Japan, mostly north of 35º latitude, experienced much warmer than usual temperatures, mostly more than +1.5ºC on average. The Eastern half of Canada and the USA, as well as most of the nations in and bordering the Caribbean, as well as the Maghreb also experienced warmer than usual temperatures. Temperatures in Western Canada, West of the USA, most of South America, Africa and Western Asia were close to average (+/- 0.5ºC).

1.5 RADPAR (Figure 1.4)

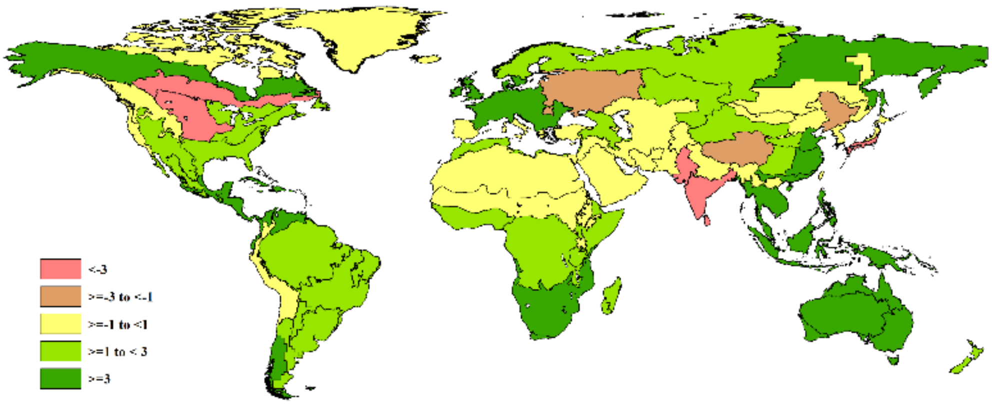


Figure 1.4 Global map of photosynthetically active radiation anomaly (as indicated by the RADPAR indicator) by CropWatch Mapping and Reporting Unit: departure of January to April 2020 total from 2005-2019 average (15YA), in percent.

Photosynthetically active solar radiation (RADPAR) was more than 3% above average for most of South America, except for the North-East of Brazil. Similarly, Central Europe, the Ukraine, Caucasus region, as well as South-East Asia got more sunshine. In South Africa and Mozambique, RADPAR was between 1-3% above average. Most of North America, with the exception of the North-West had below average sunshine. Similar below-average conditions were observed for East Africa, western half of Russia, the near East, South Asia and most of China.

1.5 BIOMSS (Figure 1.5)

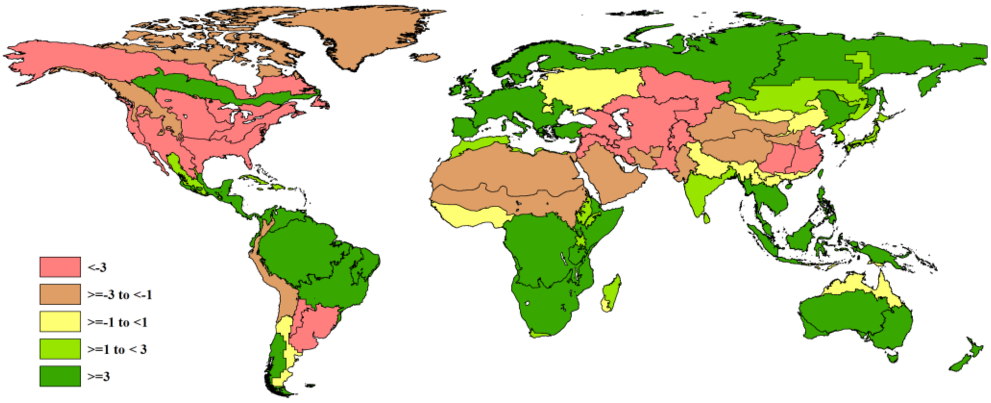


Figure 1.5 Global map of photosynthetically active vradiation anomaly (as indicated by the RADPAR indicator) by CropWatch Mapping and Reporting Unit (MRU), departure from 15YA between between January and April 2019

CropWatch models biomass (BIOMSS) production as a function of temperature, rainfall and solar radiation, indicating the impact of natural weather condition on crop growth. Below-average (-2%) biomass production was estimated for most of South America, with the exception of the Pampas in Argentina, Paraguay, and the Cerrados in Brazil. Below-average production was estimated for the Maghreb and southern Europe, as well as Turkey, Lebanon, Jordan, Palestine and Israel. East Africa, the Nile Valley, Arabian Peninsula, Western and Central Europe, the southern half of Siberia and Mongolia also had above-average BIOMSS. Conditions for biomass production were also favorable in Mexico and the Western half of the USA. Conditions for biomass production were highly favorable (>5% above the 5YA) for wheat and boro rice production in Pakistan, India and Bangladesh.