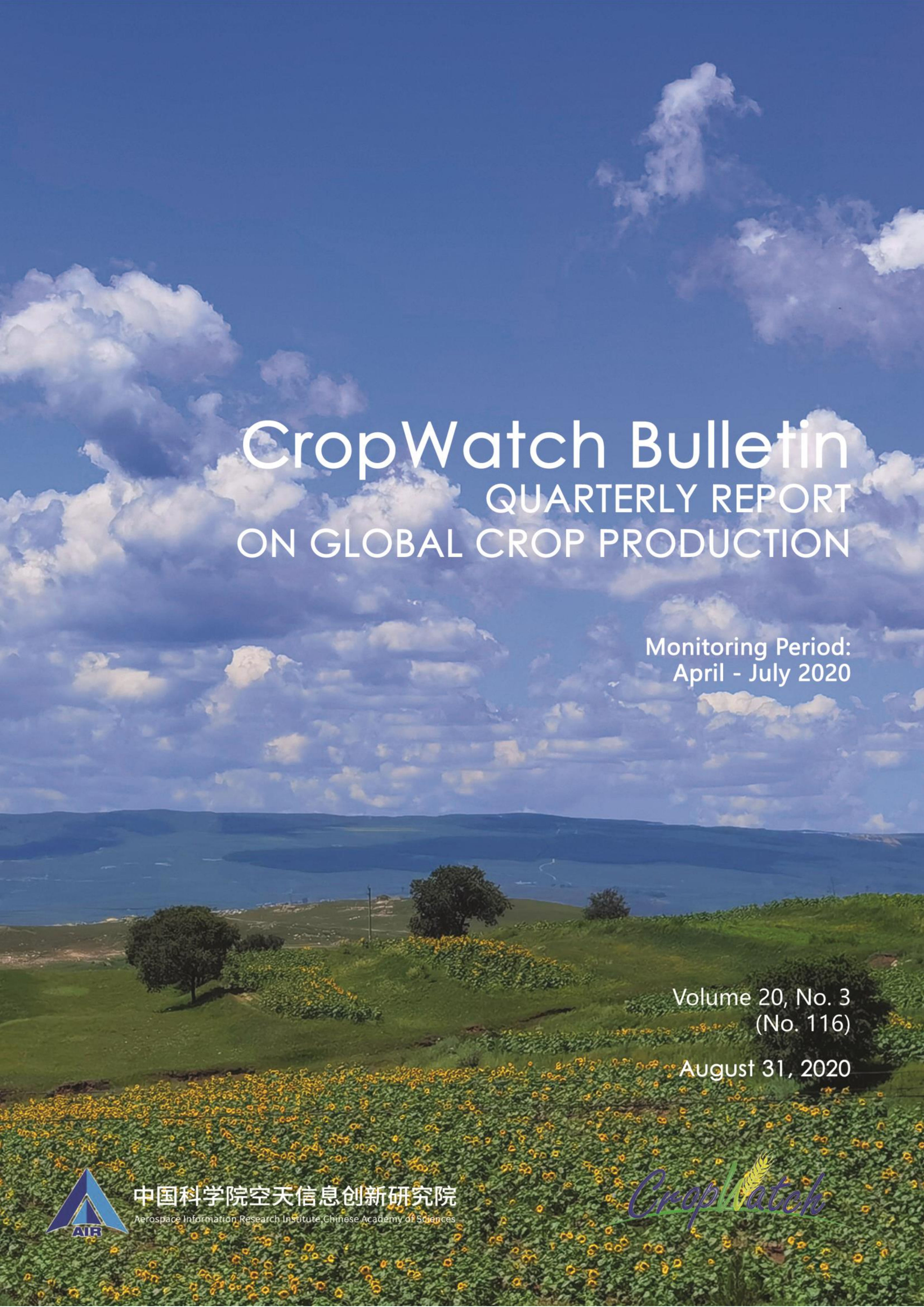

# CropWatch Bulletin

## QUARTERLY REPORT ON GLOBAL CROP PRODUCTION

Monitoring Period:
April - July 2020

Volume 20, No. 3
(No. 116)

August 31, 2020

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CropWatch

August 2020

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**CropWatch Online Resources:** This bulletin along with additional resources is also available on the CropWatch Website at http://www.cropwatch.com.cn and http://cloud.cropwatch.com.cn/.

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**➊ *NOTE:* CROPWATCH RESOURCES, BACKGROUND MATERIALS AND ADDITIONAL DATA ARE AVAILABLE ONLINE AT WWW.CROPWATCH.COM.CN.**

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# Abbreviations

| | |
|---|---|
| 5YA | Five-year average, the average for the four-month period from April to July for 2015-2019; one of the standard reference periods. |
| 15YA | Fifteen-year average, the average for the four-month period from April to July for 2005-2019; one of the standard reference periods and typically referred to as "average". |
| AEZ | Agro-Ecological Zone |
| BIOMSS | CropWatch agroclimatic indicator for biomass production potential |
| BOM | Australian Bureau of Meteorology |
| CALF | Cropped Arable Land Fraction |
| CAS | Chinese Academy of Sciences |
| CWAI | CropWatch Agroclimatic Indicator |
| CWSU | CropWatch Spatial Units |
| DM | Dry matter |
| EC/JRC | European Commission Joint Research Centre |
| ENSO | El Niño Southern Oscillation |
| FAO | Food and Agriculture Organization of the United Nations |
| GAUL | Global Administrative Units Layer |
| GVG | GPS, Video, and GIS data |
| Ha | hectare |
| Kcal | kilocalorie |
| MPZ | Major Production Zone |
| MRU | Mapping and Reporting Unit |
| NDVI | Normalized Difference Vegetation Index |
| OISST | Optimum Interpolation Sea Surface Temperature |
| PAR | Photosynthetically active radiation |
| PET | Potential Evapotranspiration |
| AIR | CAS Aerospace Information Research Institute |
| RADPAR | CropWatch PAR agroclimatic indicator |
| RAIN | CropWatch rainfall agroclimatic indicator |
| SOI | Southern Oscillation Index |
| TEMP | CropWatch air temperature agroclimatic indicator |
| Ton | Thousand kilograms |
| VCIx | CropWatch maximum Vegetation Condition Index |
| VHI | CropWatch Vegetation Health Index |
| VHIn | CropWatch minimum Vegetation Health Index |
| $W/m^2$ | Watt per square meter |

# Bulletin overview and reporting period

This CropWatch bulletin presents a global overview of crop stage and condition between April and July 2020, a period referred to in this bulletin as the AMJJ (April, May, June and July) period or just the "reporting period." The bulletin is the 118$^{th}$ such publication issued by the CropWatch group at the Aerospace Information Research Institute (AIR) of the Chinese Academy of Sciences, Beijing.

**CropWatch indicators**

CropWatch analyses are based mostly on several standard as well as new ground-based and remote sensing indicators, following a hierarchical approach.

In parallel to an increasing spatial precision of the analyses, indicators become more focused on agriculture as the analyses zoom in to smaller spatial units. CropWatch uses two sets of indicators: (i) agroclimatic indicators—RAIN, TEMP, RADPAR, and potential BIOMSS, which describe weather factors and its impacts on crops. Importantly, the indicators RAIN, TEMP, RADPAR, and BIOMSS do not directly describe the weather variables rain, temperature, radiation, or biomass, but rather they are spatial averages over agricultural areas, which are weighted according to the local crop production potential; and (ii) agronomic indicators—VHIn, CALF, and VCIx and vegetation indices, describing crop condition and development. (iii) PAY indicators: planted area, yield and production.

For each reporting period, the bulletin reports on the departures for all seven indicators, which (with the exception of TEMP) are expressed in relative terms as a percentage change compared to the average value for that indicator for the last five or fifteen years (depending on the indicator).For more details on the CropWatch indicators and spatial units used for the analysis, please see the quick reference guide in Annex B, as well as online resources and publications posted at www.cropwatch.com.cn.

**CropWatch analysis and indicators**

The analyses cover large global zones; major producing countries of maize, rice, wheat, and soybean; and detailed assessments for Chinese regions, 42 major agricultural countries, and 217 Agro-Ecological Zones (AEZs).

This bulletin is organized as follows:

| Chapter | Spatial coverage | Key indicators |
|---|---|---|
| **Chapter 1** | World, using Mapping and Reporting Units (MRU), 65 large, agro-ecologically homogeneous units covering the globe | RAIN, TEMP, RADPAR, BIOMSS |
| **Chapter 2** | Major Production Zones (MPZ), six regions that contribute most to global food production | As above, plus CALF, VCIx, and VHIn |
| **Chapter 3** | 42 key countries (main producers and exporters) and 210 AEZs | As above plus NDVI and GVG survey |
| **Chapter 4** | China and regions | As above plus high-resolution images; Pest and crops trade prospects |
| **Chapter 5** | Production outlook, and updates on disaster events and El Niño. | |

**Regular updates and online resources**

The bulletin is released quarterly in both English and Chinese. E-mail **cropwatch@radi.ac.cn** to sign up for the mailing list or visit CropWatch online at **www.cropwatch.com.cn**, **http://cloud.cropwatch.com.cn/**

# Executive summary

The current CropWatch bulletin describes world-wide crop condition and food production as appraised by data up to the end of July 2020. It is prepared by an international team coordinated by the Aerospace Information Research Institute, Chinese Academy of Sciences.

Special attention is paid to the major producers of maize, rice, wheat and soybean throughout the bulletin. The assessment is based mainly on remotely sensed data. It covers prevailing weather conditions, including extreme factors, at different spatial scales, starting with global patterns in Chapter 1. Chapter 2 focuses on agro-climatic and agronomic conditions in major production zones in all continents. Chapter 3 covers the major agricultural countries that, together, make up at least 80% of production and exports. Each is the object of a detailed analysis. Chapter 3 constitutes the bulk of the Bulletin. Chapter 4 zooms into China. The bulletin also presents this year's second CropWatch production estimates for selected countries and reviews the first production estimation in chapter 5.

This report for the period from April to July 2020 covers wheat, maize, soybean and rice production in the Northern Hemisphere. Winter wheat reached maturity in June/July and spring wheat will typically reach maturity in August. In the tropical countries, planting of the main rice crop typically starts at the beginning of the monsoon season in May or June. In the Southern Hemisphere, harvest of maize and soybean was concluded by April or May. Sowing of wheat started in May.

The outbreak of COVID-19 has had limited impact on the food production so far. Governments generally tried their best to secure adequate supply of inputs, such as seed and fertilizer. They also tried to ensure that the flow of food from the farmer to the consumer was not interrupted. There were a few shortages in some countries which also resulted in price hikes, but the situation seems to be mostly under control. However, many people, predominantly those working in the informal sectors, lost their income. The United Nations are estimating that an additional 80 to 120 million people are expected to go hungry in 2020.

Another plague, the outbreak of desert locusts in East Africa, Middle East and southwest Asia is still not under control either. Ample rainfall keeps maintaining a favorable environment for them to spread even further. Their impact on world food supply is limited but is devastating for the farmers in the areas that are hit by a swarm.

**Agro-climatic conditions**

According to the analyses presented in Chapters 1 and 3.1, prevailing climate conditions during the current 2020 AMJJ reporting period were close to normal for cropland. Average temperatures, rainfall and photosynthetically active solar radiation stayed close to the 15-year average. No prolonged heat wave in any of the major production countries was observed during this period.

However, taking all land surfaces into account, NOAA reported that May tied with 2016 as the warmest May on record. June was the third warmest on record, while July ranked as second. Both months were 0.92°C above their respective averages measured during the last century. For the northern hemisphere, this was the hottest July ever.

The following is a summary of the situation in key production regions and noteworthy anomalies during the April to July 2020 period:

● North America: Conditions were generally cooler and wetter during April and May. This caused some minor delays in planting and subsequent crop development. However, conditions turned to favorable in June and July, although some regions in the Western Great Plains suffered from drier-than-normal conditions. All in all, conditions in North America were favorable.

● South America: Moisture conditions for wheat sowing in Argentina and Brazil were favorable due to timely rainfall in May and June.

● Africa: The Horn of Africa and the Ethipian Highlands are still receiving above-average rainfall, which provided favorable conditions for the short season crops as well as for the planting of the main season crops in June and July. Conditions in the south of Africa are drier than normal, where this season is mainly used for vegetable production. Wheat production in South Africa's Cape province was off to a good start. The monsoon season in West Africa started on time and crop conditions are normal.

● Europe: Winter wheat suffered from a prolonged dry period that lasted until the end of April. This caused yield losses for winter wheat in the United Kingdom, France, Germany, Romania and the Ukraine. The return of regular rains, though still slightly below average, created generally favorable conditions for the summer crops, such as maize, sugarbeets and potatoes, as well as for fruit and forage production. Above average rainfall from the Ukraine to the Ural caused favorable conditions for spring wheat and maize in the Ukraine and Russia.

● Central Asia also benefitted from above-average rainfall. Prospects for the summer crops are favorable.

● South Asia: The monsoon season started timely. In eastern India and Bangladesh, excessive rainfall caused widespread flooding, which caused damage to crops (mainly rice), houses and infrastructure.

● Southeast Asia: The drought conditions in this region persisted until the end of May. The monsoon was off to a slow and delayed start. Rains reached close to average levels in July. The lack of rainfall was exacerbated by record low water levels of the Mekong River, which hampered irrigated dry season production of rice in the Mekong River Valley and Delta.

● China: Excessive rainfall in southern China caused extensive flooding. This will negatively impact rice production. The regions further north also received above-average rainfall. The summer crop stands to benefit from this additional moisture.

● Australia: After a prolonged drought, rainfall was average in Southeastern Australia, which created favorable conditions for wheat planting. However, in Southwest Australia, rainfall remained below average.

Overall, the weather conditions during this monitoring period were quite favorable, as few extreme weather phenomena were observed.

**2020 Production estimate**

**Maize**: Weather conditions in most maize producing countries have been rather favorable. Increases in production are expected in the USA (+2.6%), China (+0.6%), Argentina (+1.7%) and most European countries. Reductions are estimated for Brazil (-2.8%), Romania (-7%), Mozambique (-3.1%), Myanmar (-12.3%), Nigeria (-14.2%) and Turkey (-2.2%). But production gains by far outweigh the losses and at the global scale, maize production is estimated to reach 1,068.01 million tons (+1.2%).

**Rice**: Drought impacted rice production in Brazil (-3.3%), Cambodia (-5%), Vietnam (-6.5%), and Nigeria (-10.8%). Flooding is expected to decrease rice production in China (-1.8%) and Bangladesh (-5%). Conditions were favorable in India (+1.6%), Pakistan (+3.5%), Argentina (+4.8%), USA (+1.2%) and Iran (+5.3%). All in all, a decrease in global production is forecasted. Production will be 745.273 million tons (-1.1%).

**Wheat**: Conditions for wheat varied across regions. Drought conditions in the spring caused a reduction in some European countries, such as France (-6.4%), Germany (-4.1%), the United Kingdom (-5.5%) and the Ukraine (-1.9%). A decrease in production is also forecasted for the USA (-3.7%). Conditions were more favorable in the world's top three producing countries: China (+2.9%), India (+6.1%) and Russia (+4.7%). Wheat production is estimated to increase and reach 728.910 million tons (+1.8%).

**Soybean**: Soybean production in the USA is expected to increase (+3.7%), which will put USA soybean production slightly ahead of Brazil's, where production decreased (-1%). Production gains are estimated for Argentina (+2.2%) and last but not least, China (+2.5%. At the global scale, soybean production is expected to increase and reach 324.718 million tons (+0.2%).

All in all, conditions for crop production have been favorable in 2020 and global gains in production for maize (+1.2%), wheat (+1.8%) and soybean (+0.2%) are forecasted. Rice production suffered from drought conditions in Southeast Asia and flooding (Bangladesh and China) and a decrease (-1.1%) in production is forecasted.

# 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.com.cn**.

## 1.1 Introduction to CropWatch agroclimatic indicators (CWAIs)

This bulletin describes environmental and crop conditions for the period from April 2020 to July 2020, AMJJ, 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 AMJJ 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

At the global scale, temperatures continue to stay at or near record highs in 2020: Between January and July, they were 1.05°C above the 20th-century average, only 0.04°C below the record set in 2016 according to NOAA, which bases its analyses on a global data set spanning 141 years. May tied with 2016 as the warmest May on record. June was the third warmest on record, while July ranked as second. Both months were 0.92°C above their respective averages measured during the last century. For the northern hemisphere, this was the hottest July ever.

CropWatch calculates the temperatures over cropland only. Averaged over all cropland, temperatures were 0.1°C lower than the 15-year average (15YA) for this period ranging from April to July, 2020. Rain continued to be above average (+4.6%). Increased cloud cover associated with rain reduced the photosynthetically active radiation (RADPAR) by 1.0%. Biomass (+0.1%) stayed close to the 15YA. Overall, the prospects for crop production were quite favorable, mainly because no large scale droughts were observed and the increased precipitation over cropping regions dampened the effects of the global warming trend during this monitoring period.

On a global scale, most regions benefitted from above-average rainfall. Central Asia (+32%), followed by East Asia (+9%), North America (+7%) and Europe (+6%) had the highest increase over the 15YA. Negative departures for total rainfall were observed in two regions only: Central and South America (-7%) and Oceania (-6%).

Temperatures over cropland in North America and Europe were 0.5°C below the 15YA. East Asia also experienced slightly cooler-than-average temperatures (-0.2°C), whereas temperatures were 0.2°C above average in Central and South America. For the other regions, the deviations were minimal, hovering around +/-0.1°C.

Central and South America (+1.7%) and South Asia (+1.0%) were the only regions for which above average solar radiation was observed. The largest reductions were noted for East Asia (-3.6%), Central Asia (-2.9%), North America (-2.4%), Oceania (-2.3%), followed by Africa (-1.5%) and Europe (-1.4%).

Accordingly, biomass production, which is calculated as a function of rainfall, temperature and solar radiation, changed as follows: Increases were estimated for South Asia (+6.4%), Central Asia (+2.3%) and Central and South America (+1.4%). Decreases were noted for East Asia (-5.6%), Europe (-3.8%), Oceania (-3.0%) and North America (-1.4%) and no departure from the 15YA for Africa.

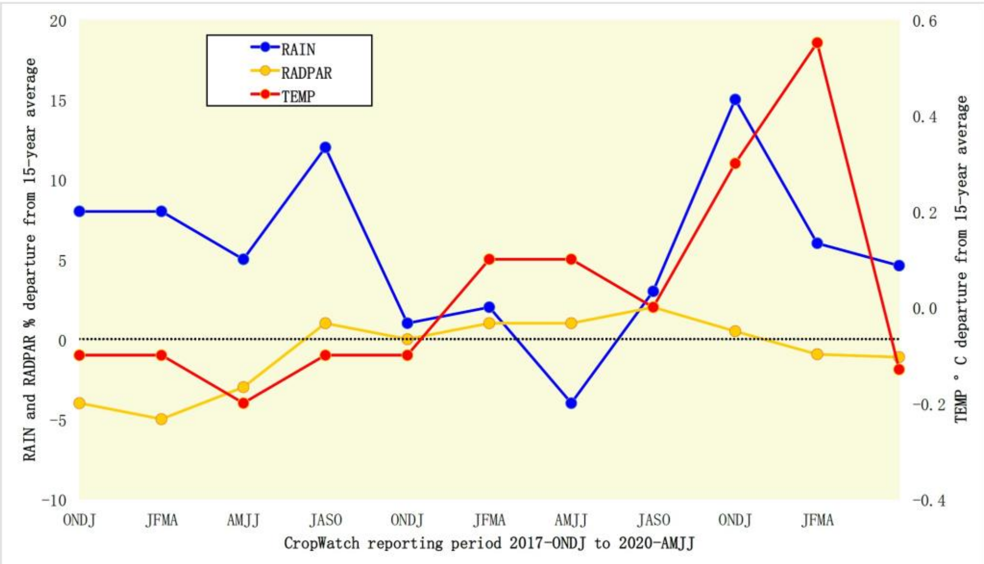
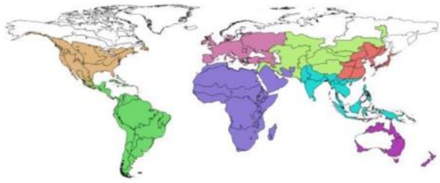



**Figure 1.1 Global departure from recent 15 year average of theRAIN, TEMP and RADPAR indicators since 2017 ONDJ period (average of 65 MRUs, unweighted)**

**Table 1.1 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 °C | RADPAR % | BIOMSS % |
|---|---|---|---|---|
| Africa | 0 | 0.0 | -1.5 | 0.0 |
| America S + C | -7 | 0.2 | 1.7 | 1.4 |
| America N | 7 | -0.5 | -2.4 | -1.4 |
| Asia centre | 32 | 0.0 | -2.9 | 2.3 |
| Asia East | 9 | -0.2 | -3.6 | -5.6 |
| Asia South | 3 | 0.0 | 1.0 | 6.4 |
| Europe | 6 | -0.5 | -1.4 | -3.8 |
| Oceania | -6 | -0.1 | -2.3 | -3.0 |
| Others | 4 | 0.0 | -1.7 | -1.3 |
| World | **4.6** | **-0.1** | **-1.0** | **0.1** |



## 1.3 Rainfall (Figure 1.2)

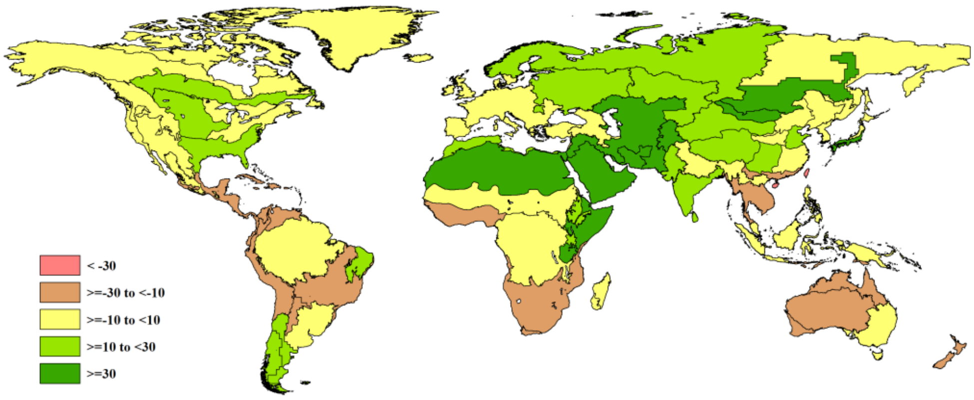



**Figure 1.2 Global map of rainfall anomaly (as indicated by the RAIN indicator) by CropWatch Mapping and Reporting Unit: departure of April to July 2020 total from 2005-2019 average (15YA), in percent.**

Rainfall was above average in the Canadian Prairies, the Northern Corn Belt and the Cotton Belt in the USA. Excessive rainfall in spring prevented maize sowing in parts of North and South Dakota. Other than that, rainfall conditions for North America were favorable. Central America, the Caribbean, the Andean countries, except for Austral Chile and Argentina, and large parts of Brazil suffered from below-average rainfall. Central-North Argentina was hardest hit (-29.3%). In general, the same regions in South America for which rainfall was below average during the previous monitoring period, also experienced drier-than-usual conditions during the current period.

In Africa, the countries north of the Sahel and the East African Highlands (+23.2%), including the Horn of Africa (+53.7%), received above average rainfall. The belt from the Sahara to the Afghan deserts received 50.7 mm rainfall on average (+78.3%). This region, together with the East African Highlands, continues to be plagued by locusts, which thrive on lush vegetation. Rainfall in the Gulf of Guinea was below average (-18.4%). However, the rainy season was off to a good start. Conditions were drier than usual in Southern Africa (-26%) and the Western Cape (-12.4%). In this region, wheat, which is predominantly irrigated, is the only major crop that is grown during this monitoring period.

In Western and Central Europe and Turkey, rainfall recovered to average levels, though soil moisture remains on the dry side. Rainfall was more than 10% above average for the Ukraine, which had suffered from drought conditions during early spring.

