Chapter 1. Global agroclimatic patterns

1.1 Introduction to CropWatch agroclimatic indicators (CWAIs)

This bulletin describes environmental and crop conditions over the period from October 2019 to January 2020, JASO, 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 C and serve the purpose of identifying global climatic patterns. Refer to Annex A for definitions and to table A.1 for 2020 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 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

Temperatures for January 2020 were the highest on record. Never since 1880, when the reference data set starts, has Earth experienced such high temperatures during that month. Temperatures during the ONDJ monitoring period exceeded the 15 year average as well, as shown in Fig 1.1. Data in this figure are based on the arithmetic means of the 65 MRUs, i.e., they are not weighted. The CropWatch indicators are computed over agricultural areas only. Rainfall also greatly departed from the 15 year average. This was mainly due to high precipitation in Africa, where flooding has affected millions of people, caused damage to infrastructure and soil erosion (Confirmed by Floods in Central-west Africa listed in the section on Disasters (Chapter 5.2)). The reasons for these floods are warmer temperatures in the Indian Ocean, a phenomenon called positive Indian Ocean Dipole. They cause higher evaporation rates off the East

African coastline. At a global level, RADPAR stayed close the average, despite of the higher rainfalls in many parts of the world. The combination of high moisture availability and close to normal RADPAR resulted in generally favorable conditions for BIOMSS production.

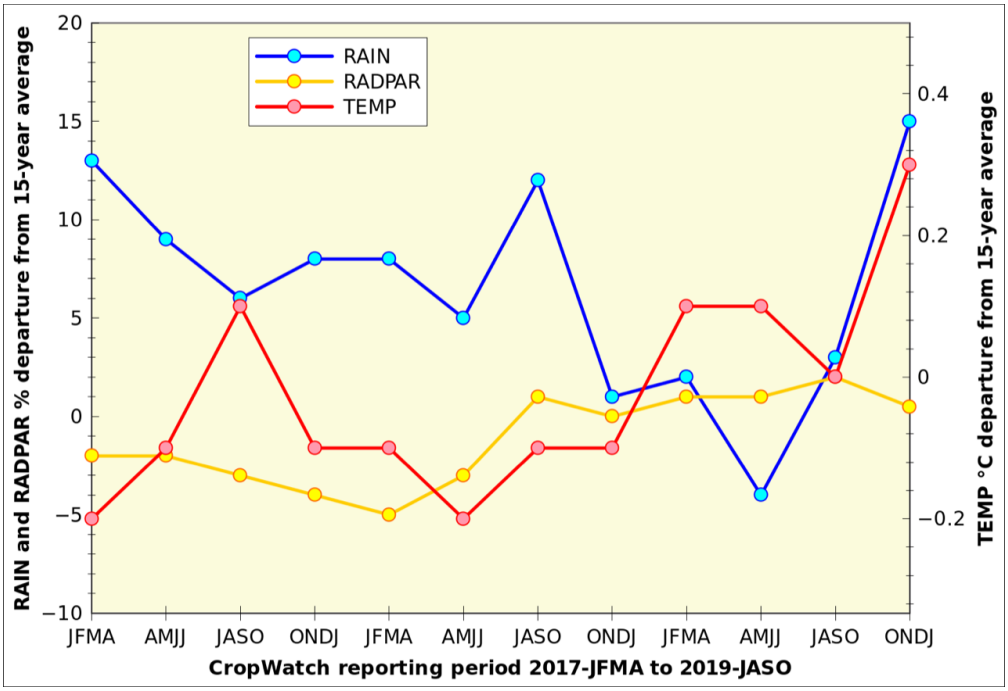

Figure 1.1 global departure from recent 15 year average of theRAIN, TEMP and RADPAR indicators since 2017-JFMA to 2019-JASO period (average of 65 MRUs, unweighted)

Currently, the situation for crop production continues to be unfavorable in Australia and the Maghreb only. The situation in South-East Asia improved in January, due to abundant rainfall. In all other regions, conditions are near normal.