Above-average rainfall was also recorded for the Scandinavian countries, Russia, Kazakhstan, the Hindu Khush, southern India, Mongolia and most of China. Mainland South-East Asia continued to be affected by below-average rainfall (-22.3%), although average rainfall for the monitoring period was 907.5 mm. Rainfall in Eastern Australia returned to average (-1%), however the situation in South-West and Southern Australia remain critical, as rainfall was 17% below the 15YA.

## 1.4 Temperatures (Figure 1.3)

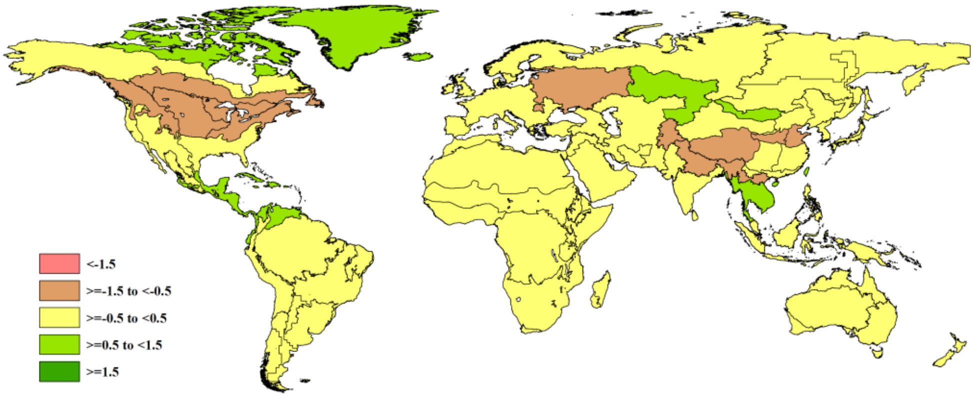



**Figure 1.3 Global map of temperature anomaly (as indicated by the TEMP indicator) by CropWatch Mapping and Reporting Unit: departure of April to July 2020 average from 2005-2019 average (15YA), in °C**

Average temperatures recorded during this monitoring period remained close to the 15YA for most regions on Earth during this period, i.e., they remained within -0.5 to +0.5°C. The Canadian Prairies and the northern half of the USA experienced temperatures that were 0.5 to 1.5°C below the 15YA. Central America and the Caribbean, on the other hand, experienced above-average temperatures (+0.5 to +1.5°C). The region from the Ukraine to the Ural Mountains was cooler than the 15YA (-1.0°C). Cooler temperatures (-0.5 to -1.5°C) were also observed for the Himalayas, Tibet and the North China Plain. In mainland South-East Asia, temperatures were 0.6 °C above average.

## 1.5 RADPAR (Figure 1.4)

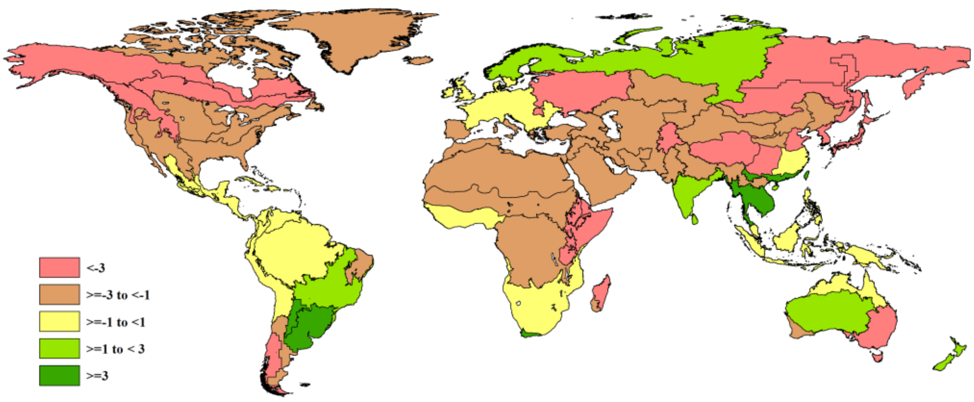



**Figure 1.4 Global map of photosynthetically active radiation anomaly (as indicated by the RADPAR indicator) by CropWatch Mapping and Reporting Unit: departure of April to July 2020 total from 2005-2019 average (15YA), in percent.**

Most of North America, except for Central Mexico, received below-average photosynthetically active solar radiation. Conditions in Central America, the Caribbean and the Central-northern Andes were close to average. RADPAR was up (+7%) for the Pampas and North-Central Argentina. Vast parts of Brazil also experienced above-average radiation, except for the North-East (-1.9%).

In Africa, the Western Cape (+6.2%) was the only MRU which received signifcant above-average radiation. For most parts, radiation departed by more than -1% from the 15YA. The deficit was largest for Madagascar (-6.9%), the East African Highlands (-5.4%) and the Horn of Africa (-3.3%).

In Central and Eastern Europe, solar radiation was close to average. For the region from the Ukraine to the Ural Mountains, it was 3.3% below average.

Central Asia, as well as Eastern Asia experienced below-average radiation. A large deficit was observed for the North China Plain (-4.8%), Southwest China (-8.4%) and East Asia (-4.7%). Positive departures were noted for South of India (+1.3%), Southern China (+5.4%) and mainland Southeast Asia (+5.4%).

In Australia, solar radiation was below the 15YA in the western (-1.2%) and eastern (-3.6%) wheat production regions.

## 1.6 BIOMSS (Figure 1.5)

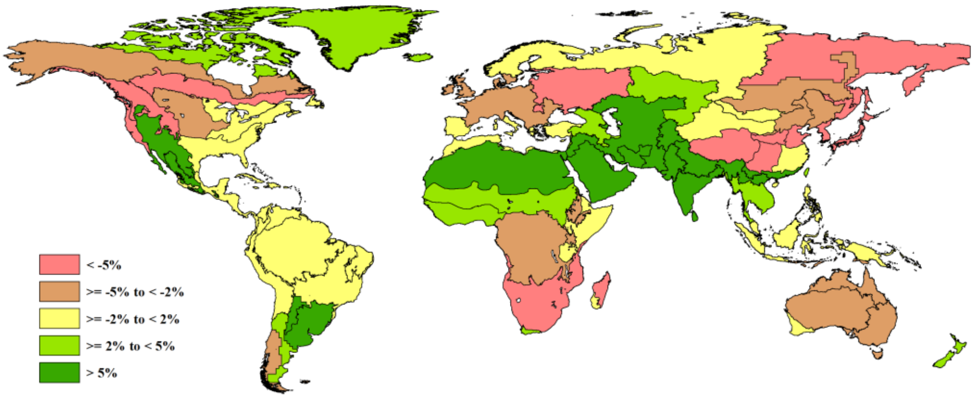



**Figure 1.5 Global map of biomass accumulation (as indicated by the BIOMSS indicator) by CropWatch Mapping and Reporting Unit (MRU), departure from 15YA between between January and April 2019**

The new calculation procedure for the BIOMASS indicator incorporates the combined effect of precipitation, sunshine and temperature. It is a very synthetic climate-based but agronomic value-added indicator which assesses the biomass production potential and hence the likely effect of weather on crop photosynthesis.

Biomas production was quite variable among the different regions in North America. It was above average for the Northwest of Mexico and the southwest of the USA (+5%). The West Coast (-9.9%) as well as the Canadian Prairies (-11.5%) were far below the 15 YA. The reduction was slightly less for the Northern Great Plains (-4.0%). For the remaining regions of North America, Central America and most of South America, biomass production was near the long-term average. The only exception were the Pampas (+7.2%) and Central North Argentina (+11.4%).

In Africa, biomass production was above average for the northern half, whereas a negative trend was observed for southern Africa (-8%), with the exception of the Western Cape (+3.5%).

In Europe, production was down by -3.9%. The region from the Ukraine to the Ural (-6.8%) suffered an even larger drop. This may have had a negative effect on wheat yields, as in those two regions, wheat was in the grainfilling phase in May and June.

For most of Western, Central and South Asia, production was more than 5% above the 15YA. In China, production was more than 5% below average in Tibet and Southwest China. Below average solar radiation in the Loess region (-9.1%) and the North China Plain (-8.8%) may have had a negative impact on wheat yields, which reached maturity during this monitoring period. East Asia (-7.7%) was also below average.

In Australia, the negative departures were more moderate and ranged between -3.6 to -4%.

# Chapter 2. Crop and environmental conditions in major production zones

*Chapter 2 presents the same indicators—RAIN, TEMP, RADPAR, and BIOMSS— as those used in Chapter 1, and combines them with the agronomic indicators—cropped arable land fraction (CALF), maximum vegetation condition index (VCIx), and minimum vegetation health index (VHIn)— to describe crop condition in six Major Production Zones (MPZ) across all continents. For more information about these zones and methodologies used, see the quick reference guide in Annex B as well as the CropWatch bulletin online resources at http://www.cropwatch.com.cn/htm/en/bullAction!showBulletin.action#.*

## 2.1 Overview

Tables 2.1 and 2.2 present an overview of the agroclimatic (Table 2.1) and agronomic (Table 2.2) indicators for each of the six MPZs, comparing the indicators to their fifteen-year and five-year averages, respectively. The text mostly refers simply to "average" with the averaging period implied.

**Table 2.1 Agroclimatic indicators by Major Production Zone, current value and departure from 15YA (April to July 2020)**

| | RAIN | | TEMP | | RADPAR | | BIOMSS | |
|---|---|---|---|---|---|---|---|---|
| | Current (mm) | Departure (%) | Current (°C) | Departure (°C) | Current (MJ/m²) | Departure (%) | Current (gDM/m²) | Departure (%) |
| **West Africa** | 485 | -19 | 27.8 | 0.5 | 1205 | 1 | 767 | 3 |
| **North America** | 428 | 8 | 18.5 | -0.7 | 1318 | -2 | 645 | -3 |
| **South America** | 280 | -14 | 17 | -1.2 | 810 | -2 | 325 | -6 |
| **S. and SE Asia** | 924 | -1 | 28.3 | -0.2 | 1252 | 1 | 746 | 7 |
| **Western Europe** | 322 | -7 | 14.5 | -0.1 | 1251 | 1 | 496 | 0 |
| **C. Europe and W. Russia** | 375 | 18 | 13.8 | -0.9 | 1165 | -2 | 473 | -6 |

*Note: Departures are expressed in relative terms (percentage) for all variables, except for temperature, for which absolute departure in degrees Celsius is given. Zero means no change from the average value; relative departures are calculated as (C-R)/R*100, with C=current value and R=reference value, which is the fifteen-year average (15YA) for the same period (April - July) for 2005-2019.*

**Table 2.2 Agronomic indicators by Major Production Zone, current season values and departure from 5YA (April to July 2020)**

| | CALF (Cropped arable land fraction) | | Maximum VCI |
|---|---|---|---|
| | Current (%) | 5A Departure (%) | Current |
| **West Africa** | 89 | -2 | 0.89 |
| **North America** | 95 | 0 | 0.90 |
| **South America** | 97 | -1 | 0.86 |

| | | | |
|---|---|---|---|
| **S. and SE Asia** | 83 | 8 | 1.02 |
| **Western Europe** | 98 | 2 | 0.92 |
| **Central Europe and W Russia** | 98 | 0 | 0.92 |

*Note: See note for Table 2.1, with reference value R defined as the five-year average (5YA) for the same period (April - July) for 2015-2019.*

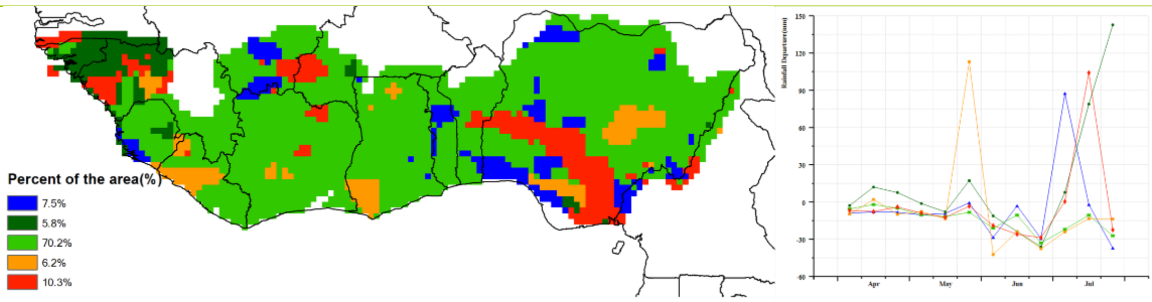
## 2.2 West Africa

This reporting period covers the main rainy season, during which predominant cereal crops are grown, such as maize, sorghum, millet and rice. Tuber crops, cassava and yams, are equally important crops in the coastal areas which are also mapped as part of the cropped land. Planting of the major crops took place as soon as the rains started in May and June. Seasonal migration of domestic livestock from the south to the north also started with the onset of the rains.

The average temperature for the region was 27.8 degrees (+0.5°C). The MPZ received 485 mm rainfall. This is 19% below the 15YA. For the major portion (70%) of this MPZ, rain was near average. Equatorial Guinea (1546 mm, +18% Dep.), Sierra Leone (1012 mm, -9% Dep.), Gabon (849 mm, +12% Dep.) and Liberia (804 mm, -14% Dep.) experienced near-average rainfall. Reduced rainfall was observed in Côte d'Ivoire (-36%), Burkina Faso (-32%), Togo (-29%), Ghana (-28%) and Nigeria (-24%) indicating potential water stress as reflected in the VHI map of the region with moderate to severe drought in central to northern parts of the MPZ. Regionwide the average solar radiation was 1205 MJ/m2 with a slight increase (+1%, 15YA Dep.) resulting in a slight increase in biomass production potential (BIOMSS = 767 gDM/m2, +3% 15Yr Dep.). The VCIx map shows that the areas with the highest values (>0.8) were located in the in the coastal and central regions, whereas lower values were observed in the northern parts of the MPZ, which were also drier. The cropped arable land fraction (CALF) was at 89% with a slight decrease (-1% 5YA Dep.) The lowest CALF values were observed in Nigeria (77%, -4% Dep.), Gambia (64%, -6% Dep.) and Burkina Faso (62%, -8% Dep.). This can be attributed to the conflict in northern Nigeria and dry environments in Gambia and Burkina Faso. The rest of the region had CALF values of more 95%.

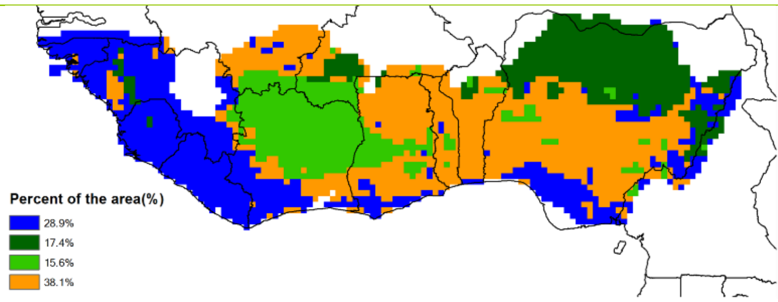
Generally, both climatic and agronomic indicators show good potential for agriculture production during this rainy season. There were some pockets of moderate to severe drought in this region as well. Some areas showed favorable BIOMSS departures. However, the final outcome for this season will depend on the distribution of the rains during the remainder of the rainy season.

**Figure 2.1 West Africa MPZ: Agroclimatic and agronomic indicators, April to July 2020**

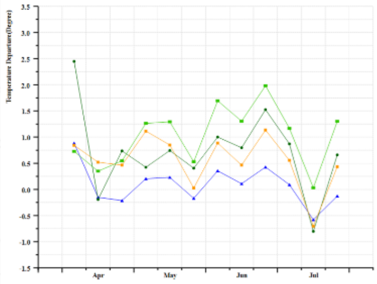



a. Spatial distribution of rainfall profiles

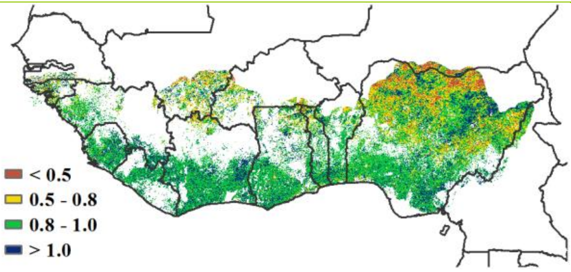
b. Profiles of rainfall departure from average (mm)



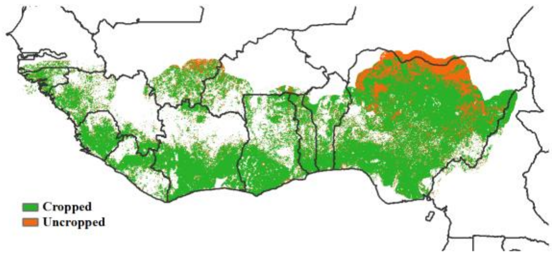

c. Spatial distribution of temperature profiles



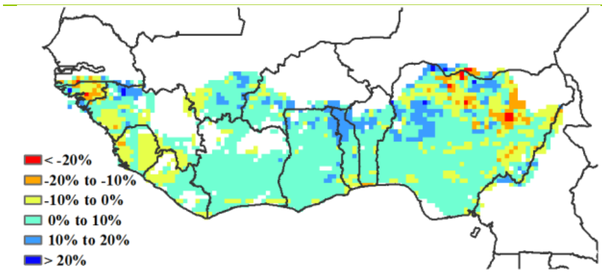

d. Profiles of temperature departure from average (mm)



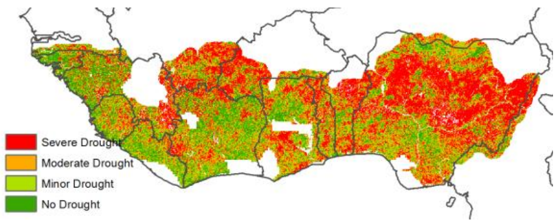

e. Maximum VCI




f. Cropped arable land




g. Biomass accumulation potential departure




h. VHI minimum

*Note: For more information about the indicators, see Annex B.*

## 2.3 North America

During the current monitoring period from April to July 2020, winter wheat reached maturity. Maize planting started in April, followed by soybean in May. Maize reached the silking period in late July and in soybean, seed filling started at around that time, whereas spring wheat was in its late grain filling phase. In general, the crop conditions in North America are favorable.

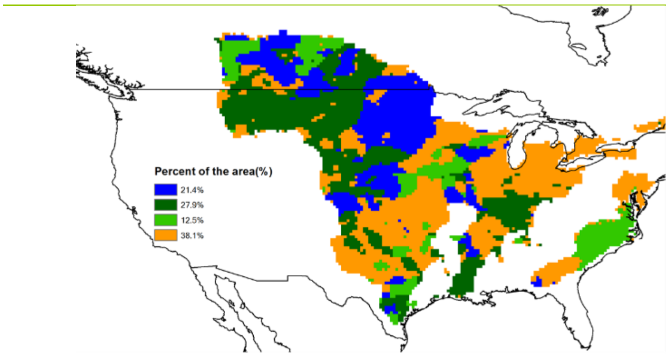
Compared with the 15YA, the weather conditions in the North American production area during the monitoring period were slightly wetter and cooler. Rainfall was 8% higher, temperature was 0.7°C lower and photosynthetically active radiation was 2% lower than the 15YA. As a result, estimated potential biomass was 3% lower than the 5YA. All parts of North America experienced a cooler than normal period in mid-April, but the temperatures subsequently rose quickly to 1.5-3.5°C above average by the end of April. Starting in May, the temperatures closely followed the 15-year trajectory, exceeding it in July. The pattern for precipitation was different: During the period from May to June, the precipitation in the Prairies and the Northern Plains was significantly higher than average, while the precipitation in other regions was close to average.

The potential biomass in the north and west of the Corn Belt and the north and south of the Great Plains is estimated to be above average, which may be attributed to slightly above-average precipitation and close-to-average temperature and RADPAR. On the contrary, the potential biomass in the Prairies was significantly lower than average, which may have been caused by cooler temperatures and lower RADPAR.

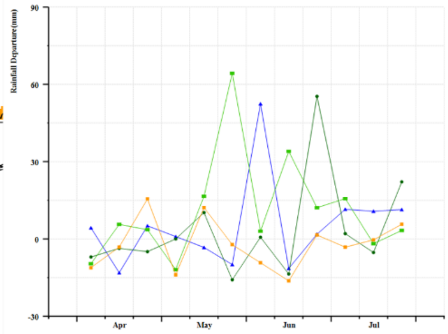
The maximum VCI index as high as 0.9 indicates favorable crop conditions in the monitoring area. During the period from May to June, thanks to abundant rainfall, crop conditions in most parts of the Prairies and in the west of the Corn Belt were excellent. Areas with poor crop conditions were mainly distributed in the western part of the southern plain, which may be related to the relatively dry conditions. On the contrary, very wet conditions may have prevented some planting in North and South Dakota. During the monitoring period, the proportion of cultivated land reached 95%, which was the same as the 5YA.

In short, the crop conditions in this MPZ area are favorable. In the next monitoring period, all spring and summer crops will reach maturity and harvest of soybean and maize will start in September.

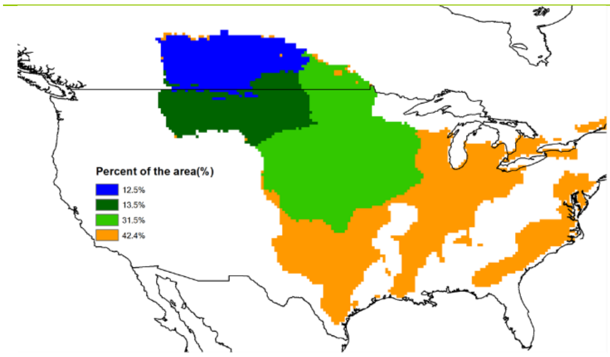
**Figure 2.2 North America MPZ: Agroclimatic and agronomic indicators, April to July 2020**



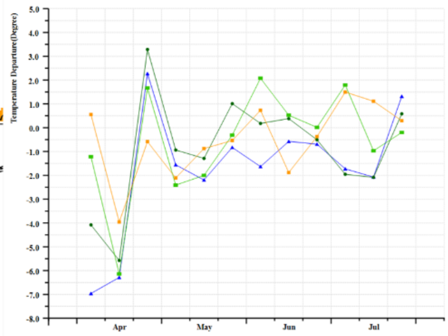

a. Spatial distribution of rainfall profiles



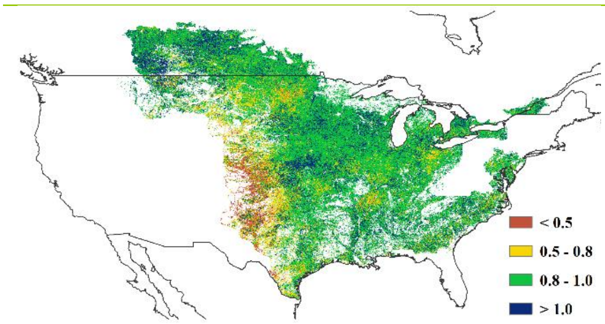

b. Profiles of rainfall departure from average (mm)



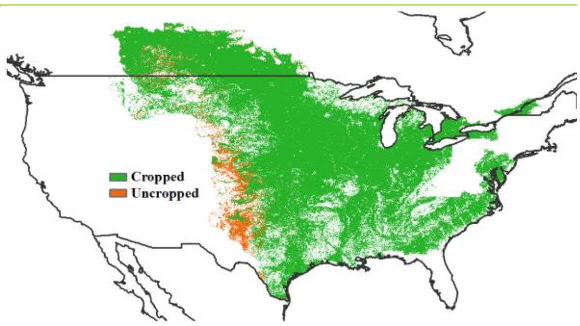

c. Spatial distribution of temperature profiles



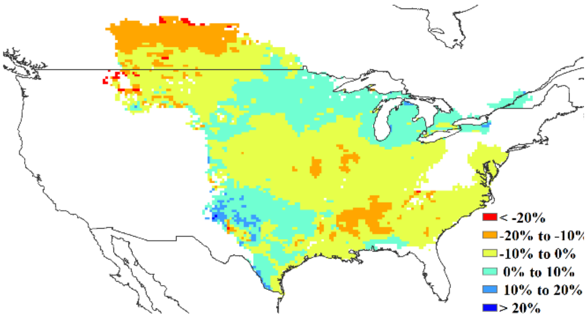

d. Profiles of temperature departure from average (mm)




e. Maximum VCI




f. Cropped arable land




g. Biomass accumulation potential departure

*Note:* For more information about the indicators, see Annex B.

## 2.4 South America

This reporting period covers the harvest of late maize and soybean, followed by a fallow period or sowing of wheat. The CropWatch indices reveal average conditions for this region.

Spatial distribution of rainfall profiles showed a quite clear North-South pattern. Rainfall in the North was stable and near average. A pattern located in the center and south of Brazil, Paraguay and Uruguay showed negative anomalies during April and positive anomalies during May, June and July. On the contrary, in the South, including most of Argentina's agricultural area, a pattern with a positive anomaly during April, followed by a quite stable and near average values pattern was observed. In addition, the dynamics of VHI categories moved from near 20% of the area with moderate and severe drought conditions in April to less than 10% in July, suggesting a general improvement in conditions at the end of the period.

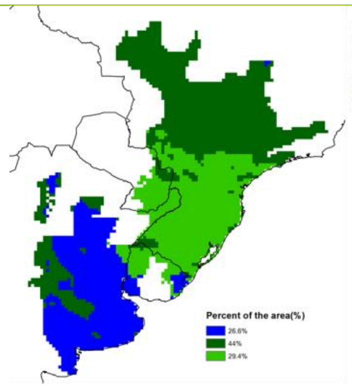
Temperature profiles were grouped along five areas distributed along a latitude gradient. Nevertheless, it is difficult to find clear differences among profiles. In general, they showed positive anomalies at the end of April and in the middle of June and July. In the South (red and blue areas), a positive anomaly was observed during May, while Northern regions showed a negative anomaly in this month.

BIOMSS showed a radial pattern with higher-than-average conditions in the center of the region (Chaco, North Pampas and Paraguay) and lower-than-average conditions in the extreme North, South and East. A high portion of the region was planted according to the CALF index, with the exception of sites in the Center and South West Pampas.

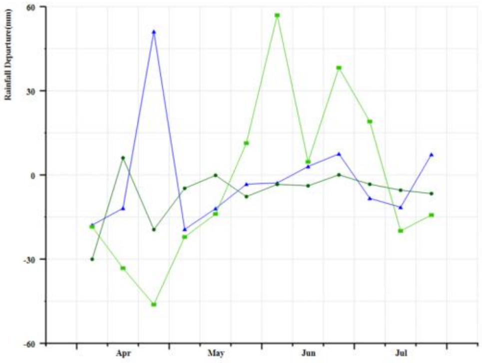
Maximum VCI showed a mixed pattern along the region and particularly in the Pampas, showing high variability in crop growing conditions with average VCIx at 0.86. High VCIx values were observed in the North and Center of the Brazilian agricultural area, Subtropical Highlands and part of Argentina's Pampas. Lowest VCIx values were observed in the Center of the Pampas and East Chaco in Argentina and in Rio Grande do Sul in Brazil which coincided with the uncropped fields in Figure f.

In summary, several indices showed near-average conditions with some positive anomalies in rain and temperature at specific times. Drought conditions were eased starting mid-May thanks to the above or near average rainfall.

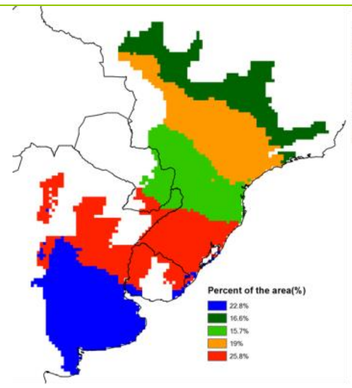
**Figure 2.3 South America MPZ: Agroclimatic and agronomic indicators, April to July 2020**



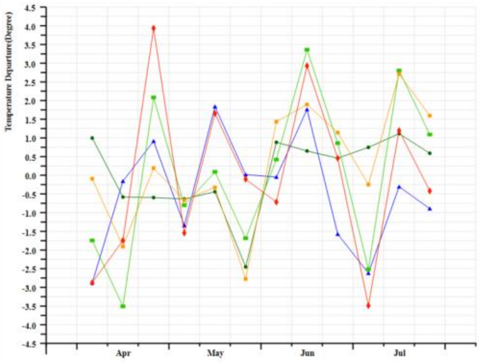

a. Spatial distribution of rainfall profiles



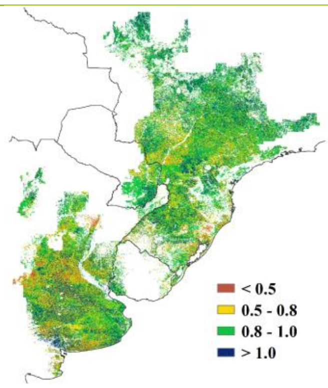

b. Profiles of rainfall departure from average (mm)



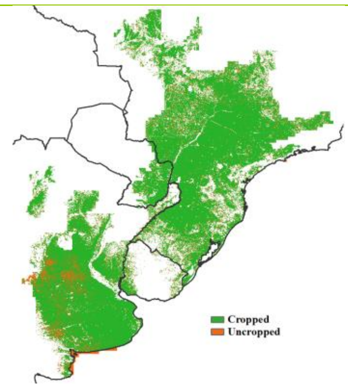

c. Spatial distribution of temperature profiles



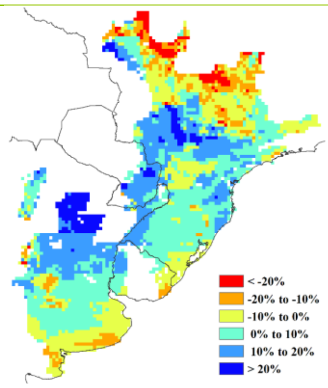

d. Profiles of temperature departure from average (mm)



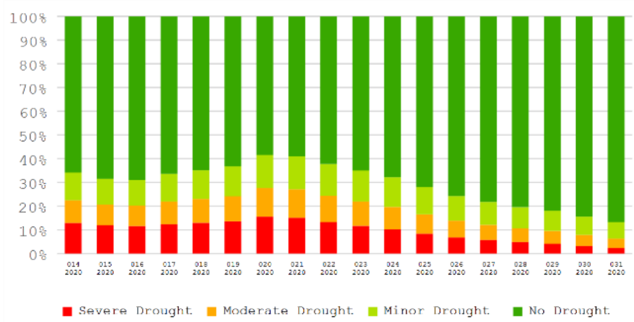

e. Maximum VCI




f. Cropped arable land




g. Biomass accumulation potential departure




h. The proportions of different drought categories

*Note:* For more information about the indicators, see Annex B.

## 2.5 South and Southeast Asia

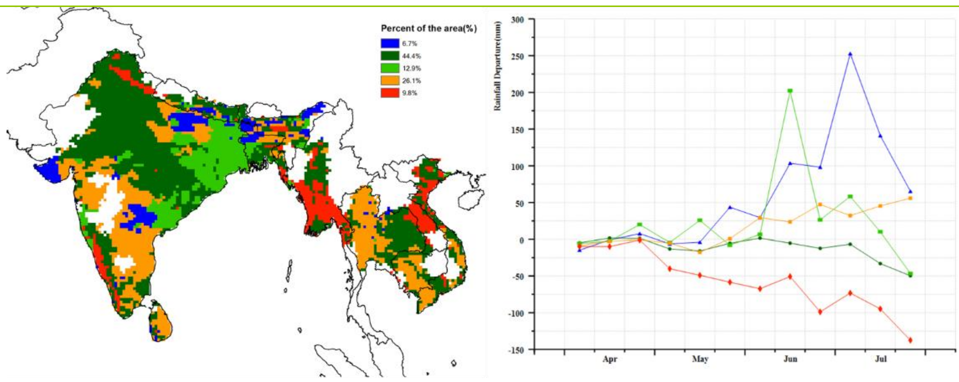
The South and Southeast Asia MPZ spans a large geographic area, including India, Bangladesh, Cambodia, Myanmar, Nepal, Thailand, Laos and Vietnam. Rice is the main crop in most countries, and wheat, maize, soybean and other crops are also grown. During this monitoring period, this MPZ experienced close to average agroclimatic conditions (RAIN-1%, TEMP-0.2°C, RADPAR+1%), while BIOMSS was higher than the average by 7%, and CALF was increased by 8%. Meanwhile, the MPZ had a high value for VCIx (1.02). The growth conditions of crops in the main production areas vary greatly in space. Conditions were generally more favorable for most of India and less favorable in some Southeast Asian countries. This monitoring period covers the harvest of the winter crops, mainly wheat in India and Bangladesh, boro/dry season rice, as well as the planting of the main rice crop in the entire MPZ.

During the monitoring period, 70.5% of the region received close-to-average rainfall, including much of India, Thailand and western Cambodia. Heavy rainfall occurred in June and July in eastern India and a small part of southwest India. Southern Myanmar and southern Laos received below-average rainfall in June and July. This has led to drought conditions in southern Myanmar and Laos, as can be seen from the minimum vegetation health index map. Temperature in 22.4% of cultivated areas was close to average, mainly in eastern India and Bangladesh. Temperatures for most of the Indochina Peninsula countries were above average. Most parts of northern India had low temperatures and high fluctuations. CALF reached 83% in this MPZ, 8% above the average of this stage and VCIx was at 1.02. CALF and VCIx are high over India, Vietnam, Thailand, Bangladesh, and Sri Lanka. Uncropped areas mainly occur in a small part of south and central India and Myanmar, where they are associated with Low VCIx values below 0.8.

BIOMASS performance was better in most of northern India. Below-average BIOMSS mainly occurred in the western coast of India, Assam and Nepal. Severe drought in most south-east Asian countries can be seen from the VHI minimum map.

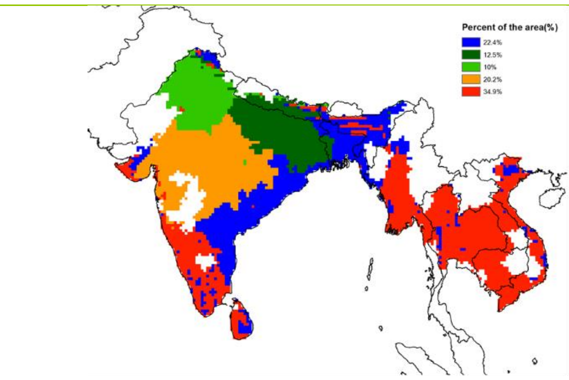
In summary, the crop condition of the MPZ is expected to be above average. However, due to the high temperature, record-low water levels of the Mekong River in the early part of this monitoring period and low rainfall in parts of Southeast Asian countries, crop growth needs further analysis in the future mouths.

**Figure 2.4 South and Southeast Asia MPZ: Agroclimatic and agronomic indicators, April to July 2020**

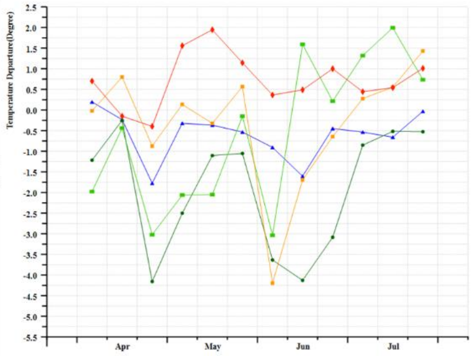



a. Spatial distribution of rainfall profiles

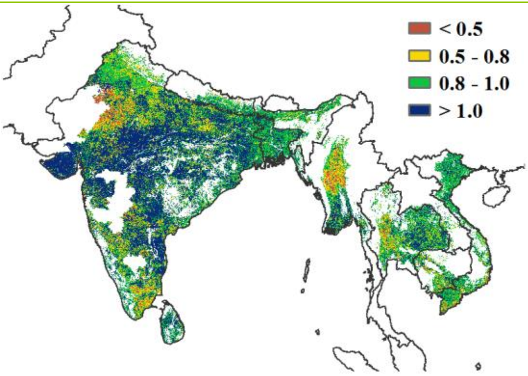
b. Profiles of rainfall departure from average (mm)



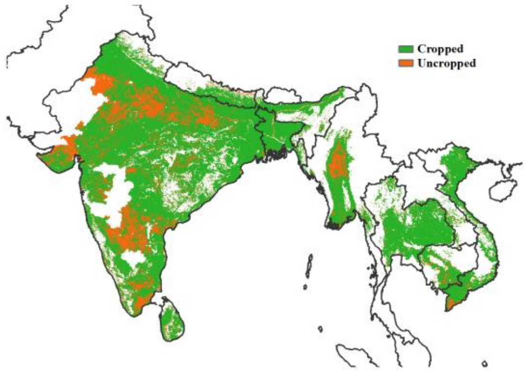

c. Spatial distribution of temperature profiles



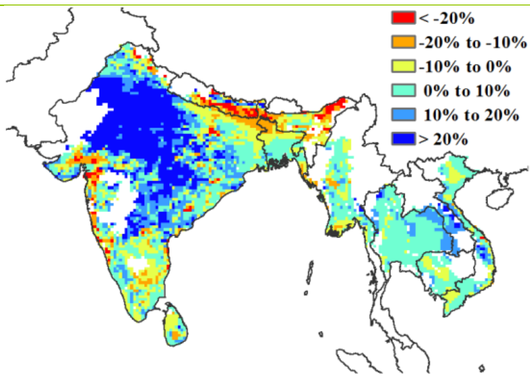

d. Profiles of temperature departure from average (mm)



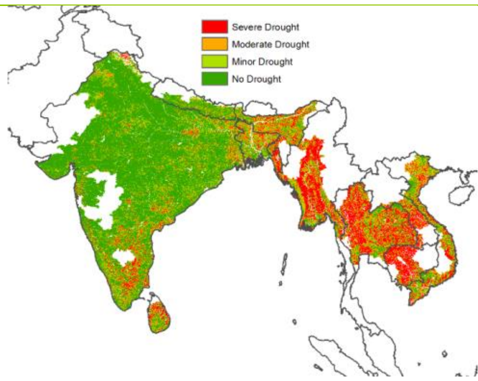

e. Maximum VCI




f. Cropped arable land




g. Biomass accumulation potential departure




h. VHI minimum

*Note:* For more information about the indicators, see Annex B.

## 2.6 Western Europe

This monitoring period covers the vegetative growth of winter wheat and summer crops in the Western European Major Production Zone (MPZ). Overall, crop conditions were below average in most parts of the Western European MPZ based on the integration of agroclimatic and agronomic indicators (Figure 2.5).

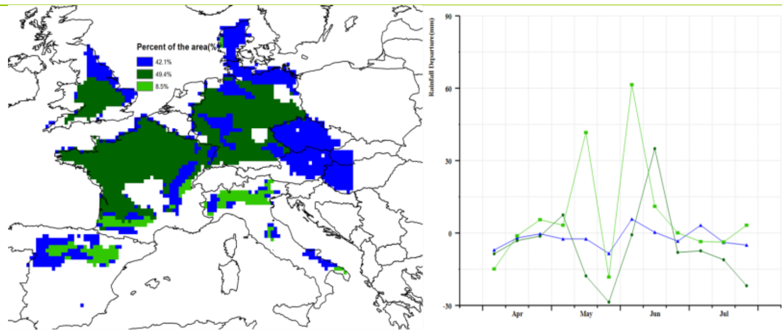
The whole MPZ showed a drop in RAIN (7% below average), and significant spatio-temporal differences in precipitation between the countries were observed. They can be characterized as follows: (1) the precipitation in April in almost the entire MPZ was below average; (2) during the whole monitoring period, 42.1percent of MPZ areas experienced below-average precipitation with the exception of early June and early July. The affected regions include western Spain, Franche Comté region, Provence-Alpes-Côte d'Azur, the central part of the Rhone-Alpes region, and the southern part of the Midi-Pyrénées region in France, Piedmont region and Umbria region, Puglia in Italy, the east coast and the north of England, Southeast of Bavaria, Hesse, North of Lower Saxony, Schleswig-Holstein and Mecklenburg-Western Pomerania in Germany, Denmark, Czech Republic, Slovakia, Austria and Hungary; (3) during the entire monitoring period, precipitation for 49.4% percent of the MPZ areas (Central and Western England, most of France and most of Germany) showed a bimodal trend of drastic changes around the average, and above-average rain was observed only in early May and mid-June, whereas precipitation was below average by about 29% in late May. In mid-June, 33% of the area was above average; (4) after early May, with the exception of late May and late June to mid-July, the precipitation in 8.5 percent of MPZ areas was above average, and the above-average rate reached about 38% in mid-May, and about 60% in early June, respectively. Countries with the most severe precipitation deficit included Germany (RAIN -22%), UK (RAIN -18%), Italy (RAIN -10%) and France (RAIN -10%), while only Spain experienced significant above-average precipitation (RAIN +40%). Due to the rainfall deficit, flowering and grain filling for the winter crops were negatively impacted. More rain will be needed in the coming weeks to raise soil moisture to favorable levels in order to ensure good yields for the summer crops.

Temperature (TEMP) for the MPZ as a whole was slightly below average (TEMP -0.1°C), and sunshine was well above average with RADPAR up by 1%. Temperature in Denmark, northern England, and northern Germany was significantly above average in mid-June and late June, and the temperature in most areas of France, Spain, Czech Republic, Slovakia, Austria, Hungary and UK was significantly above average in early and late May. High temperature shortened the grain filling stage of crops and accelerated the maturity, which may have reduced crop yields. TEMP in the MPZ was significantly below average in early June, early July and mid-July.

Despite of the rainfall deficit, the potential BIOMSS was near average due to sunnier conditions for the MPZ. The lowest BIOMSS values (-10% and below) occurred in parts of Spain, eastern and southeastern Germany, northern and central Italy. In contrast, BIOMSS was above average (sometimes exceeding a 10% departure) over northern and southwestern France, central and southern Spain, and southern UK. The average maximum VCI for the MPZ reached 0.92. More than 98% of arable lands were cropped, which is 2% above the recent five-year average. Most uncropped arable land is concentrated in eastern and southeastern Spain, with patchy distribution in other countries. The VHI minimum map shows that most of France, the eastern part of the UK and Germany were most affected by severe drought conditions.

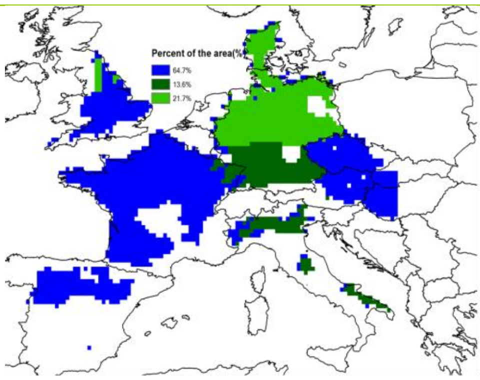
Generally, crop conditions in the Western Europe MPZ were below average due to rainfall deficits. More rain will be needed in several important crop production areas to ensure an adequate soil moisture supply for the growth of the summer crops.

**Figure 2.5 Western Europe MPZ: Agroclimatic and agronomic indicators, April to July 2020**

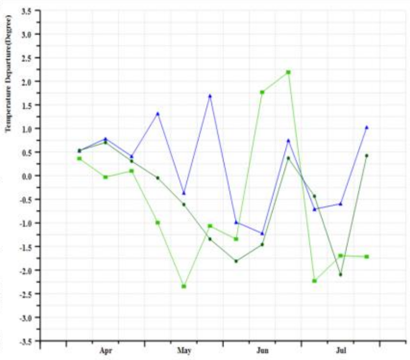



a. Spatial distribution of rainfall profiles

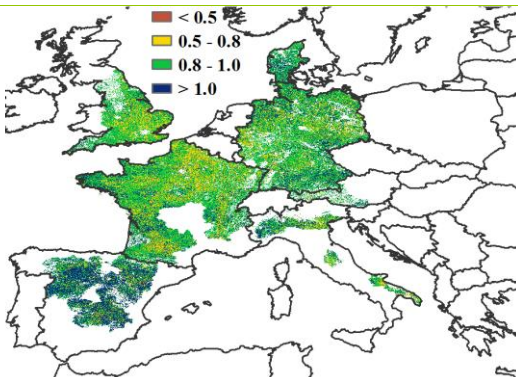
b. Profiles of rainfall departure from average (mm)



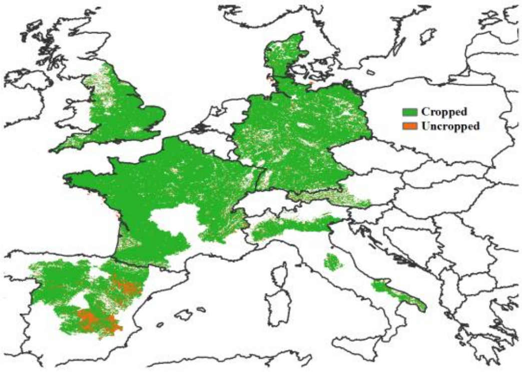

c. Spatial distribution of temperature profiles



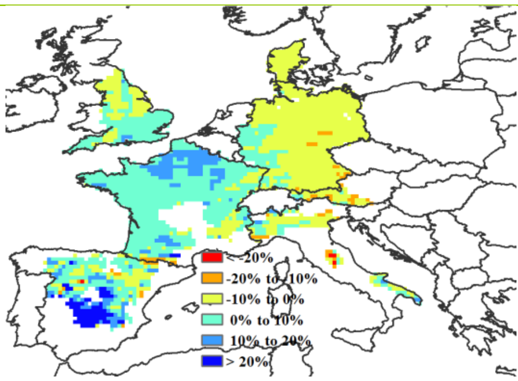

d. Profiles of temperature departure from average (mm)



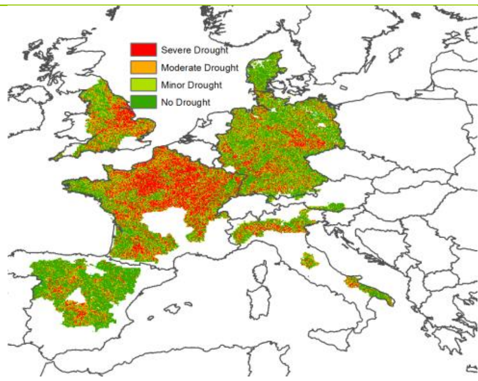

e. Maximum VCI




f. Cropped arable land




g. Biomass accumulation potential departure




h. VHI minimum

*Note:* For more information about the indicators, see Annex B.

## 2.7 Central Europe to Western Russia

In this monitoring period, the growth condition of summer crops of the MPZ was below the average, with a 6% decrease in BIOMASS. As a whole, rainfall significantly increased 18%, while temperature and RADPAR decreased 0.9° C and 2% respectively, compared with the average of the past 15 years.

Based on rainfall departure map, the rainfall changed significantly in the MPZ, with the highest rainfall in mid-June (+90 mm).The specific spatial and temporal distribution characteristics are as follows: (1) From April to May, the precipitation was below average in eastern Romania, northern Moldova, southern Ukraine and Russia (9.9% of the MPZ). However, these regions increased significantly in mid-June. (2) From late-May to early-June, the precipitation in southern Russia and southwestern Ukraine (24.5% of the MPZ) was higher than average from late May to early June.

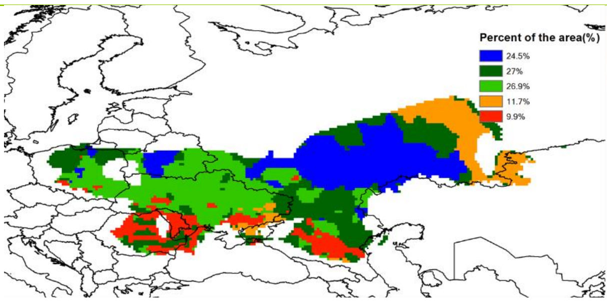
(3) In late June, the precipitation in most central Europe and western Russia (51.4% of the MPZ) sharply decreased and was lower than average.

According to its departure map, the temperature in the MPZ fluctuated dramatically. The lowest temperature (-6.1°C) in late-June affected the most eastern part of the MPZ, accounting for 30.9% of the total area, while the highest temperature occurred in mid-July (+3.9°C), mainly in western Russia. Meanwhile, in mid-June, the temperature rose(+2.4°C) in southern Belarus, eastern Poland and most of Ukraine (36.6% of the MPZ).