1.3 Rainfall (Figure 1.2)

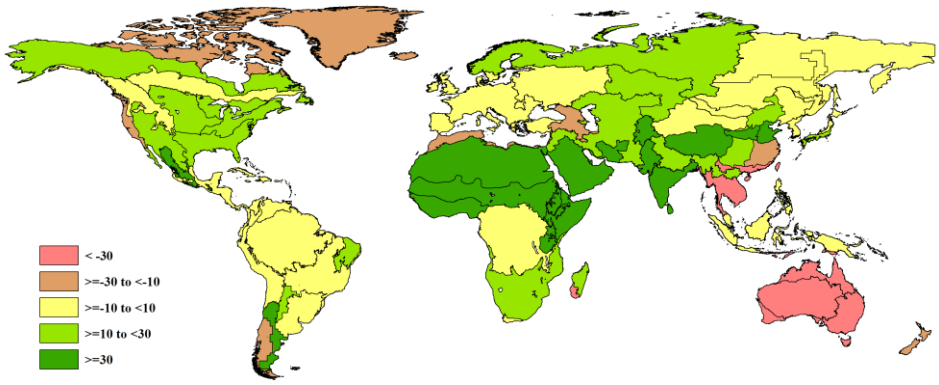

Figure 1.2 Global map of rainfall anomaly (as indicated by the RAIN indicator) by CropWatch Mapping and Reporting Unit: departure of October 2019 to January 2020 total from 2005-2019 average (15YA), in percent.

During the previous CropWatch monitoring period, which lasted from July to October, extreme rainfall deficits had been reported for Australia, most of Brazil, with the exception of the heart of the Amazon basin, the Andean countries, Portugal, Italy, Turkey, Georgia, Eastern China, the Philippines and Indonesia.

Severe drought conditions continued in Australia during this monitoring period. Precipitation was more than 30% below average. South-East Asia also suffered from a severe drought. Moderate drought conditions were observed for South-East China, the Maghreb, Southern Caucasus and the West coast of

the USA. Most of South America experienced close to normal rainfall conditions. However, the late onset of the rainy season extended the dry period in most of Brazil until December. Rainfall was more than 30% above average in the northern half of Africa, with the already mentioned exception of the Maghreb, East Africa, the Arabian Peninsula, Pakistan and parts of Afghanistan and India. The higher-than-usual precipitation in the Sahel and South Asia was mainly due to a prolonged rainy season, which lasted until early November in some parts. The Tibetan plateau also experienced higher than normal precipitation. North America generally experienced normal and above-normal precipitation. Favorable rainfall conditions were observed for Europe, Siberia and most of China, with the exception of the South-East.

1.4 Temperatures (Figure 1.3)

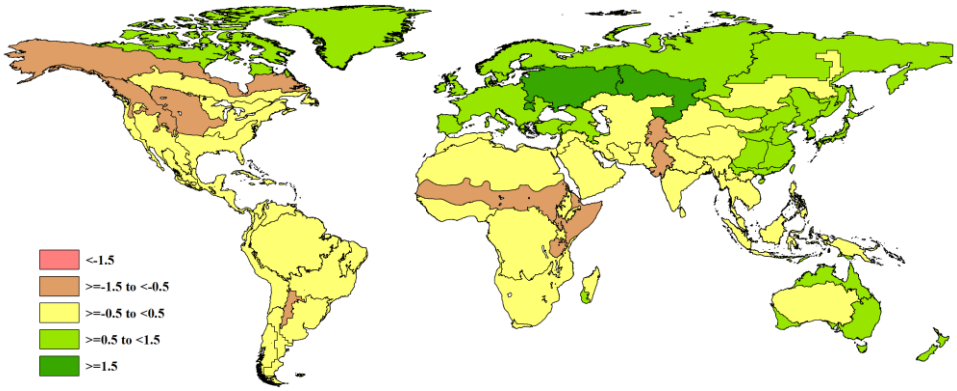

Figure 1.3 Global map of temperature anomaly (as indicated by the TEMP indicator) by CropWatch Mapping and Reporting Unit: departure of October 2019 to January 2020 average from 2005-2019 average (15YA), in °C .

Colder-than-normal (-1.5 to -0.5ºC) temperatures were observed for the Midwest in the USA, the prairies in Canada, as well as the Sahel. The rest of Africa, as well as South America, the Middle East, Central and South Asia experienced normal temperatures. However, temperatures were milder than usual in Europe and Siberia. In Eastern China, temperatures were 0.5 to 1.5ºC above average. Temperatures over cropland in drought-stricken Australia were also above average.