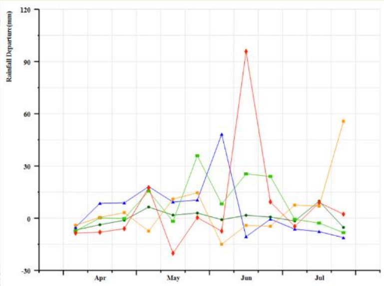
The CropWatch indicators show that except for southeastern Russia, almost all the arable land was cultivated in the MPZ, its CALF at 98%. However, BIOMASS decreased 6% compared with the average of the past 15 years, which might be attributable to the impact of lowest temperature in mid-May and late June. Based on the spatial distribution map of BIOMASS departure, the lowest BIOMSS (-10% and below) occurred in western Russia, Northern Ukraine, northern Romania, Belarus, Poland, Czech Republic, Slovakia, Hungary, Moldova. In contrast, the highest BIOMSS (about +10%) was concentrated in southeast Russia, southern Ukraine and southern Romania. The average value of VCIx was 0.92, and values higher than 0.8 were observed in western MPZ.

In summary, the results of CropWatch agroclimatic and agronomic indicators during the monitoring period demonstrated that, though there was abundant precipitation in the MPZ, the decreased temperature and RADPAR cumulatively affected the crops in the critical growth period, resulting in the low BIOMASS. In conclusion, the growth condition of summer crops of the MPZ is below the average, and the crop yields are likely to be lower than average.

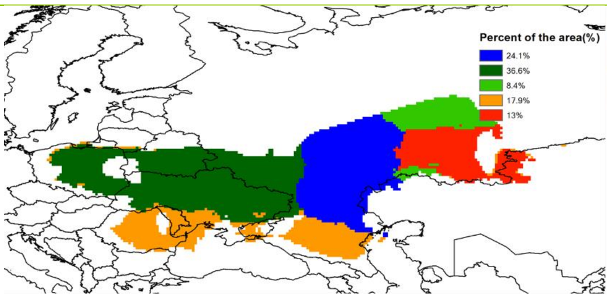
**Figure 2.6 Central Europe-Western Russia MPZ: Agroclimatic and agronomic indicators, April to July 2020**



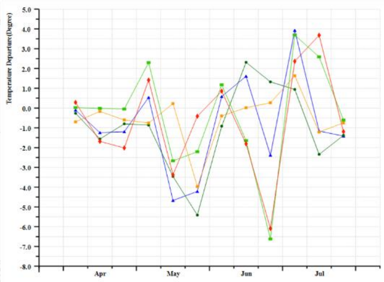

a. Spatial distribution of rainfall profiles



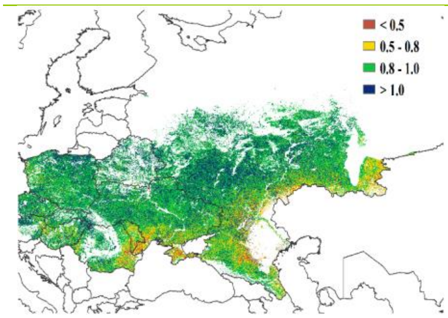

b. Profiles of rainfall departure from average (mm)



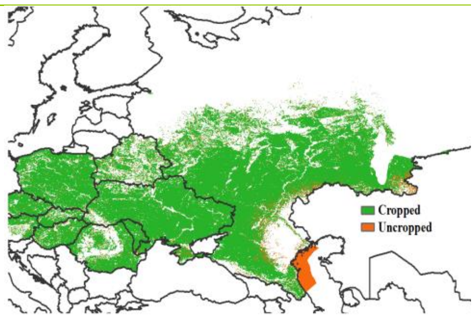

c. Spatial distribution of temperature profiles



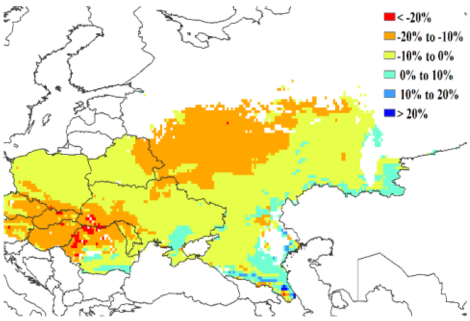

d. Profiles of temperature departure from average (mm)



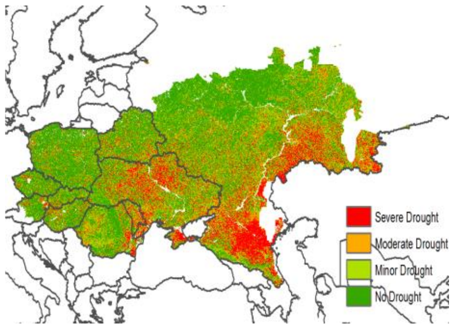

e. Maximum VCI




f. Cropped arable land




g. Biomass accumulation potential departure




h. VHI minimum

*Note:* For more information about the indicators, see Annex B.

# Chapter 3. Core countries

## 3.1 Overview

*Chapter 1 has focused on large climate anomalies that sometimes reach the size of continents and beyond. The present section offers a closer look at individual countries, including the 42 countries that together produce and commercialize 80 percent of maize, rice, wheat, and soybean. As evidenced by the data in this section, even countries of minor agricultural or geopolitical relevance are exposed to extreme conditions and deserve mentioning, particularly when they logically fit into larger patterns.*

**1. Introduction**

The global agro-climatic patterns that emerge at the MRU level (chapter 1) are reflected with greater spatial detail at the national and sub-national administrative levels described in this chapter. The "core countries", including major producing and exporting countries are all the object of a specific and detailed narrative in the later sections of this chapter, while China is covered in Chapter 4. Sub-national units and national agro-ecological zones receive due attention in this chapter as well.

In many cases, the situations listed below are also mentioned in the section on disasters (chapter 5.2) although extreme events tend to be limited spatially, so that the statistical abnormality is not necessarily reflected in the climate statistics that include larger areas. No attempts are normally made, in this chapter, to identify global patterns that were already covered in Chapter 1. The focus is on 166 individual countries and sometimes their subdivisions for the largest ones. Some of them are relatively minor agricultural producers at the global scale, but their national production is nevertheless crucial for their population, and conditions may be more extreme than among the large producers.

**2. Overview of weather conditions in major agricultural exporting countries**

The current section provides a short overview of prevailing conditions of maize, rice, wheat and soybeans in a group of just 20 countries, conventionally taken as the major exporters, with each of them exporting at least one million tons of the covered commodities. They include the top 10 exporters in the world, with the United States and Argentina exporting all four crops, and Brazil, Ukraine and Russia exporting three of them each.

**Maize**: Maize exports are dominated by just 4 countries: USA, Brazil, Argentina and the Ukraine. Together, they supply three quarters of maize being traded internationally. In South America, this reporting period covered the grainfilling period of late (2nd crop) maize and its harvest. Conditions in all South American maize production regions tended to be on the dry side, which provided good conditions for harvest. However, soil moisture conditions in Parana, Goias and Mato Grosso do Sul were drier than usual in April and May, which may have negatively impacted yields. In general, a high production can be expected, mainly due to increased acreage.

In the USA, weather conditions for maize were generally favorable. Spring was somewhat on the wet and cooler side, but the CropWatch indicators had reached positive territory by July. Planting was delayed in some areas of North and South Dakota due to cool and wet conditions. A powerful storm, called Derecho, hit Iowa on August 10, 2020. Its highest measured wind speed was 203 km/h. It affected about 6 million ha, or half of Iowa's cropland. Many maize fields got flattened, but it is too early to accurately assess the impact on maize yields.

Maize in Europe largely benefitted from rather favorable conditions for maize production. No periods with prolonged excessive heat were reported and rainfall during May, June and July was close to average, although rather on the dry side, especially in France and Germany.

In Ethiopia and East Africa, maize keeps benefitting from above average rainfall. However, locusts continue to cause crop damage in some hot spots.

In China, maize was off to a good start, helped by the generally above-average precipitation and favorable temperatures.

**Rice**: Four out of the 5 top rice exporting countries are located in South and Southeast Asia: India supplies about 1/3 of the rice that is internationally traded, followed by Thailand with 1/5. The USA, number 3, supplies less than 10%. Vietnam contributes about 7% and Pakistan close to 6%.

Southeast Asia, with a combined market share of a bit more than 25%, was still suffering from the prolonged drought that caused record low water levels in the Mekong river. This in return hampered irrigated rice production during the dry season. The rainy season was off to a slow start in May, however, rains reached average levels by July. Crop conditions in all of mainland Southeast Asia had recovered to average levels by the end of July. Excessive monsoon rainfall caused wide-spread flooding in Bangladesh and Eastern India, especially in Bihar and Assam. It remains to be seen what the impact on yields will be, since rice can tolerate short periods of submergence. In other parts of India, as well as in Pakistan, abundant monsoon rains caused generally favorable conditions for rice production.

**Wheat**: This monitoring period covers the sowing of wheat in the Southern Hemisphere. Conditions were favorable in Argentina, South of Brazil, Cape Province of South Africa, and Southeast Australia. However, drier-than-normal conditions prevailed in Southwest Australia.

Most winter wheat sown in the Northern Hemisphere reached maturity by May, June or July. Spring wheat harvest typically starts in August. Conditions in the USA and Canada were generally favorable. The cool temperatures in the spring caused favorable conditions for yield formation. There were a couple of frost events in April and early May in the USA, but damage was limited. Precipitation was favorable, except for the western region of the Great Plains (Colorado and Oklahoma), where conditions were drier than normal.

In Europe, conditions were very wet during the planting season last fall, especially in the UK. Warmer winter temperatures caused an early spring green-up, followed by dry and sunny weather until the end of April. This caused a depletion of soil moisture in France, Germany and the UK. Subsequent rains were close to average, but they came too late and were not sufficient to help fully compensate for the yield losses. Similarly, dry conditions in March and April in Romania and the Ukraine caused significant yield losses for winter wheat. Conditions were more favorable for most of Russia. Spring wheat in Kazakhstan was off to a good start, but drier-than-normal conditions in July caused moisture stress in some regions.

Morocco and the other nations in the Maghreb suffered from drought conditions during the winter months. This caused crop failures in Morocco, especially in the south. In the other Maghreb countries, significant yield losses for rainfed wheat occurred.

In India and Pakistan, where wheat was harvested in late March and April, the crop benefitted from abundant moisture and generally favorable weather conditions. However, untimely rainfall in April caused some delays in harvest and may also have negatively impacted grain quality.

Winter wheat in the North China Plain reached maturity in late May/early June. The area increased in the region from last year. Higher rainfall may have increased the disease pressure and solar radiation was also reduced. Moreover, the region experienced a few hot days in early May, during which temperatures reached close to 40°C.

**Soybean**: In the southern hemispheres, most of the soybean had been harvested by March and were covered in the May CropWatch bulletin. In the USA, Canada and the Ukraine, conditions for soybean production have been favorable so far. Slightly cooler-than-normal conditions prevailed in North America until May, which delayed growth and development. Subsequently, the conditions for soybean improved to above average and high yields can be expected. In the Ukraine, conditions are generally favorable and same production levels as last year can be expected. Conditions for soybean production in China have been favorable so far, mainly due to above-average rainfall.

**Figure 3.1 National and subnational rainfall anomaly (as indicated by the RAIN indicator) of April to July 2020 total relative to the 2005-2019 average (15YA), in percent**

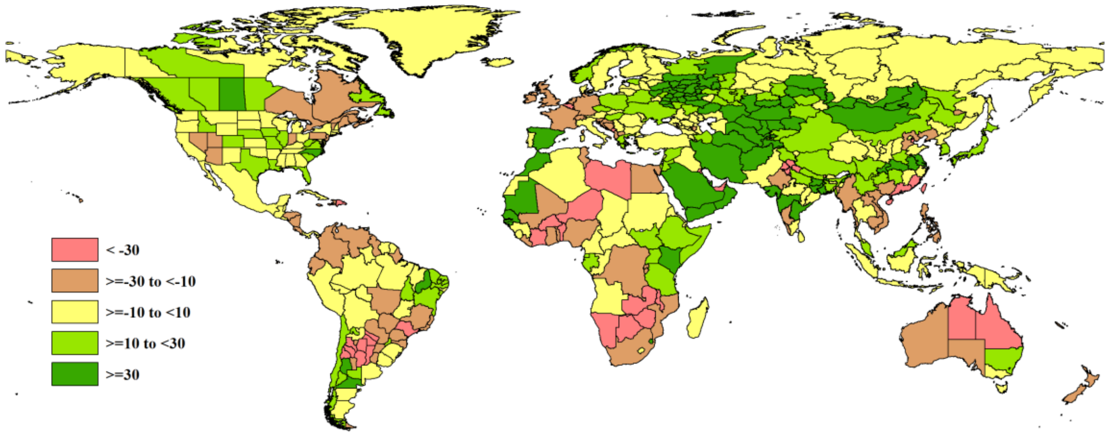



**Figure 3.2 National and subnational temperatute anomaly (as indicated by the TEMP indicator) of April to July 2020 average relative to the 2005-2019 average (15YA), in °C**

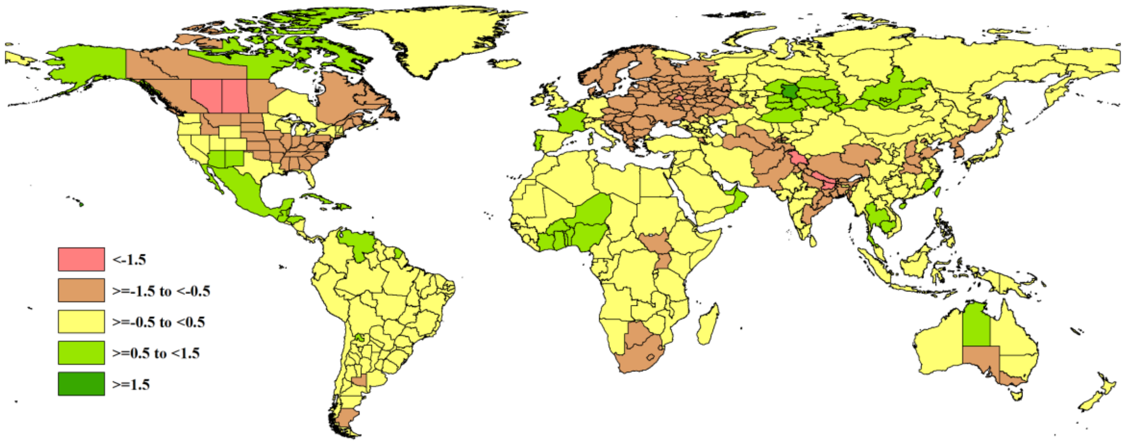


**Figure 3.3 National and subnational sunshine anomaly (as indicated by the RADPAR indicator) of April to July 2020 total relative to the 2005-2019 average (15YA), in percent**

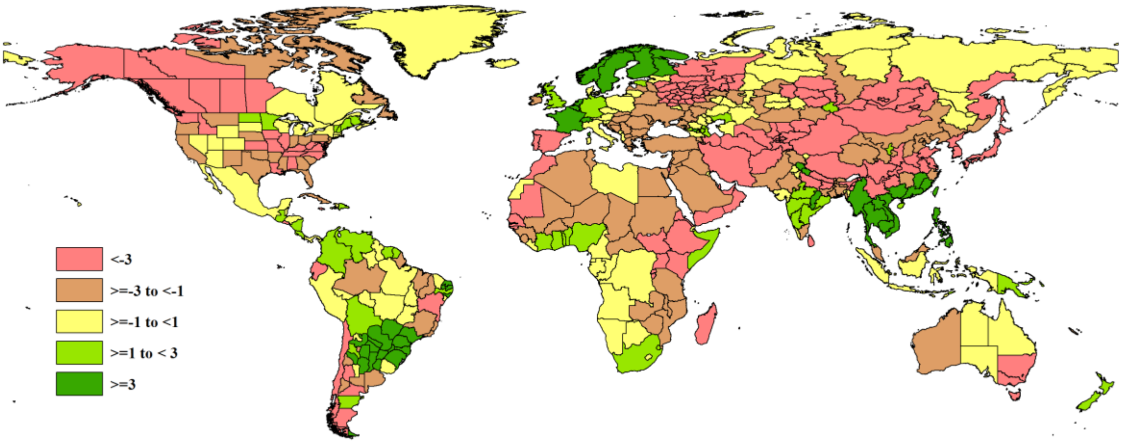
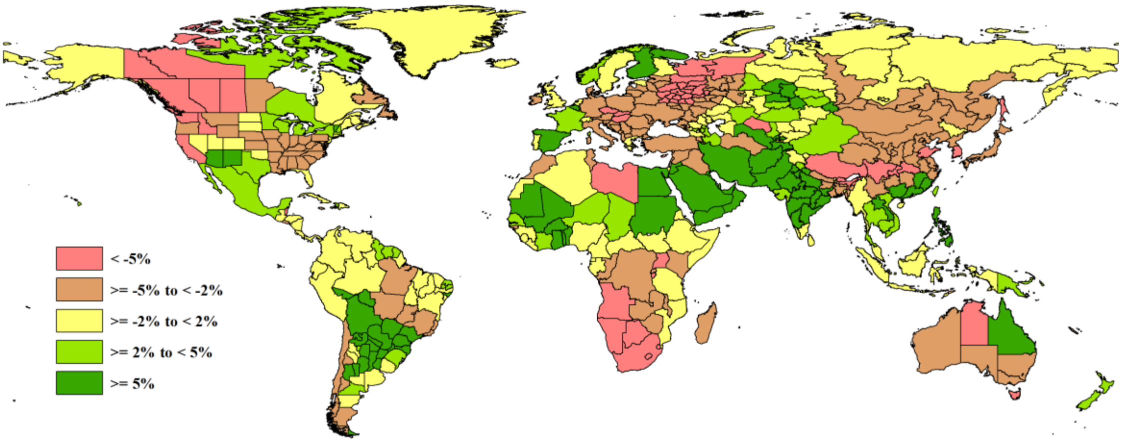



**Figure 3.4 National and subnational bionass production potential anomaly (as indicated by the BIOMSS indicator) of April to July 2020 total relative to the 2005-2019 average (15YA), in percent**




## 3.2 Country analysis

This section presents CropWatch analyses for each of 42 key countries (China is addressed in Chapter 4). The maps and graphs refer to crop growing areas only: (a) Phenology of major crops; (b) Crop condition development based on NDVI over crop areas at national scale, comparing the April - July 2020 period to the previous season and the five-year average (5YA) and maximum; (c) Maximum Vegetation Condition Index over arable land (VCIx) for April - July 2020 by pixel; (d) Spatial NDVI patterns up to April - July 2020 according to local cropping patterns and compared to the 5YA; and (e) NDVI profiles associated with the spatial pattern under (d). Next, separate graphs (labeled as figures (f), (g), and subsequent letters) are included to illustrate crop condition development graphs based on NDVI average over crop areas for different agro-ecological zones (AEZ) within a country, again comparing the April - July 2020 period to the previous season and the five-year average (5YA) and maximum.

Refer to Annex A, Table A.1-A.11 for additional information about indicator values by country. Country agricultural profiles are welcome to visit the CropWatch Explore module of the **cloud.cropwatch.com.cn** website for more details.

Figures 3.5 - 3.45; Crop condition for individual countries ([AFG] Afghanistan to [ZMB] Zambia) including agro-ecological zones (AEZ) from April - July 2020.

# [AFG] Afghanistan

Wheat, maize and rice are the main cereals that are grown in Afghanistan. The country produces spring and winter wheat. The sowing of spring wheat starts in March and April and the harvest is in August and September. Winter wheat is sown in October and November and harvested in May and June. Maize sowing starts in May and harvest is in August. Likewise, rice sowing starts in May/June and harvest is in October/November.

During this reporting period, the precipitation in Afghanistan was higher than the 15YA and lower than in 2019. Rainfall gradually declined from April to June. Temperature was lower than average in early April and mid-May 2020. Biomass was estimated to be 10 to 14% below the 15YA. According to crop condition development graphs based on NDVI, the national crop conditions were above average and close to the 5-year maximum.

The cropped arable land was mainly in Badghis, Faryab, Balkh, Kunduz, Takhar, Badakhshan, and Nuristan. The cropped arable land fraction (CALF) increased by 93% over the 5YA. According to the maximum vegetation condition index (VCIx) map, the vegetation in the south was better than in the north. As to the spatial distribution of NDVI profiles, crop conditions in most of the area (about 85.8% of cropped area) were above average or close to average from April to July. The most favorable conditions (28.4%) were identified mainly in the north of Badghis, Faryab, Saripul, and Samangan provinces. For 14.2%, the conditions were below average. This was mainly in the northern part of Baghlan.

In general, the conditions for wheat and maize are favorable.

**Regional analysis**

CropWatch subdivides Afghanistan into four zones based on cropping systems, climatic zones, and topography. They are described below as Dry region, Central region with sparse vegetation, Mixed dry farming and irrigated cultivation region, and Mixed dry farming and grazing region.

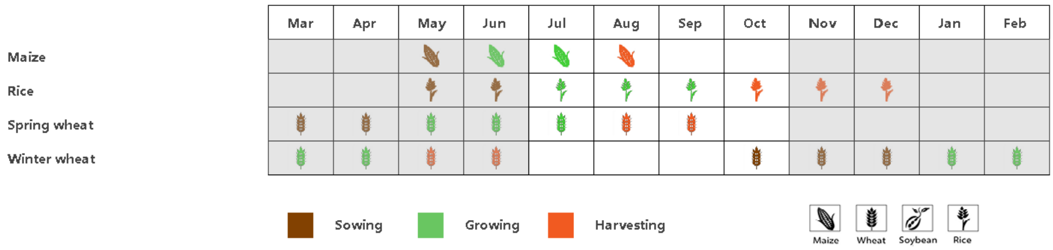
The RAIN in the Central region with sparse vegetation was 159 mm (+9%). The TEMP was 23.6°C (-0.8°C), and the RADPAR was 1571 MJ/m$^2$(-4%). According to the NDVI-based crop condition development graph, the NDVI was higher than the average level and almost equal to the 5-year maximum. Potential biomass increased by 13%, CALF had increased substantially (+74%) and VCIx was 1.11.

The Mixed dry farming and grazing region recorded 90 mm of RAIN (+43%), TEMP was lower than average at 20.1°C (-0.8°C), and the RADPAR was 1601 MJ/m$^2$ (-3%). According to the NDVI-based development graph, crop conditions were better than the five-year average. CALF in this region increased by 38% and VCIx reached 0.93.

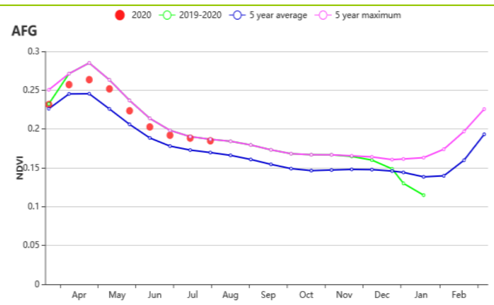
In the Mixed dry farming and irrigated cultivation region, the following indicator values were observed: RAIN 415 mm (+45%); TEMP 16.3°C (-1.0°C); RADPAR 1494 MJ/m$^2$ (-5%). Potential biomass was 453 g DM/m$^2$ (+5%) and CALF was 31% above the average. According to the NDVI-based crop condition development graph, NDVI was higher than the average level and VCIx reached 0.84.

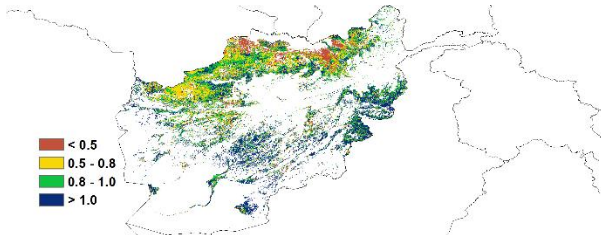
The Dry region recorded 83 mm of RAIN (+15%). TEMP was 21.9°C (-0.6°C) and the RADPAR was 1626 MJ/m$^2$ (-2%). The CALF was 105% higher than the 5YA. VCIx was 1.0 and the potential biomass increased by 21%. According to the crop condition development graph, the NDVI was higher than maximum level recorded over the past 5 years.

**Figure 3.5 Afghanistan's crop condition, April - July 2020**



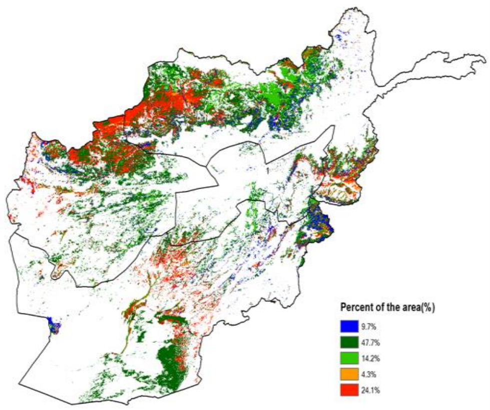

(a) Phenology of major crops

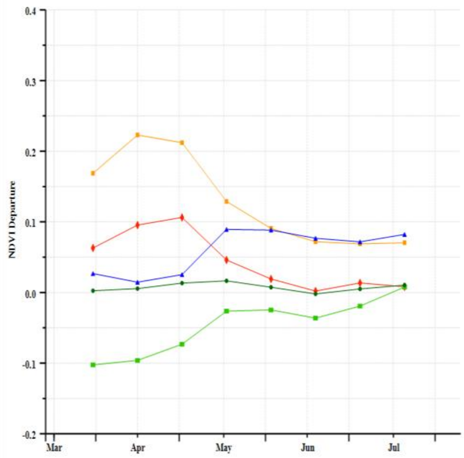



(b) Crop condition development graph based on NDVI

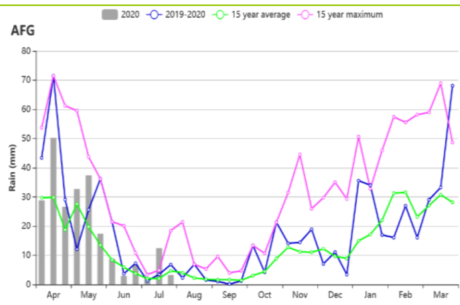
(c) Maximum VCI

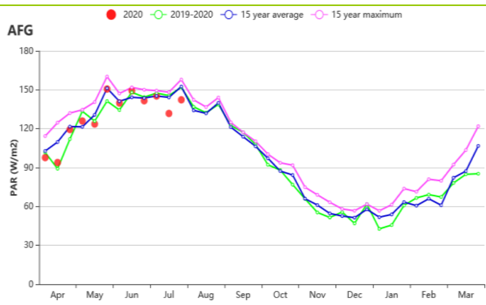



(d) Spatial NDVI patterns compared to 5YA

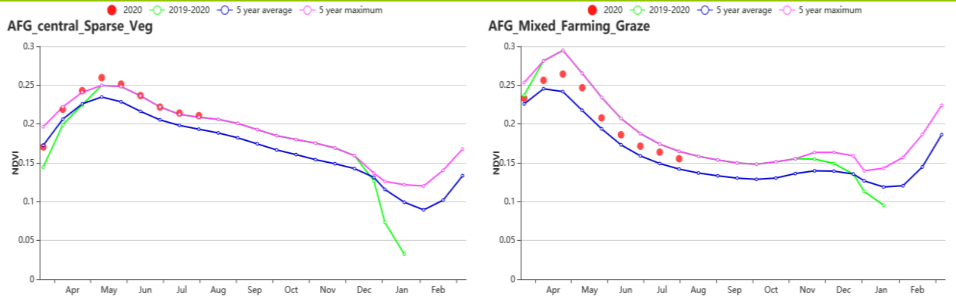
(e) NDVI profiles



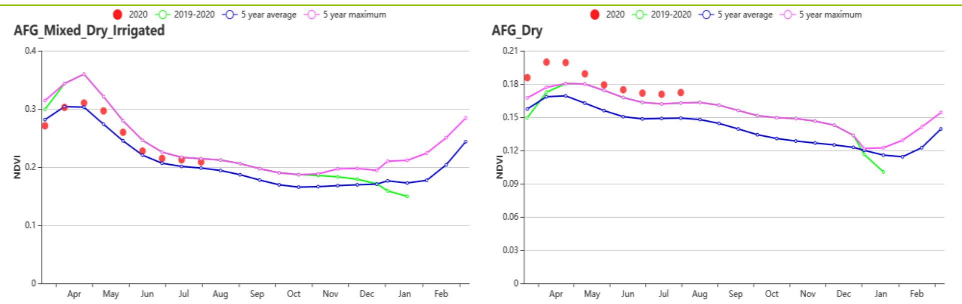




(f) Rainfall profiles

(g) Temperature profiles




(h) Crop condition development graph based on NDVI (central_Sparse_Veg Region (left) and Mixed_Farming_Graze Region (right))




(i) Crop condition development graph based on NDVI (Mixed_Dry_Irrigated Region (left) and Dry (right))

**Table 3.1 Afghanistan's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2020**

| Region | RAIN | | TEMP | | RADPAR | | BIOMSS | |
|---|---|---|---|---|---|---|---|---|
| | Current (mm) | Departure (%) | Current (°C) | Departure (°C) | Current (MJ/m²) | Departure (%) | Current (gDM/m²) | Departure (%) |
| Central region | 159 | 9 | 13.6 | -0.8 | 1571 | -4 | 415 | 13 |
| Dry region | 83 | 15 | 21.9 | -0.6 | 1626 | -2 | 468 | 21 |
| Dry and irrigated cultivation region | 415 | 45 | 16.3 | -1.0 | 1494 | -5 | 453 | 5 |
| Dry and grazing region | 90 | 43 | 20.1 | -0.8 | 1601 | -3 | 320 | -6 |

**Table 3.2 Afghanistan's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2020**

| Region | Cropped arable land fraction | | Maximum VCI |
|---|---|---|---|
| | Current (%) | Departure (%) | Current |
| Central region | 15 | 74 | 1.11 |
| Dry region | 9 | 105 | 1.00 |
| Dry and irrigated cultivation region | 29 | 31 | 0.84 |
| Dry and grazing region | 15 | 38 | 0.93 |

# [AGO] Angola

During this monitoring period, maize and rice reached maturity and wheat sowing started in May. Rainfall was below average (RAIN, -7%), whereas temperature (TEMP, -0.1°C) and radiation remained close to normal. Biomass was estimated to be 14% below average, although NDVI was close to the 5YA at the national level.

VCIx values varied from 0.8 to more than 1 throughout the country. The spatial distribution of NDVI profiles indicates that in nearly 29.5% of the cropped area, crop conditions were above average during the entire monitoring period, especially in Cunene and Cuando Cubango provinces. Rainfall was quite variable in space and time, which caused moisture deficits in the south and west. But crop conditions were in general close to normal.

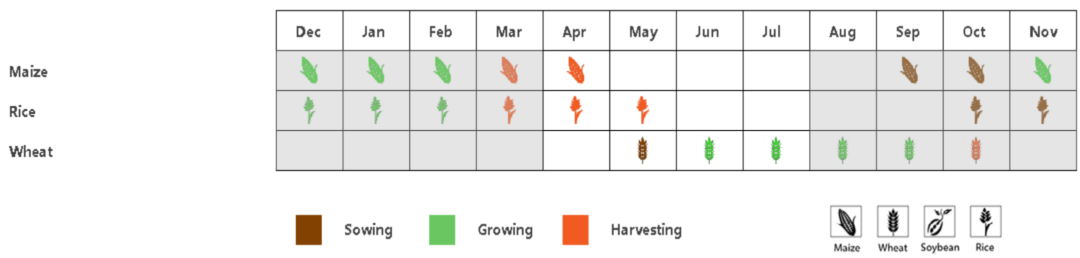
**Regional Analysis**

Considering the cropping systems, climatic zones and topographic conditions, Angola is divided into five agro-ecological zones (AEZs): (1) Arid zone, (2) Central Plateau, (3) Humid zone, (4) Semi-arid zone, and (5) Sub-humid zone.

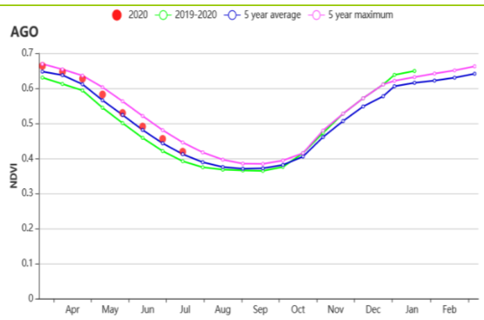
During the reporting period, four zones received below-average rainfall, including Arid zone (-24%), Central Plateau (-24), Semi-arid zone (-34%), and Subhumid zone (-4%). Above-average rainfall (RAIN +4%) was only recorded in Humid zone. The Arid zone was the only region which recorded above-average temperatures (TEMP +0.5°C). It was cooler than normal in the Central Plateau (-4°C). The remaining zones recorded decreases in temperature varying from 0.1°C to 0.2°C. Except for a decrease of 3% in the Humid zone, the remaining zones recorded increases in radiation by 1%. Biomass decreased in all agro-ecological zones. However, despite the increases in rainfall, the total biomass production in the Humid zone decreased by 21% compared to the past fifteen years average, due to a reduction in both temperature and radiation. Large departure in CALF by 6% was observed in the Semi-arid zone while the remaining regions recorded an about-average CALF. Favourable vegetation condition indexes (VCIx) were observed in all agro-ecological zones.

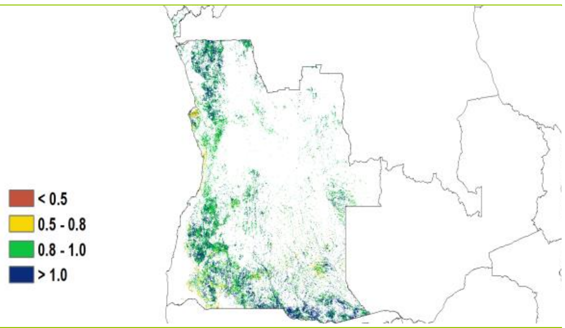
The Arid zone was the one with the lowest VCIx. The lowest VCIx verified in this region, also reflects the reported below-average crop conditions during the entire period (figure f). Close-to-average crop conditions were recorded in the Semi-arid zone while in the Sub-humid zone, and Central Plateau, crop conditions were favourable. In the Humid zone, crop conditions were well above the average of the past five years in April, dropping to below-average from early May till the end of the reporting period.

**Figure 3.6 Angola's crop condition, April - July 2020**

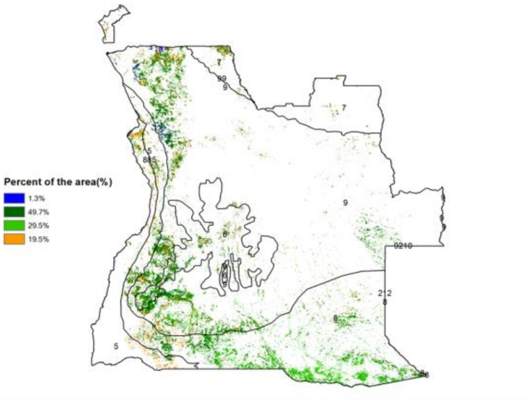


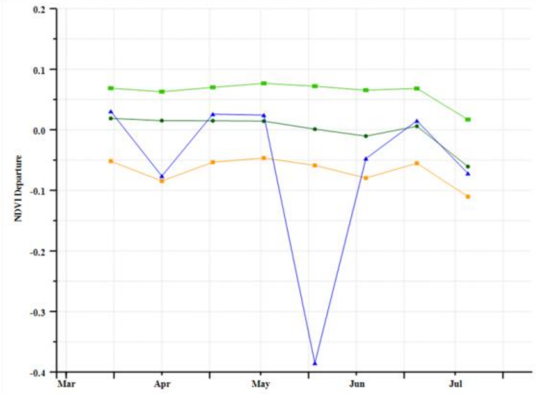

(a). Phenology of major crops



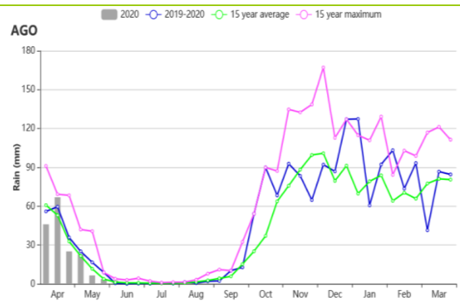



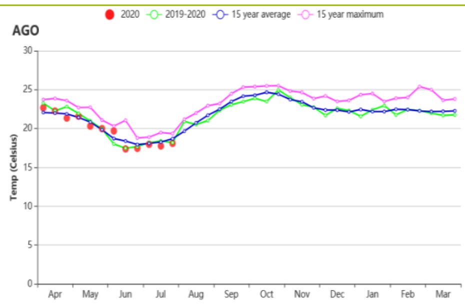

(b) Crop condition development graph based on NDVI (c) Maximum VCI



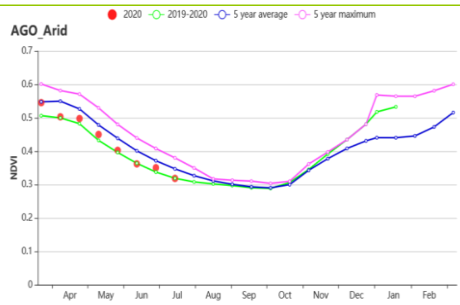



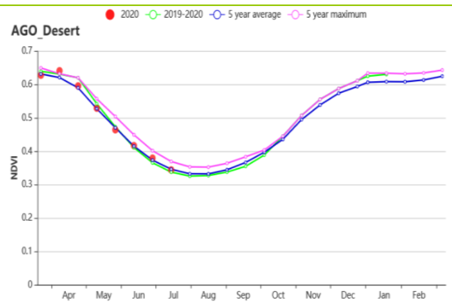

(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



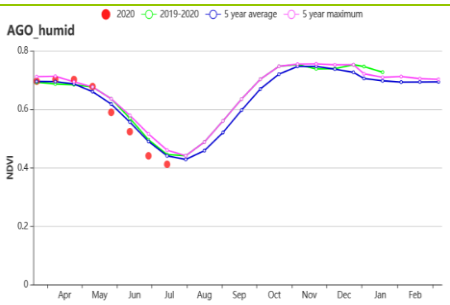



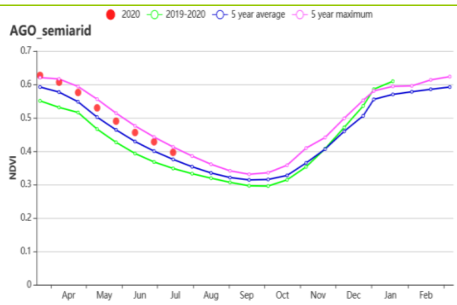

(f) Rainfall profiles (g) Temperature profiles



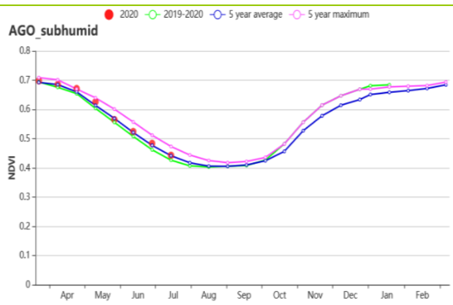




(h) Crop condition development graph based on NDVI-Arid zone (left), and Central Plateau (right)




(i) Crop condition development graph based on NDVI-Humid zone (left), and Semi-arid zone (right)




(j) Crop condition development graph based on NDVI-Subhumid zone

**Table 3.3 Angola agro-climatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2020**

| Region | RAIN | | TEMP | | RADPAR | | BIOMSS | |
|---|---|---|---|---|---|---|---|---|
| | Current (mm) | Departure (%) | Current (°C) | Departure (°C) | Current (MJ/m²) | Departure (%) | Current (gDM/m2) | Departure (%) |
| **Arid Zone** | 102 | -24 | 22.8 | 0.5 | 1207 | 1 | 392 | 102 |
| **Central Plateau** | 94 | -24 | 16.0 | -0.4 | 1256 | 1 | 188 | 94 |
| **Humid zone** | 428 | 4 | 22.5 | -0.2 | 1194 | -3 | 424 | 428 |
| **Semi-Arid Zone** | 49 | -34 | 18.8 | -0.2 | 1194 | 1 | 199 | 49 |
| **Sub-humid zone** | 234 | -4 | 20.0 | -0.1 | 1230 | 1 | 326 | 234 |

**Table 3.4 Angola agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2020**

| Region | Cropped arable land fraction | | Maximum VCI |
|---|---|---|---|
| | Current (%) | Departure (%) | Current |
| **Arid Zone** | 79 | 0 | 0.83 |
| **Central Plateau** | 100 | 1 | 0.97 |
| **Humid zone** | 100 | 0 | 0.99 |
| **Semi-Arid Zone** | 99 | 6 | 1.00 |
| **Sub-humid zone** | 100 | 0 | 0.97 |

AFG AGO **ARG** AUS BGD BLR BRA CAN DEU EGY ETH FRA GBR HUN IDN IND IRN ITA KAZ KEN KGZ KHM LKA MAR MEX MMR MNG MOZ NGA PAK PHL POL ROU RUS THA TUR UKR USA UZB VNM ZAF ZMB

# [ARG] Argentina

The reporting period covers the harvest of late maize, soybean and rice and the subsequent fallow period. Wheat sowing started in June. For the whole country, rainfall showed a 14% negative anomaly, TEMP showed a slight negative anomaly of 0.2°C, RADPAR and BIOMSS showed positive anomalies of 6% and 8% respectively. CALF showed a 1% reduction and maximum VCI value was 0.83. The observed rainfall deficit may have negatively affected planting and emergence of wheat. However, drier conditions than usual had limited impact on the crops that were harvested in April and May. CropWatch keeps the production estimate at the same level as in the May forecasts.

The rainfall temporal profile showed negative anomalies in April, May and July. The temperature profile followed the average time series, with some positive and negative deviations. The graph of NDVI development at the national level showed negative anomalies during the entire reporting period

For the whole country, the crop condition classification based on NDVI showed that more than 80% of the area was near or below average during the entire reporting period. The crop condition classification based on VHI showed that at the beginning of the reporting period, near 30% of the area was affected by moderate or severe drought or more than 40% if minor droughts were also considered. A tendency of reduction in the area affected by drought was observed towards to the end of this monitoring period.  Only 5% of the area was affected by severe or moderate and 10% by minor drought. Rainfall returned to average starting in late May.

**Regional Analysis**

CropWatch subdivides Argentina into eight agro-ecological zones (AEZ) based on cropping systems, climatic zones, and topography; they are identified by numbers on the NDVI departure cluster map. During this monitoring period, most crops were grown in the following four agro-ecological zones: Chaco, Mesopotamia, Humid Pampas, and Subtropical highlands. The other four agro-ecological zones were less relevant for this period.

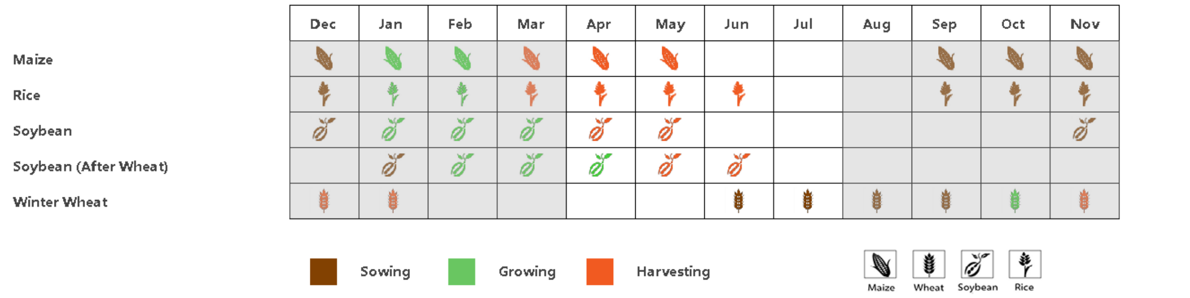
Mean values of rainfall showed negative anomalies for the main agro-ecological zones: Chaco (-36%), Mesopotamia (-14%), Pampas (-10%), Subtropical highlands (-8%). TEMP showed no anomaly in Chaco, positive anomaly in Subtropical highlands (+0.2°C), and negative anomalies in Mesopotamia (-0.4°C) and Pampas (-0.2°C). RADPAR showed positive anomalies in the four zones: Chaco (+14%), Mesopotamia (+11%), Subtropical highlands (+3%) and Humid Pampas (+2%). BIOMSS also showed positive anomalies in Chaco (+20 %), Mesopotamia (+12 %), Subtropical highlands (+6%) and Humid Pampas (+4%). CALF was almost complete (99%) for Chaco, Mesopotamia and Subtropical highlands, while Pampas showed somewhat lower values (90%). VCIx values were higher in the Subtropical highlands (0.88), followed by Mesopotamia (0.84), Pampas (0.83) and Chaco (0.78).

Rainfall profiles for Humid Pampas showed lower than average values during May and July. Chaco also showed negative anomalies in April. Mesopotamia showed most negative anomalies during April and May. Subtropical highlands showed near-average values during the entire reporting period. NDVI profiles showed near average values for Pampas, negative anomalies during end of April, May and June for Mesopotamia. Subtropical highlands showed negative NDVI anomalies during most of the period and Chaco showed negative anomalies all the time.

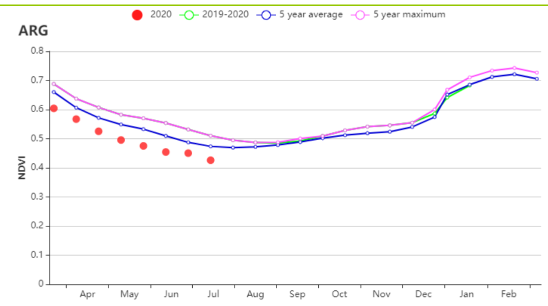
Spatial distribution of NDVI profiles showed a mixed spatial pattern, with the exception of Flooding Pampas (dark green profiles) with positive anomalies at the beginning of the reporting period and no or negative anomalies at the end. Also, the blue profile, with below average values at the beginning and no anomalies at the end, can be identified in small areas at Center West and Center East Pampas, South Pampas and North Mesopotamia. Most of Pampas, Chaco and Subtropical highlands showed a mixture of light green and red patterns; the light green profile was below average during the entire period, while the red profile showed a decrease in NDVI values with negative anomalies starting by late April. VCIx showed also a quite mixed pattern. Near half of the areas of Pampas showed poor conditions with lower than 0.8 values. Low VCIx values were observed also for East Chaco (lower than 0.5 in some cases) and for South Mesopotamia (mostly lower than 0.8).

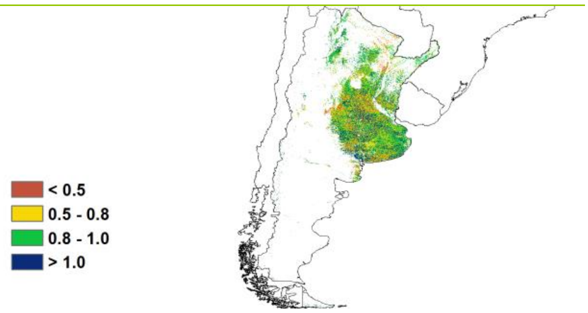
Argentina showed poor conditions in several indices (Precipitation and NDVI anomalies, VCIx and CALF), but a tendency of improving conditions at the end of the period was observed (e.g. VCIm crop condition classification). Dry conditions could have affected the planted area of wheat as shown in a CALF reduction for the Pampas.