1.5 RADPAR (Figure 1.4)

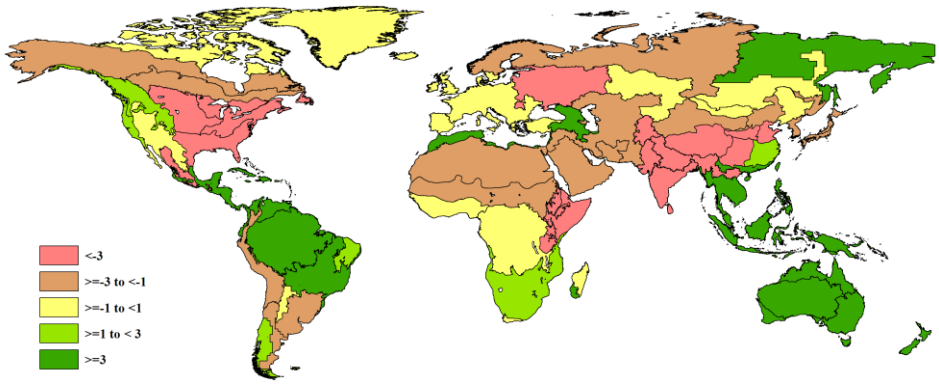

Figure 1.4 Global map of photosynthetically active radiation anomaly (as indicated by the RADPAR indicator) by CropWatch Mapping and Reporting Unit: departure of October 2019 to January 2020 total from 2005-2019 average (15YA), in percent.

Higher solar radiation increases photosynthesis and thus crop production potential and yields. Greatly above-average conditions (+3%) were recorded for Brazil, Venezuela, Central America, the Maghreb, Southern Caucasus, South East Asia and Australia. Most of these regions were plagued by prolonged

drought conditions. Below-average solar radiation (-1 to -2%) was recorded for most of Argentina and the other Andean countries, the Sahel, the Arabian Peninsula and Central Asia. Severe radiation deficits (more than -3% below average) were observed for the USA and Canada east of the Rocky Mountains, the Horn of Africa, Russia west of the Ural, the Hindukusch, the Indian subcontinent and the Tibetan Plateau.

1.6 BIOMSS (Figure 1.5)

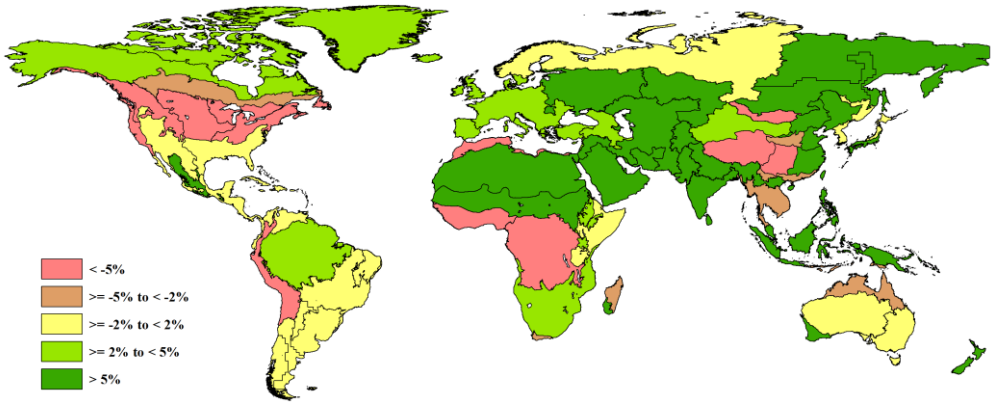

Figure 1.5 Global map of photosynthetically active vradiation anomaly (as indicated by the RADPAR indicator) by CropWatch Mapping and Reporting Unit (MRU), departure from 15YA between between January and April 2019

The BIOMSS indicator is controlled by temperature, rainfall and solar radiation. In some regions, rainfall is more limiting, whereas in other ones, mainly the tropical ones, solar radiation tends to be the limiting factor. Biomass production was more than 5% below average for Peru, Ecuador, Colombia, the northwest and central States of the USA, the Canadian Prairies, Central Africa, the Maghreb, the Tibetan Plateau and parts of Mongolia. It was also below average in Cambodia, Thailand, Laos and Vietnam due to rainfall deficits in the early part of this monitoring period. The indicator showed average values for the crop production regions of Brazil, Argentina, the southern USA, most of Australia and northern Siberia. In Europe and southern Africa, as well as the heart of the Amazon basin, production was 2-5% above average. Modeled BIOMSS production was more than 5% above average for North Africa, including the Sahel, the Arabian Peninsula, most of Russia, Central and South Asia, as well as Eastern China, the Philippines and Indonesia.