**Figure 3.7 Argentina´s crop condition, April - July 2020**

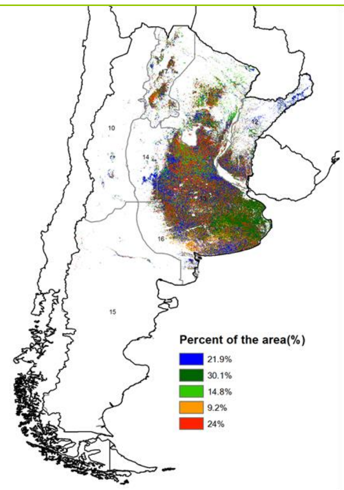


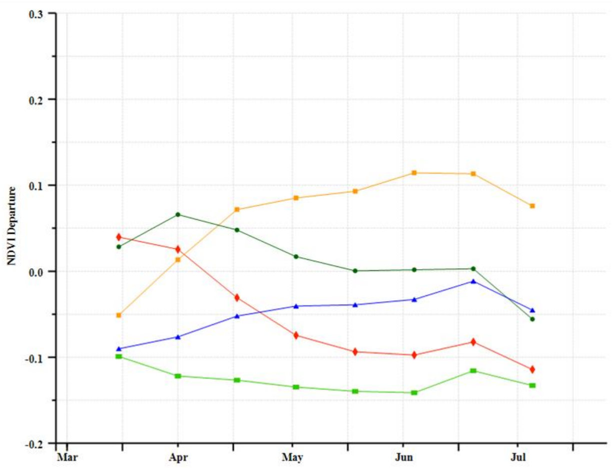

(a). Phenology of major crops



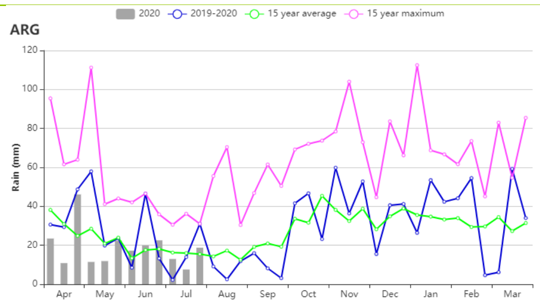



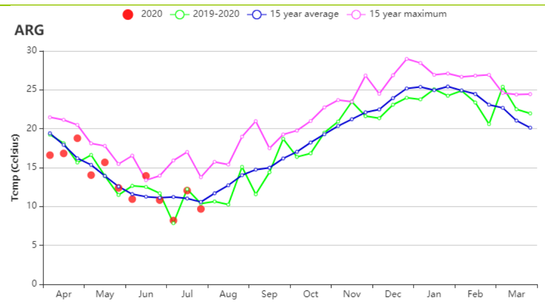

(b) Crop condition development graph based on NDVI (c) Maximum VCI



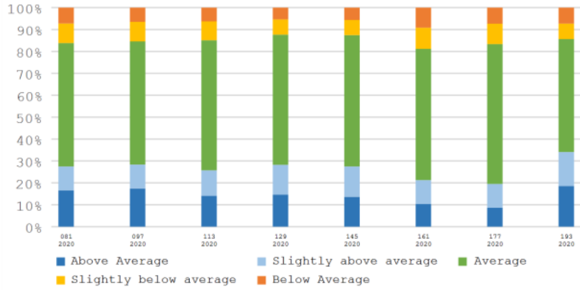




(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles

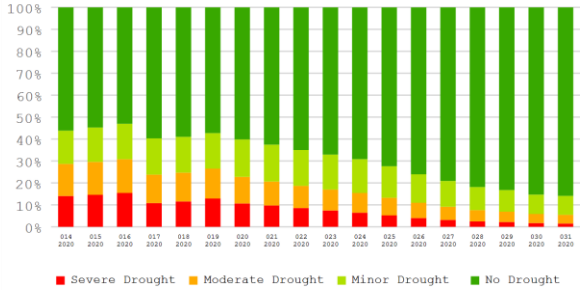


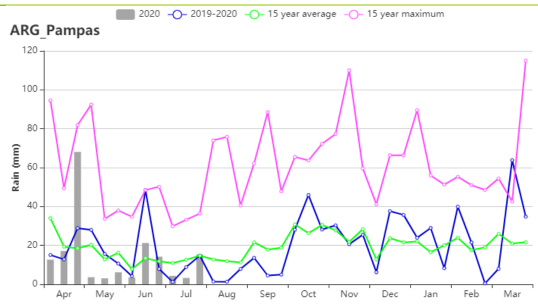

(f) Time series rainfall profile (left) and temperature profile (right))



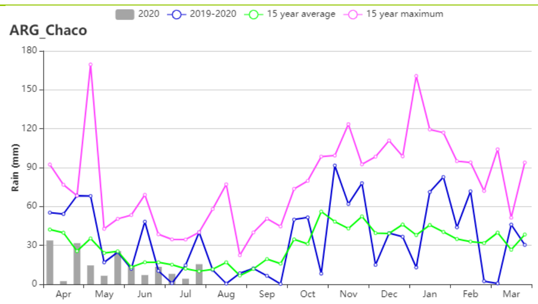

(g) Proportion of NDVI anomaly categories compared with 5YA



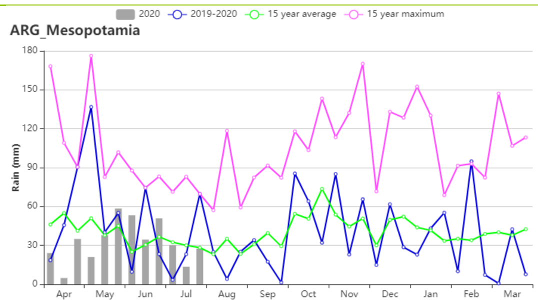

(h) Proportion of VHI categories compared with 5YA



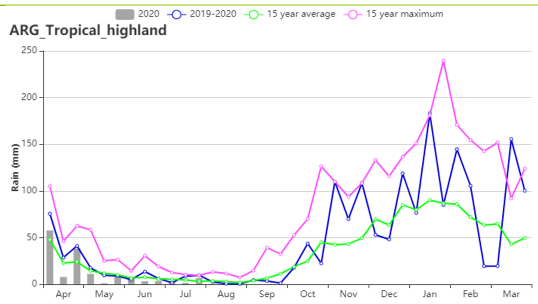

(i). Time series rainfall profile (Humid Pampas)



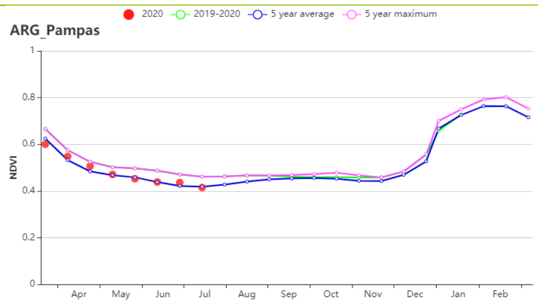

(j). Time series rainfall profile (Chaco)



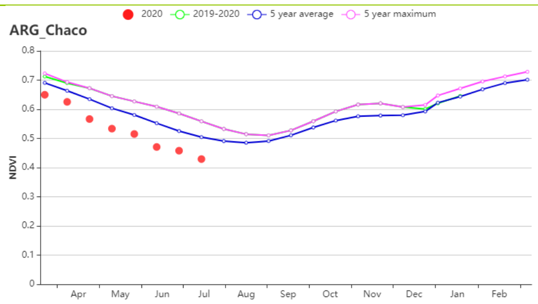

(k). Time series rainfall profile (Mesopotamia)



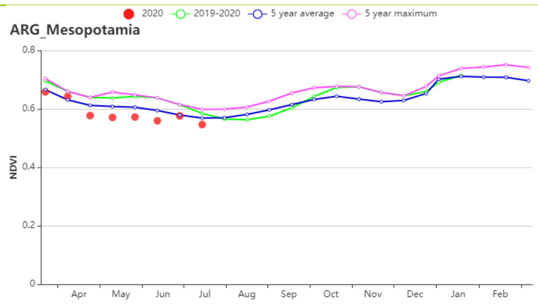

(l). Time series rainfall profile (Subtropical highlands)



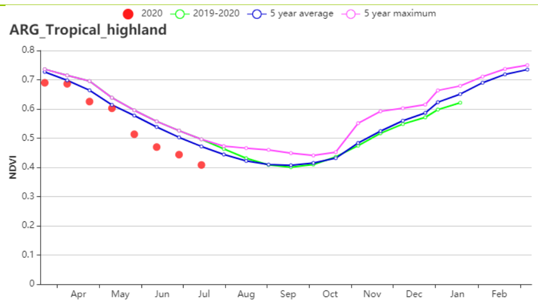

(m). Crop condition development graph based on NDVI (Humid Pampas)




(n). Crop condition development graph based on NDVI (Chaco)




(o). Crop condition development graph based on NDVI (Mesopotamia)




(p). Crop condition development graph based on NDVI (Subtropical highlands)

**Table 3.5 Argentina agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2020**

| Region | RAIN | | TEMP | | RADPAR | | BIOMSS | |
|---|---|---|---|---|---|---|---|---|
| | **Current (mm)** | **Departure (%)** | **Current (°C)** | **Departure (°C)** | **Current (MJ/m²)** | **Departure (%)** | **Current (gDM/m²)** | **Departure (%)** |
| Chaco | 177 | -36 | 16.4 | 0 | 716 | 14 | 312 | 20 |
| Mesopotamia | 391 | -14 | 15.1 | -0.2 | 670 | 11 | 270 | 12 |
| Humid Pampas | 172 | -10 | 12 | -0.4 | 614 | 2 | 204 | 4 |
| Subtropical highlands | 150 | -8 | 14 | 0.2 | 826 | 3 | 289 | 6 |

**Table 3.6 Argentina's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2020**

| Region | Cropped arable land fraction | | Maximum VCI |
|---|---|---|---|
| | **Current (%)** | **Departure (%)** | **Current** |
| **Chaco** | 99 | 0 | 0.79 |
| **Mesopotamia** | 99 | 1 | 0.84 |
| **Humid Pampas** | 91 | -2 | 0.83 |
| **Subtropical highlands** | 99 | 0 | 0.88 |

AFG AGO ARG **AUS** BGD BLR BRA CAN DEU EGY ETH FRA GBR HUN IDN IND IRN ITA KAZ KEN KGZ KHM LKA MAR MEX MMR MNG MOZ NGA PAK PHL POL ROU RUS THA TUR UKR USA UZB VNM ZAF ZMB

# [AUS] Australia

The sowing of wheat and barley started in May, as these crops are grown during the Australian winter season.

At the national scale, Australia experienced weather conditions that were close to the 15YA. Rain was off to a good start in April, but subsequently dropped to below-average levels in July. Accordingly, rain, temperature, solar radiation, and biomass were slightly below the 15YA: RAIN -6%, TEMP -0.2°C, RADPAR -2%, BIOMSS -3%. The agronomic indicators were positive, with a VCIx of 0.87 and an increased CALF (+5%).

The conditions in the four main wheat production states can be divided into two groups. The southeastern states, including New South Wales and Victoria, had above average rainfall, and below-average temperature and sunshine, which resulted in below-average biomass accumulation. While the southwestern states, including South Australia and Western Australia, both had below-average rainfall, low sunshine and biomass accumulation. As a result, the maximum VCI data for the southeastern states were better than for the southwest.

The national NDVI profile shows that overall crop conditions were even better than the 5-year maximum. The spatial NDVI pattern further shows that more than 50% of the cultivated cropland trailed slightly below the long-term average. Those areas were mostly located in the southwest. However, all the cropland had positive NDVI departures in July.

Overall, the agro-climatic indicators in the reporting period are promising. The above average CALF and NDVI indicate generally favorable crop conditions.

**Regional analysis**

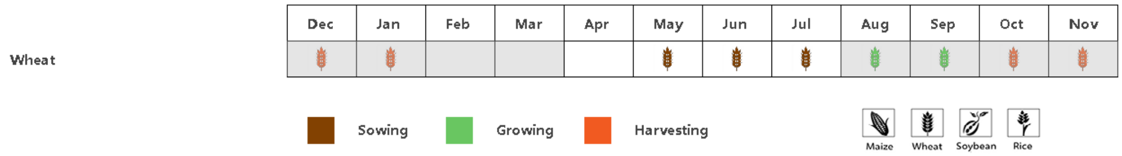
This analysis adopts five agro-ecological regions for Australia, namely the Arid and Semi-arid Zone (marked as 18 in NDVI clustering map), Southeastern Wheat Zone (19), Subhumid Subtropical Zone (20), Southwestern Wheat Zone (21), Wet Temperate and Subtropical Zone (22).

According to the NDVI profiles, three of the five regions can be assigned into a group, which had average NDVI. They include the Arid and Semi-arid Zone, Southwestern Wheat Zone and Wet Temperate and Subtropical Zone. These 3 regions all had below-average rainfall, average or above-average temperature, average sunshine, and below average biomass. The CALF was also average. VCIx was 0.99 for the Wet Temperate and Subtropical zone.

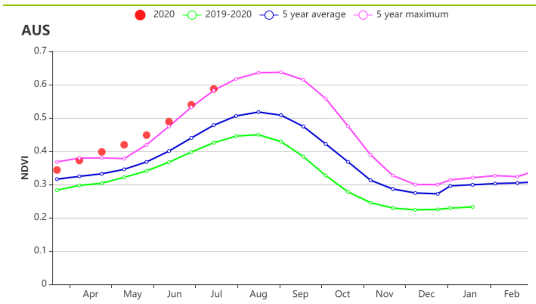
The Southeastern Wheat Zone had positive rainfall departure (+11%), negative temperature departure (-0.7°C) and sunshine (-4%). The biomass was consequently below average (-7%). The CALF and VCIx were positive; the crop conditions in this region were generally favorable.

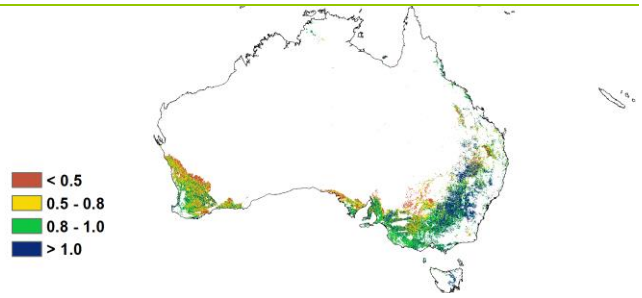
The last region is the Subhumid Subtropical Zone. Although the rainfall (-9%), temperature (-0.1°C) and sunshine (-2%) were below average, the biomass was average. Combined with the largely improved CALF (+21%) and good maximum VCI (0.94), the crop conditions are promising.

**Figure 3.8 Australia crop condition, April - July 2020**

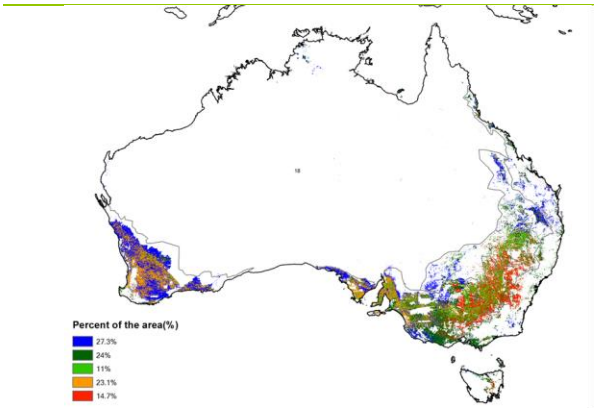


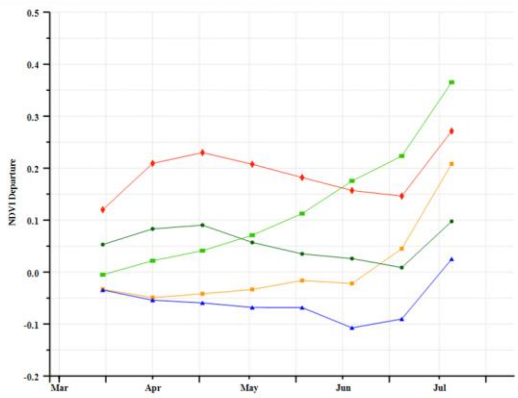

(a). Phenology of major crops



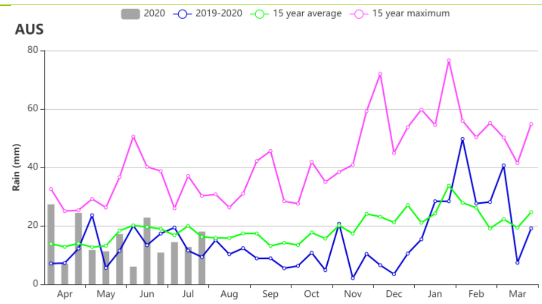



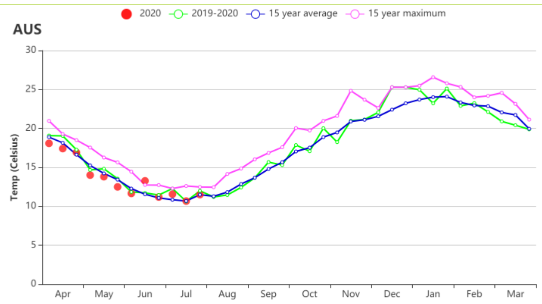

(b) Crop condition development graph based on NDVI (c) Maximum VCI



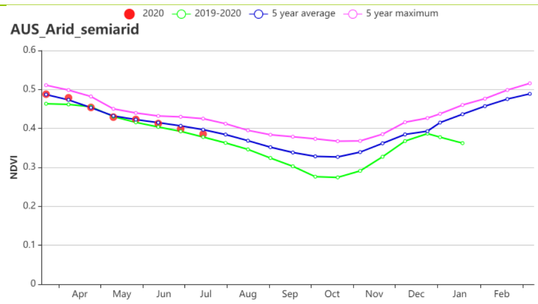



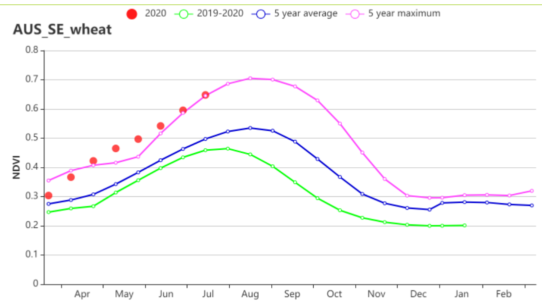

(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



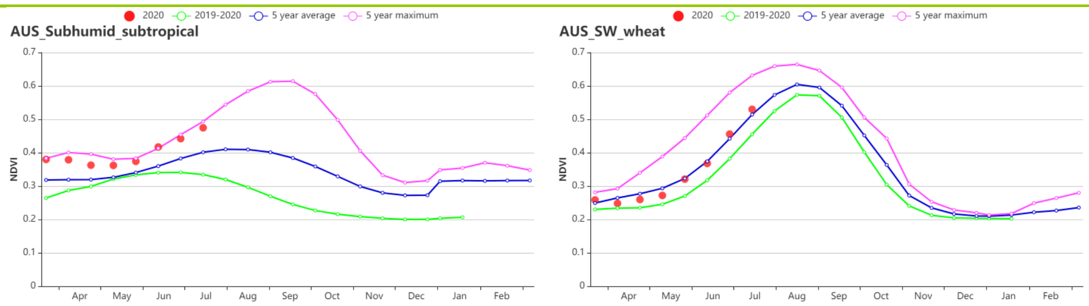




(f) Time series rainfall profile (left) and temperature profile (right))

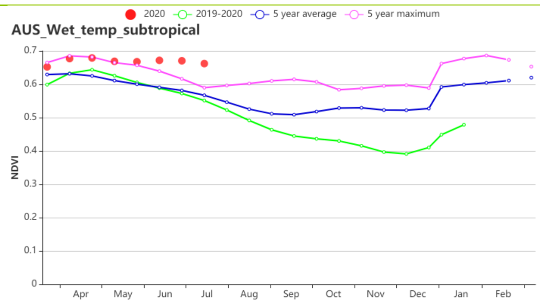



(g) Crop condition development graph based on NDVI (Arid and semiarid zone (left) and Southeastern wheat area (right))




(h) Crop condition development graph based on NDVI (Subhumid subtropical zone (left) and Southwestern wheat area (right))




(i) Crop condition development graph based on NDVI (Wet temperate and subtropical zone)

**Table 3.7 Australia agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2020**

| Region | RAIN | | TEMP | | RADPAR | | BIOMSS | |
|---|---|---|---|---|---|---|---|---|
| | Current (mm) | Departure (%) | Current (°C) | Departure (°C) | Current (MJ/m²) | Departure (%) | Current (gDM/m²) | Departure (%) |
| Arid and semiarid zone | 96 | -24 | 21.9 | 0.5 | 1012 | 0 | 306 | -8 |
| Southeastern wheat area | 220 | 11 | 11.4 | -0.7 | 548 | -4 | 183 | -7 |
| Subhumid subtropical zone | 127 | -9 | 14.2 | -0.1 | 760 | -2 | 268 | 0 |
| Southwestern wheat area | 187 | -17 | 14.5 | 0.4 | 616 | -2 | 234 | -1 |
| Wet temperate and subtropical zone | 216 | -7 | 12.6 | -0.1 | 646 | -2 | 234 | -1 |

**Table 3.8 Australia's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2020**

| Region | Cropped arable land fraction | | Maximum VCI |
|---|---|---|---|
| | Current (%) | Departure (%) | Current |
| Arid and semiarid zone | 71 | -1 | 0.77 |
| Southeastern wheat area | 95 | 4 | 0.91 |
| Subhumid subtropical zone | 70 | 21 | 0.94 |
| Southwestern wheat area | 87 | 3 | 0.72 |
| Wet temperate and subtropical zone | 99 | 1 | 0.99 |

# [BGD] Bangladesh

During this monitoring period, rice was the most important crop, followed by wheat. Rainfall was above average by 14%. The average temperature was a bit lower (-0.6°C) and the photosynthetically active radiation was 1248 MJ/m$^2$ (1% lower than average). The national NDVI development curve shows that crop conditions across the country were slightly better than the 5-year average in April and May, but dropped to below-average levels thereafter due to widespread flooding. The spatial NDVI pattern shows that 30.7% of the crops were above the 5-year average throughout the season, dispersed over the country but concentrated in the lower Ganges River and Chittagong. The best Vegetation Condition Index (VCIx) ranged from 0.8 to 1, indicating good crop growth prospects in the whole country, and the national VCIx value was 0.94, with most areas higher than 0.8. However, the floods in June and July caused wide-spread crop damage or delayed planting of a man rice.

**Regional analysis**

Bangladesh can be divided into four Agro-Ecological Zones (AEZ): Coastal region, the Gangetic plain, the Hills, and the Sylhet basin.

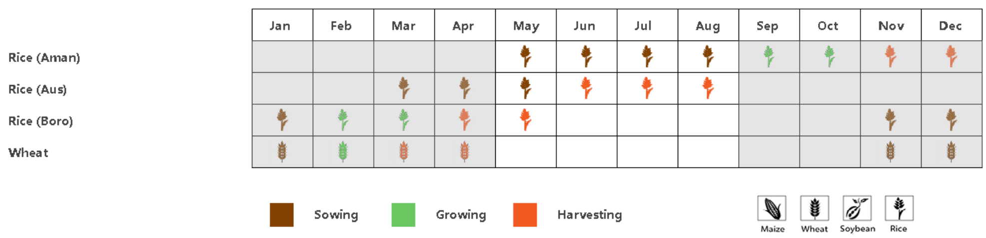
In the **Coastal region**, both RAIN and RADPAR were above average (+8% and +2%, respectively). Temperature was below average (-0.6°C). The crop condition development graph based on NDVI shows that crop conditions were close to the 5-year average from April to May and then below average. CALF was at 90% and VCIx at 0.97, with BIOMSS up 4% (the highest for any region), which indicate average conditions.

**The Gangetic plains** received the largest precipitation amount (+38% above average). Temperature was below average (-0.9°C) and RADPAR was 2% below. The NDVI was similar to the Coastal region, starting close to average and exceeding the average in May, but then dropping sharply. During the monitoring period, high CALF (98%) and VCIx at 0.97 indicated good prospects. But the sharp drop in NDVI in June and July indicates that conditions are generally unfavorable.

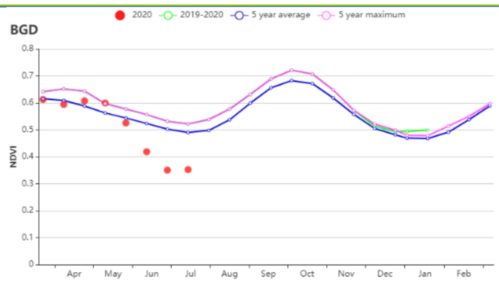
**In the Hills**, rainfall was 12% above the average, with a below-average TEMP (-0.4°C) and favourable sunshine (RADPAR +1%). The crop condition development graph based on NDVI shows that crop condition was close to, but below average during the whole monitoring period. BIOMSS was below average (-3%), CALF was 95% and VCIx was 0.95, indicating unsatisfactory crop conditions.

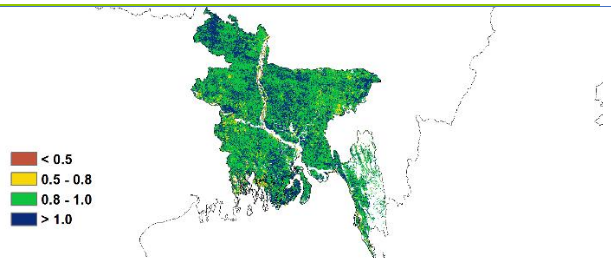
In the **Sylhet Basin**, rainfall was above average by 11%. TEMP was 0.5°C below the average and RADPAR was 2% below. The BIOMSS potential of 817 g DM/m$^2$ was also 2% below the 5YA, with CALF at 99% and VCIx of 0.97. Widespread flooding in June and July caused unfavorable crop conditions.

**Figure 3.9 Bangladesh's crop condition, April - July 2020**



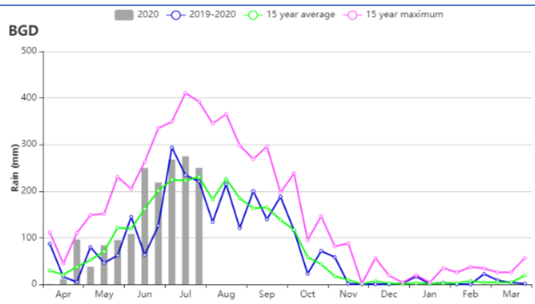

(a). Phenology of major crops

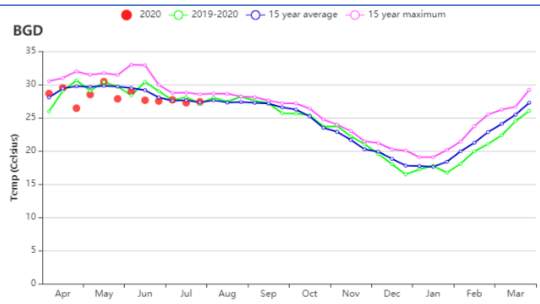



(b) Crop condition development graph based on NDVI

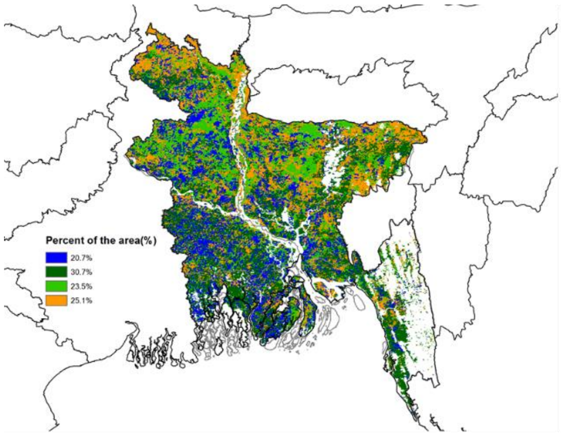
(c) Maximum VCI

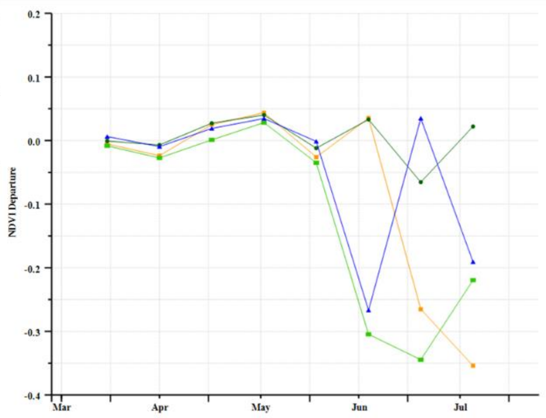



(d) Rainfall Index

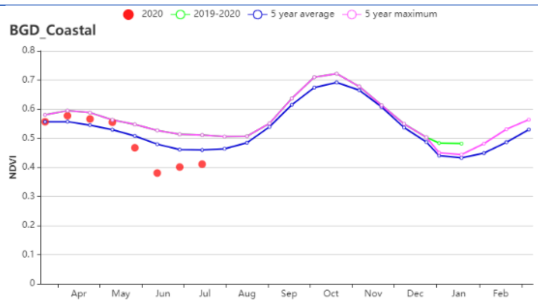
(e) Temperature Index

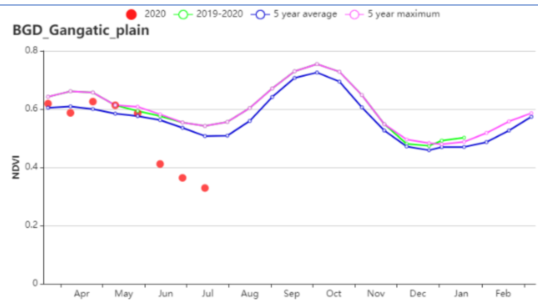


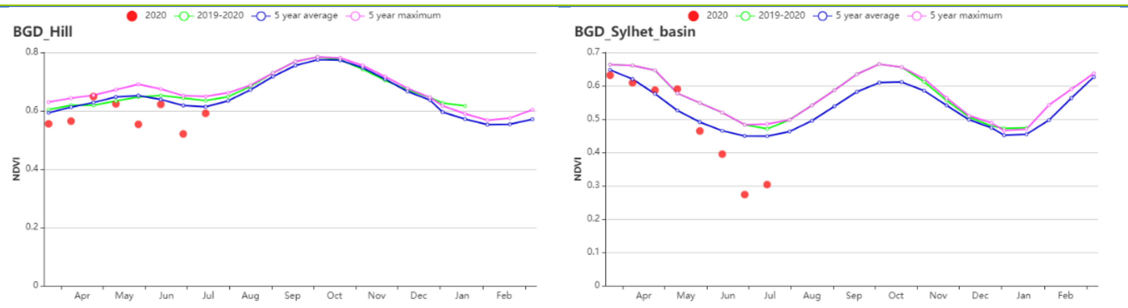

(f) Spatial NDVI patterns compared to 5YA

(g) NDVI profiles




(h) Crop condition development graph based on NDVI (Coastal Region (left) and Gangetic Region (right))




(l) Crop condition development graph based on NDVI (Hill Region (left) and Sylhet Basin (right))

**Table 3.9 Bangladesh's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2020**

| Region | RAIN | | TEMP | | RADPAR | | BIOMSS | |
|---|---|---|---|---|---|---|---|---|
| | Current (mm) | Departure (%) | Current (°C) | Departure (°C) | Current (gDM/m²) | Departure (%) | Current (MJ/m²) | Departure (%) |
| Coastal region | 1524 | 8 | 28.8 | -0.6 | 1340 | 2 | 902 | 4 |
| Gangetic plain | 1725 | 38 | 28.7 | -0.9 | 1227 | -2 | 791 | -4 |
| Hills | 1700 | -12 | 27 | -0.4 | 1303 | 1 | 830 | -3 |
| Sylhet basin | 1671 | 11 | 27.8 | -0.5 | 1207 | -2 | 817 | -2 |

**Table 3.10 Bangladesh's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April- July 2020**

| Region | CALF | | Maximum VCI |
|---|---|---|---|
| | Current (%) | Departure (%) | Current |
| Coastal region | 90 | 6 | 0.97 |
| Gangetic plain | 98 | 1 | 0.97 |
| Hills | 97 | 1 | 0.95 |
| Sylhet basin | 99 | 2 | 0.97 |

AFG AGO ARG AUS BGD **BLR** BRA CAN DEU EGY ETH FRA GBR HUN IDN IND IRN ITA KAZ KEN KGZ KHM LKA MAR MEX MMR MNG MOZ NGA PAK PHL POL ROU RUS THA TUR UKR USA UZB VNM ZAF ZMB

# [BLR] Belarus

In Belarus the reporting period includes the planting of spring wheat and summer crops until June and the harvest of winter wheat from July. The nationwide rainfall amount reached 352 mm, which was 11% above average. However, solar radiation (RADPAR -3%) and temperature (-1.0°C) fell below the 15YA average, the potential biomass was decreased by -7% and lower than average. Agronomic conditions were shown as favorable: very good values of VCIx (0.97) and cropped arable land fraction (CALF, 100%) were observed.

The NDVI development graph was generally below 5-year average from Apirl to early May and recovered in June. The spatial pattern showed diverse patterns. In about 69.1% of cropped area crop condition was close to or above 5-year average. Only 11.4% of cropped areas were 0.1 NDVI units below the average, mostly scattered in the south-east and along the western border. Average national VCIx exceeded 0.97, indicating fair crop prospects in most crop area. Overall, although agronomic conditions were satisfactory in this period, water shortage in previous months during spring might have constrained crop growth, and more solar radiation will be needed to ensure good winter wheat production and summer crop development.

**Regional analysis**

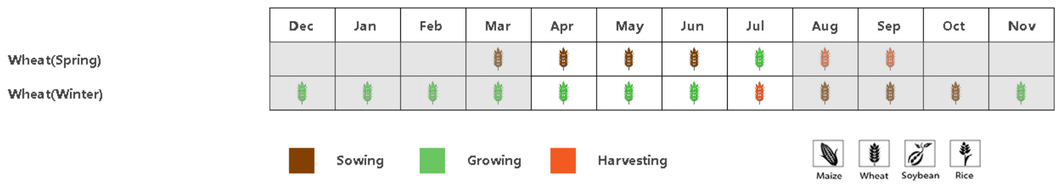
Based on cropping system, climatic zones and topographic conditions, regional analyses are provided for three agro-ecological zones (AEZ), including Northern Belarus (028, Vitebsk, northern area of Grodno, Minsk and Mogilev), Central Belarus (027, Grodno, Minsk and Mogilev and Southern Belarus (029) which includes the southern halves of Brest and Gomel regions.

**North Belarus** (Vitebsk, northern area of Grodno, Minsk and Mogilev) recorded a minor radiation deficit (-4%) combined with lower temperature (-1.0°C) and higher rainfall (+13%). BIOMSS decreased 8% below average. The VCIx had reached 0.99, and CALF had reached 100%. The NDVI development curve was below or close to average in April and early May and slightly higher in June. Crop overall condition is normal.

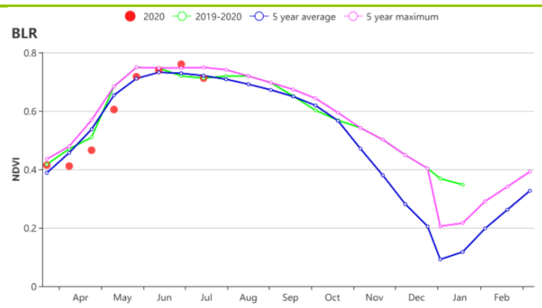
**Central Belarus** (Grodno, Minsk and Mogilev) also experienced higher rainfall (12%) and lower temperature (-1.0°C) and less sunshine (-2%). Potential biomass decreased about 6%. High CALF (100%) and VCIx (0.97) were also recorded. Similar to northern Belarus, the NDVI growth curve remained close to the average trend from April to May but showed recovery since June.

Precipitation in **Southern Belarus** was higher by 14%, while temperature and radiation were slightly lower by 1.0°C and 2%, respectively. Potential biomass was expected to decrease by 7%. The CALF and the VCIx were100% and 0.95 respectively. Although agronomic indicators showed that crop growth was generally favorable, the impact of water shortage in spring and radiation deficit in this period on the crops requires close attention. The average NDVI development curve suggests that from April to June, crop condition was general below average for most of the time.

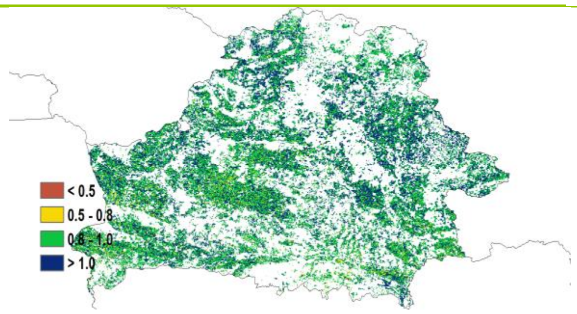
**Figure 3.10 Belarus's crop condition, April - July 2020**



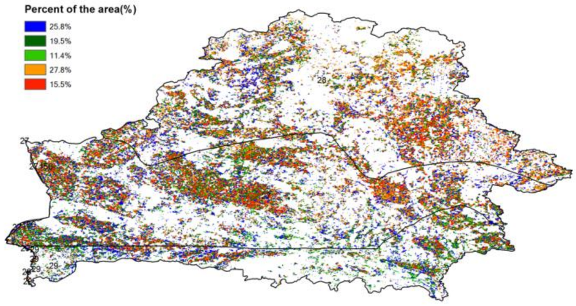

(a). Phenology of major crops



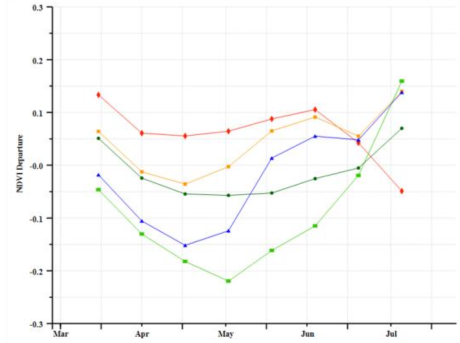

(b) Crop condition development graph based on NDVI



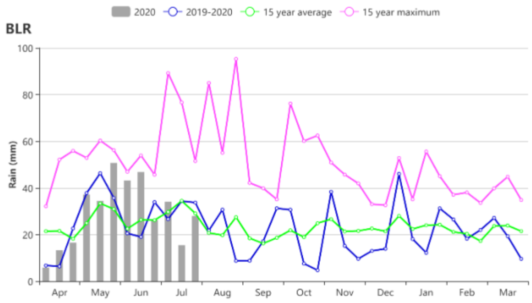

(c) Maximum VCI



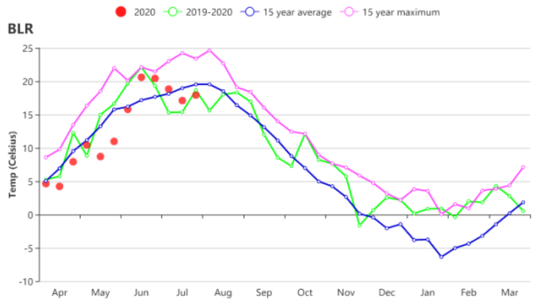

(d) Spatial NDVI patterns compared to 5YA



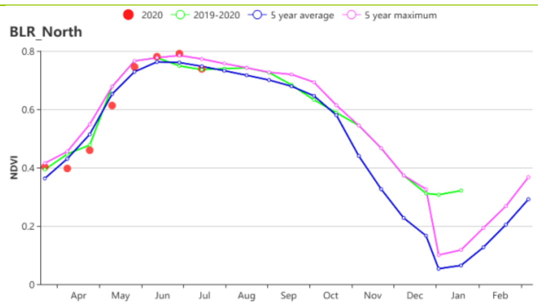

(e) NDVI profiles



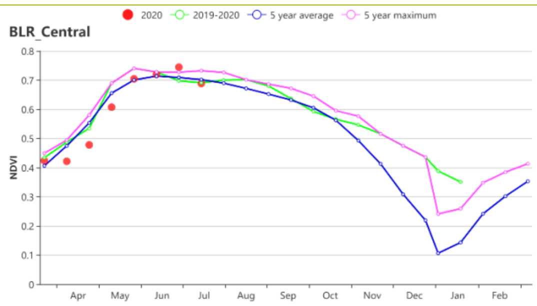

(f)Rainfall time series



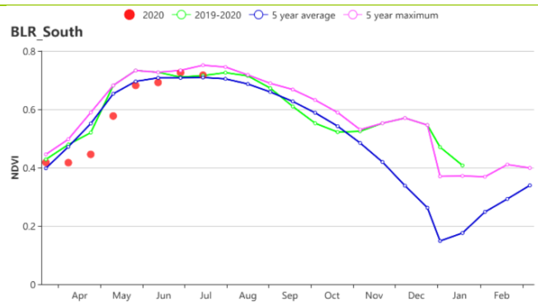

(g) Temperature time series




(h) Crop condition development graph based on NDVI (North Belarus)




(i) Crop condition development graph based on NDVI (Central Belarus)




(j) Crop condition development graph based on NDVI (South-west Belarus)

**Table 3.11 Belarus's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2020**

| Region | RAIN | | TEMP | | RADPAR | | BIOMSS | |
|---|---|---|---|---|---|---|---|---|
| | Current (mm) | Departure (%) | Current (°C) | Departure (°C) | Current (MJ/m²) | Departure (%) | Current (gDM/m²) | Departure (%) |
| **Center** | 353 | 12 | 13 | -1.0 | 1095 | -2 | 427 | -6 |
| **North** | 369 | 13 | 12 | -1.0 | 1054 | -4 | 386 | -8 |
| **South-west** | 312 | 4 | 14 | -1.0 | 1114 | -2 | 455 | -7 |

**Table 3.12 Belarus's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2020**

| Region | Cropped arable land fraction | | Maximum VCI |
|---|---|---|---|
| | Current (%) | Departure (%) | Current |
| **Center** | 100 | 0 | 0.97 |
| **North** | 100 | 0 | 0.99 |
| **South-west** | 100 | 0 | 0.95 |

# [BRA] Brazil

During this reporting period, the harvest of summer crops (maize, soybean, and rice) was almost concluded except for maize in north-eastern regions. Wheat was sown in April to May and was approaching peak growth in July. Overall crop conditions in Brazil remained close to average compared to the previous five years.

Agro-climatic indicators present generally close to average conditions with 0.1°C higher temperature and 1% above average RADPAR while rainfall was 4% lower compared with the 15YA. Slightly below-average rainfall resulted in a 1% reduction of potential biomass. Although agro-climatic indicators remained close to average, significant departures were observed among different states of Brazil ranging from -45% in Sao Paulo to +33% in Piaui. Diversified accumulated rainfall was also presented among states with largest rainfall at 1358 mm in Amapa and least rainfall at 174 mm in Sao Paulo. Largest rainfall departure from the 15YA was also observed in Rio Grande Do Norte, Bahia and Sergipe with 22%, 24% and 26% above average, respectively. Mato Grosso Do Sul and Rio De Janeiro suffered from water shortage with 29% and 27% less rainfall, respectively. Radiation departures among the provinces ranged from -6% in Bahia to +11% in Parana. Sao Paulo, Mato Grosso Do Sul, and Santa Catarina also presented larger than 5% positive departures of radiation. According to the national rainfall profiles, the 10-days accumulations of rainfall also show overall average conditions except for the period from early April to early May. Temperature was overall close to average for all states. Large negative departures of BIOMSS occurred in Distrito Federal, Goias and Minas Gerais, by -11%, -8% and -7% respectively, as a result of below average rainfall, temperature, and radiation. Above-average radiation in Mato Grosso Do Sul, Santa Catarina, Alagoas, Parana, and Sao Paulo benefitted the biomass accumulation and resulted in positive deviations by more than 5% from the 15YA. For more detailed information, it is recommended to visit CropWatch Explore

(http://cropwatch.com.cn/newcropwatch/main.htm?language=en).

The crop condition development graph based on NDVI for Brazil presents slightly below-average values which recovered to average by late June. According to the NDVI departure clustering maps and profiles, below-average conditions were mostly located in Southern Brazil including Sao Paulo, Rio Grande Do Sul, Parana, Santa Catarina, and Mato Grosso Do Sul. The below-average NDVI could be attributed to the lower rainfall since the beginning of the year as the similar pattern was observed in the rainfall departure map at state level (Figure h). Scattered areas within the regions mentioned above show relatively low VCIx values (below 0.8), which confirmed the unfavorable crop conditions. Northeast Brazil including Nordeste, and northern part of East Coast presented above-average crop conditions throughout the monitoring period, thanks to the above-average rainfall (Figure h). Most other areas showed generally close-to-average NDVI compared with the previous five years. The bar graph showing the proportion of different categories of crop condition indicates that the above-average conditions accounted for more than 20% to 35% of the area during the monitoring period while the percentage of below-average conditions was less than 20%. In late June to early July, the proportion of above-average crops reached the lowest point but with limited impact on crop production since most summer crops were already harvested. As shown in figure g, drought conditions generally stayed at below 20% when severe, moderate, and minor drought were considered. Above-average rainfall since mid-May also eased the drought conditions as indicated by the decreasing trend of the percentage of cropland affected by drought. National VCIx is 0.92 and CALF is 1% above average. Cropland is almost 100% cultivated. Several non-major agricultural producing states in the northeast presented above 1.0 VCIx, which benefited from favorable agro-climatic conditions. Five agricultural states in southern Brazil showed VCIx at levels below 0.9, which coincided with the below-average condition presented in the NDVI departure clustering map. All in all, crop conditions in Brazil were close to average and CropWatch estimates close to avearge outputs for soybean and maize. It is also noteworthy that the above-average radiation at the end of the monitoring period is favorable for the drying and harvest of the crops in the southern states (Figure i).

**Regional analysis**

Considering the differences of cropping systems, climatic zones and topographic conditions, eight agro-ecological zones (AEZ) are identified for Brazil. These include the Central Savanna, the east coast, Parana river, Amazon zone, Mato Grosso zone, Southern subtropical rangelands, mixed forest, and farmland, and the Nordeste. Four zones received average rainfall, including Southern subtropical rangelands, Northeastern mixed forest and farmland, Amazonas, and Coast zones. Central Savanna (+20%) and Nordeste (+26%) received significant above average rainfall, while Parana Basin (-19%) and Mato Grosso (-9%) zone suffered from water shortage. The prolonged dry conditions in the Parana Basin and Mato Grosso zone was observed since the starting of the season in October of last year which hampered crop development and resulted in lower production. Parana Basin was also the zone with largest positive departure of radiation. Sunny weather further worsened the drought situations. Temperature for all eight zones was close to average with largest departure for the Northeastern mixed forest and farmland at 0.4°C above average. Large BIOMSS departures were found in Central Savanna (-3%) and Southern subtropical rangelands (+4%) when compared to the 15YA. BIOMSS for the other zones generally stayed at close to average levels.

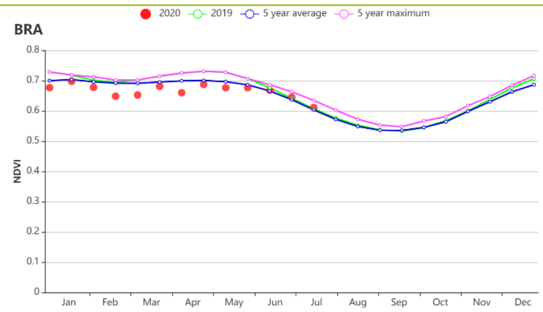
Favorable agro-climatic conditions in **Nordeste**, and **Central Savanna** resulted in significant above-average crop conditions as indicated by the NDVI-based crop development profiles in the two zones. Rice and late maize were the major crops grown during this monitoring period and the harvests were almost concluded by July. Due to favorable climatic conditions, cropped arable land fraction (CALF) in those two zones were 7% and 3% above the 5YA while all the other six zones remain at the 5YA level. VCIx of Nordeste was the highest among the zones, exceeded 1.0 and reached 1.06 indicating that crop conditions were better than during the the last five years. Rice and maize production are expected to be up from the 5YA.

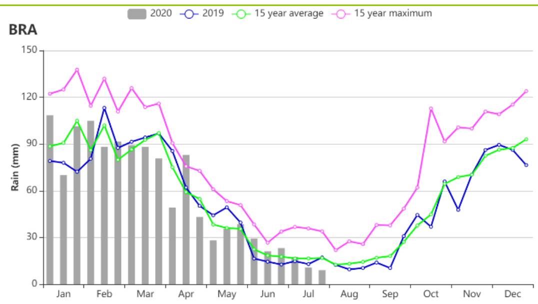
Average or close-to-average crop conditions were observed in **Amazon**, **Coast**, **Northeastern mixed forest and farmland**, and **Mato Grosso** zones. Among those four zones, Mato Grosso is the only major agricultural zone with soybean and maize as the dominant crops. The First Maize and Soybean crops were already harvested by April while the harvesting of the Second Maize is still ongoing. Agro-climatic conditions generally remained at average levels except for Mato Grosso where a rainfall deficit was observed. Irrigation of the second season crop helped reduce the negative impact of drier-than-normal conditions on crop growth. Second maize output is projected at average levels.

NDVI was significantly below average according to the NDVI-based development profiles in **Parana basin**, and **Southern subtropical rangelands**. The same phenomenon was reported in the previous bulletin mainly due to the continuous water shortages. During the current monitoring period, wheat is still in its early development, reaching heading stages in July, while most summer crops have been harvested already. The outputs of main maize and soybean in Parana basin are estimated at below-average levels. The continuously dry and hot weather in Southern subtropical rangelands adversely affected the sowing and growing stages of wheat as shown by delayed NDVI peak in early July which was supposed to have been reached one month earlier (Figure q). Wheat production is projected to be below average compared with the 5YA.

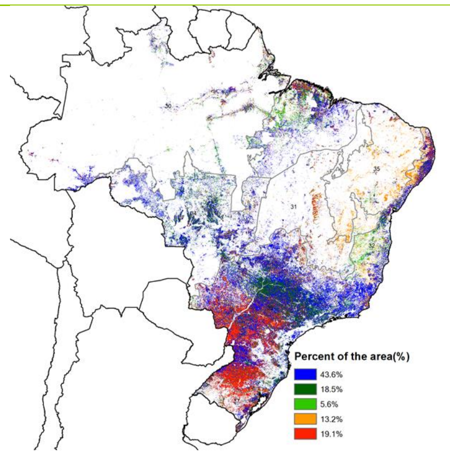
**Figure 3.11 Brazil's crop condition, April - July 2020**

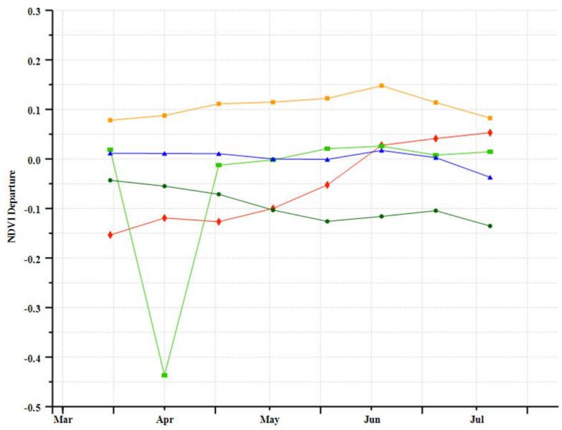

(a). Phenology of major crops



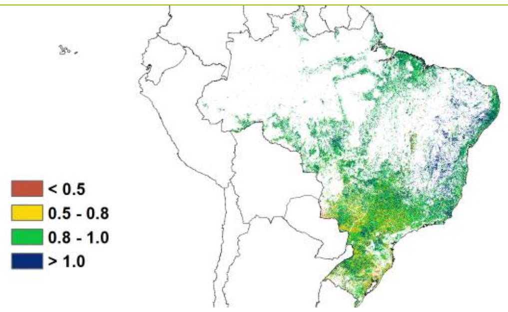




(b) Crop condition development graph based on NDVI (c) Time series rainfall profile_Brazil

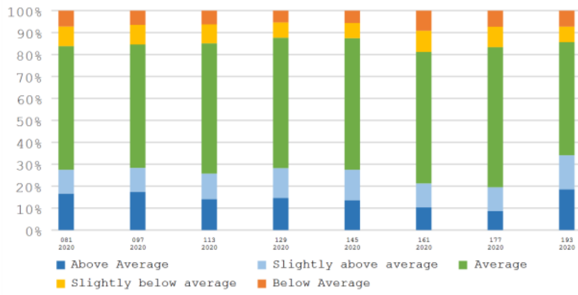


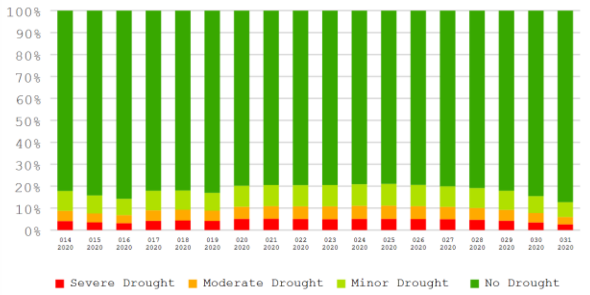

(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



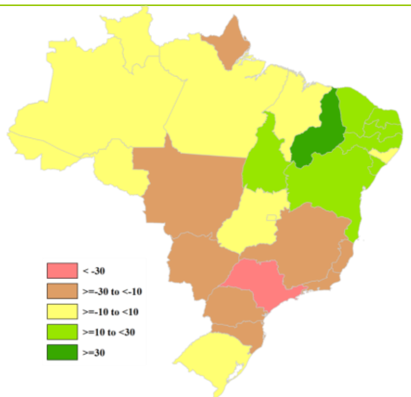

(f) Maximum VCI



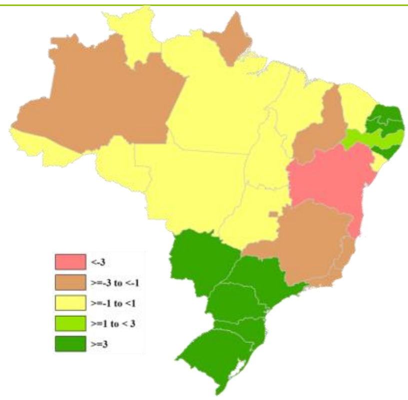

(g) Proportion of NDVI anomaly categories from April to July 2020



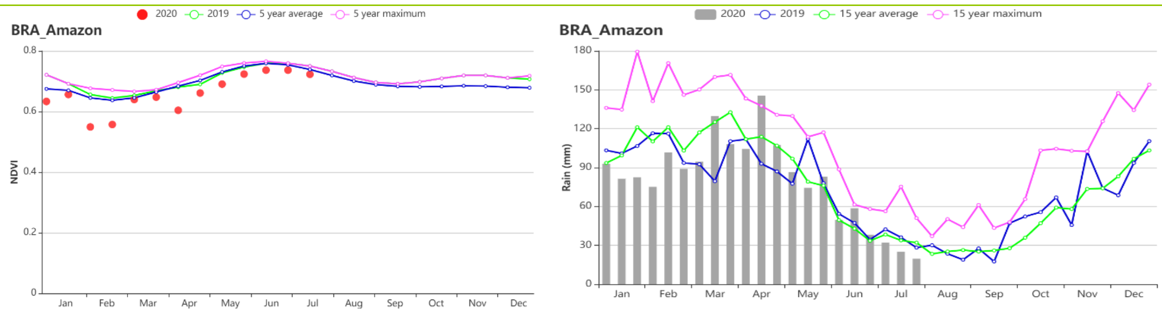

(h) Proportion of drought categories from April to July 2020



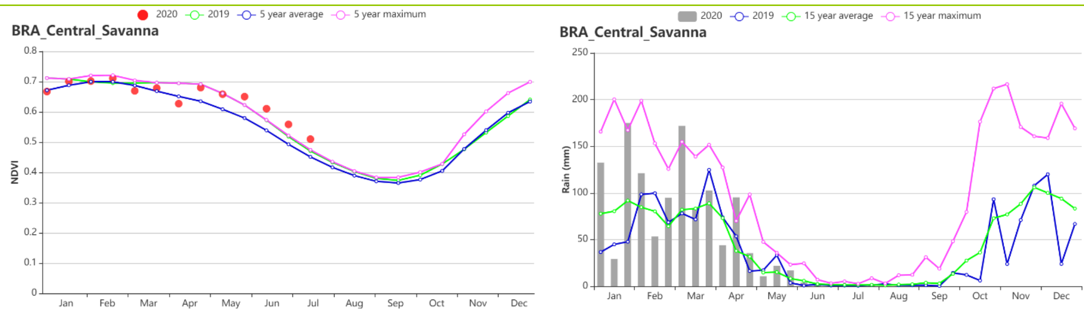

(i) Rainfall departure from 15YA in percentage for each state



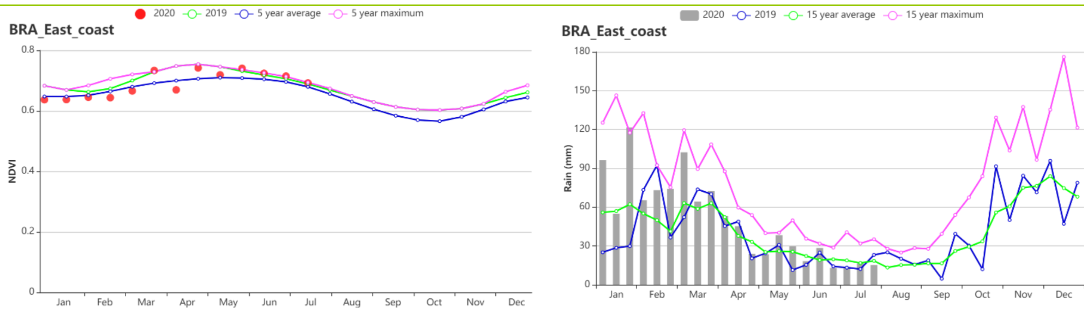

(j) PAR departure from 15YA in percentage for each state



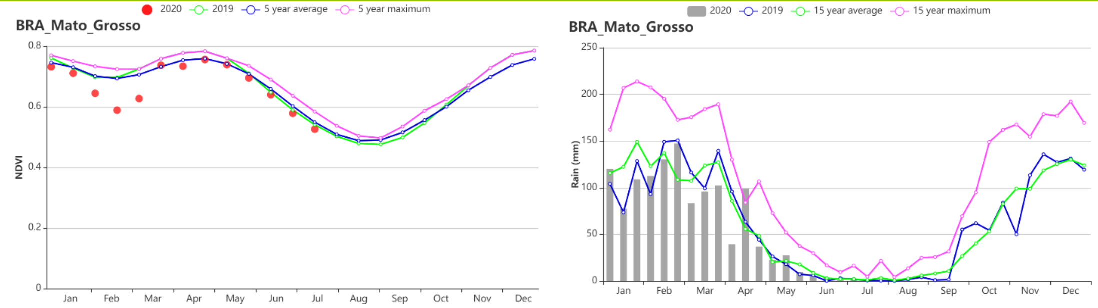

(k) Crop condition development graph based on NDVI (left) and rainfall profile (right) of Amazon



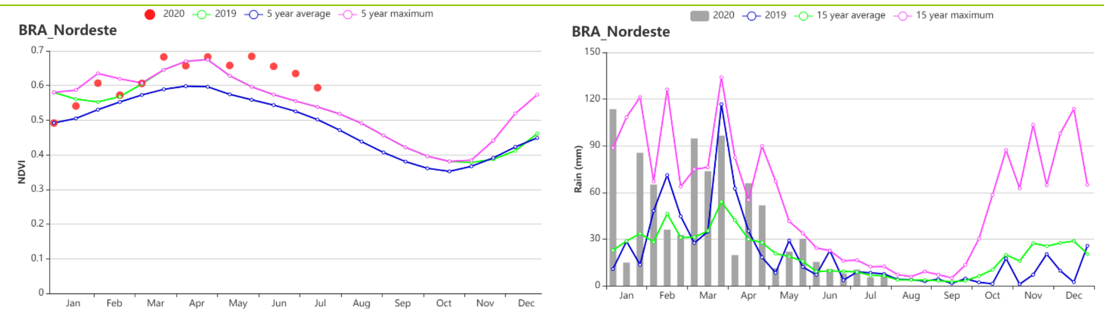

(L) Crop condition development graph based on NDVI (left) and rainfall profile (right) of Central Savanna



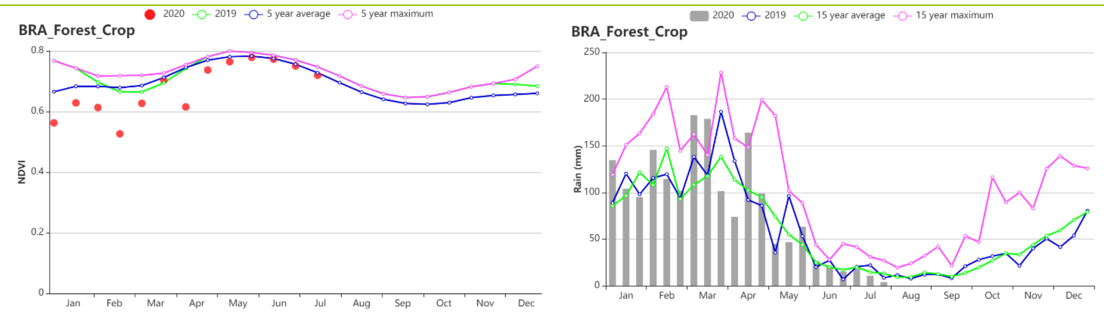

(m) Crop condition development graph based on NDVI (left) and rainfall profile (right) of East Coast



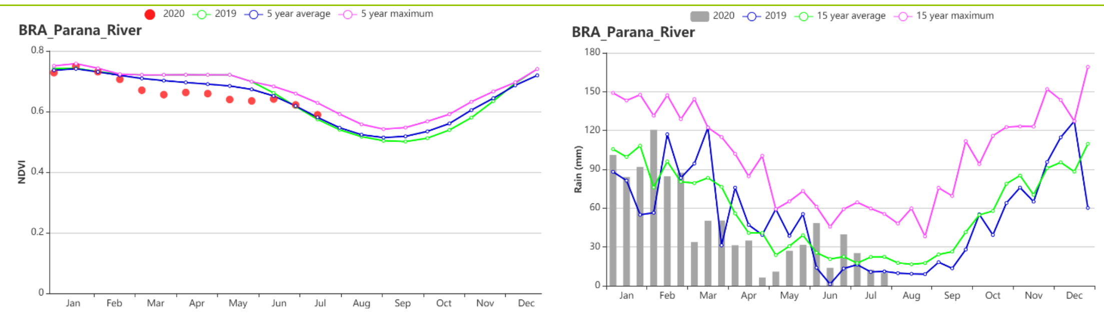

(n) Crop condition development graph based on NDVI (left) and rainfall profile (right) of Mato Grosso



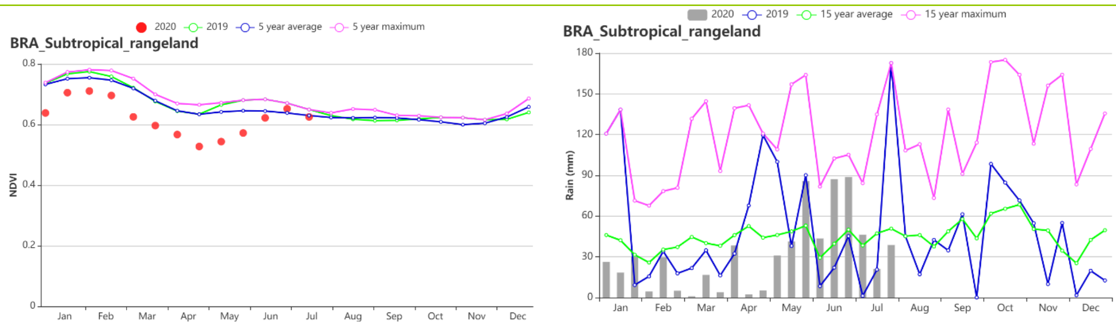

(o) Crop condition development graph based on NDVI (left) and rainfall profile (right) of Nordeste




(p) Crop condition development graph based on NDVI (left) and rainfall profile (right) of Northeastern mixed forest and farmland




(q) Crop condition development graph based on NDVI (left) and rainfall profile (right) of Parana River Basin




(r) Crop condition development graph based on NDVI (left) and rainfall profile (right) of Amazonas

**Table 3.13 Brazil's agroclimatic indicators by regions, current values and departure from 15YA, April - July 2020**

| Region | RAIN | | TEMP | | RADPAR | | BIOMSS | |
|---|---|---|---|---|---|---|---|---|
| | Current (mm) | Departure (%) | Current (°C) | Departure (°C) | Current (MJ/m2) | Departure (%) | Current (gDM/m2) | Departure (%) |
| Amazonas | 824 | 2 | 25.1 | 0.3 | 1079 | -1 | 667 | -1 |
| Central Savanna | 235 | 20 | 21.9 | -0.3 | 1048 | -3 | 476 | -5 |
| Coast | 320 | 2 | 20.5 | 0 | 866 | -2 | 487 | -2 |
| Northeastern mixed forest and farmland | 586 | -1 | 25.4 | 0.4 | 1139 | 0 | 668 | -2 |
| Mato Grosso | 246 | -9 | 23.7 | 0.3 | 1070 | 1 | 490 | -1 |
| Nordeste | 257 | 26 | 23.7 | -0.2 | 1030 | -2 | 629 | 0 |
| Parana basin | 292 | -19 | 18.4 | 0.1 | 885 | 5 | 391 | 2 |
| Southern subtropical rangelands | 530 | -2 | 15.1 | -0.1 | 642 | 4 | 263 | 4 |

**Table 3.14 Brazil's agronomic indicators by regions, current season's values and departure from 5YA, April - July 2020**

| Region | Cropped arable land fraction | | Maximum VCI |
|---|---|---|---|
| | Current (%) | Departure (%) | Current |
| Amazonas | 100 | 0 | 0.97 |
| Central Savanna | 98 | 3 | 0.98 |
| Coast | 100 | 0 | 0.99 |
| Northeastern mixed forest and farmland | 100 | 0 | 0.97 |
| Mato Grosso | 100 | 0 | 0.94 |
| Nordeste | 100 | 7 | 1.06 |
| Parana basin | 100 | 0 | 0.87 |
| Southern subtropical rangelands | 98 | 0 | 0.81 |

# [CAN] Canada

During this monitoring period, the harvest of winter wheat was completed in July, while the sowing of the summer crops maize, soybean and spring wheat took place in April and May. According to agroclimatic indicators, Canada experienced wet and cool weather. Overall, crop conditions lagged behind average until mid-June, but then improved to average levels in the Saint Lawrence basin and to above-average levels in the Prairies. Overall, crop conditions are favorable.

The rainfall was above the 15-year average (RAIN, +8%) while the temperature (TEMP, -1.1°C) and radiation (RADPAR, -5%) were below average. Below-average temperatures and radiation led to a decrease in potential biomass (BIOMSS, -7%). The rainfall profile shows that the precipitation was slightly below average in April and Mid-June and above average for the rest of the period. The time-series of temperature depicts that they were below average in April and subsequently tended to stay sligthly below average. The cold temperatures in early April may have delayed the sowing of the summer crops. The NDVI profile map shows that the crop conditions were below average until mid-June and improved to above average by the end of this monitoring period. The crop condition was best on 21.5% of the cropped area, concentrated in the south of Ontario and patches in Saskatchewan and Manitoba. The general negative deviation from the long-term average was due to to the cooler-than-usual temperatures, so the crops developed more slowly. But conditions had recovered to normal or above normal by July. The national maximum VCI value was 0.96, and the CALF was slightly above the recent 5-year average (CALF, +1%).

The overall conditions of winter wheat in Canada are assessed as average, and the prospects for the summer crops, including spring wheat, are favorable.

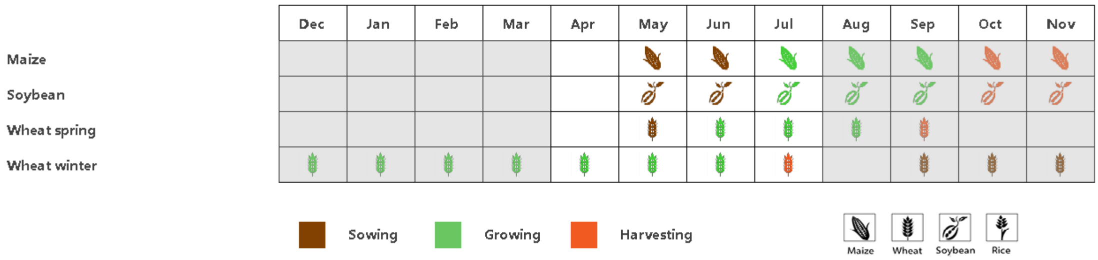
**Regional analysis**

The Prairies (area identified as 53 in the crop condition clusters map) and Saint Lawrence basin (49) are the major agricultural regions in Canada.

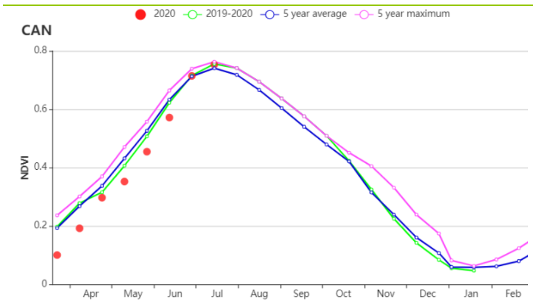
The rainfall in the Prairies, the main food production area in Canada, was above average (RAIN 452 mm, +30%), while the temperature(TEMP, -1.5°C) and radiation (RADPAR, -6%) was below average, leading to a decrease of potential biomass by 11%. The major crops in this region are winter wheat and spring wheat. According to the NDVI development graph and NDVI profile, crop condition were below average until June. Subsequently, they improved greatly. The negative departures were due to the delayed sowing of spring wheat. Nevertheless, crop conditions in the Prairies are favorable, mostly due to abundant rainfall.

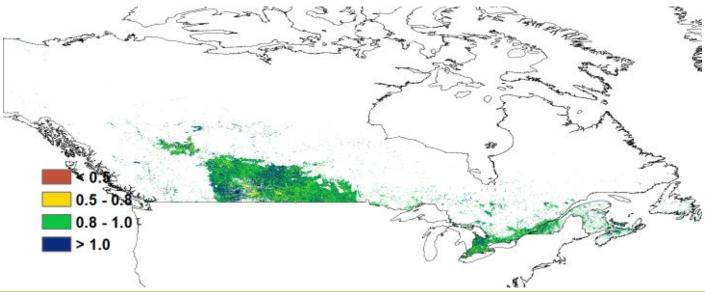
The conditions in the Saint Lawrence basin differed from the rest of the country as rainfall (RAIN, -15%) was below average. Temperature (TEMP, -0.6°C) was also below average, while radiation did not deviate from the 15YA (RADPAR, 0%). This had led to an increase in potential biomass (BIOMSS, +1%). According to the NDVI development graph, crop conditions were slightly below average in May, and close to the average level thereafter. As in the Prairies, this was due to the delayed sowing of the summer crops. Crop conditions are favorable for this region.

**Figure 3.12 Canada's crop condition, April - July 2020**



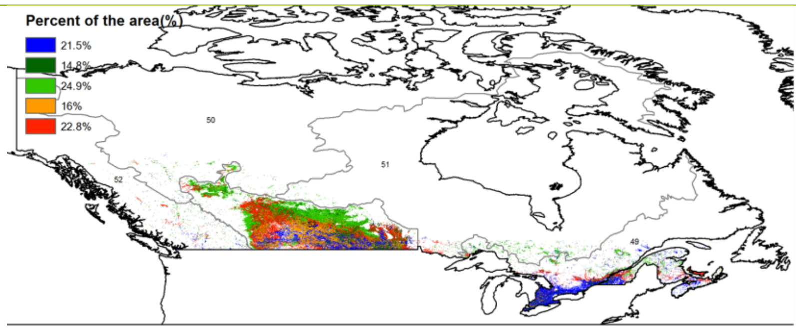

(a). Phenology of major crops

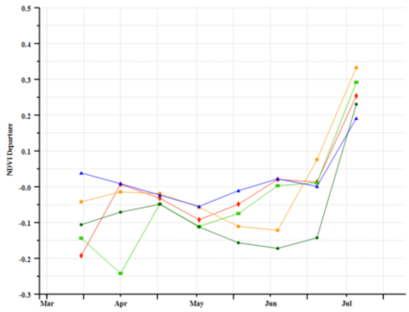



(b) Crop condition development graph based on NDVI

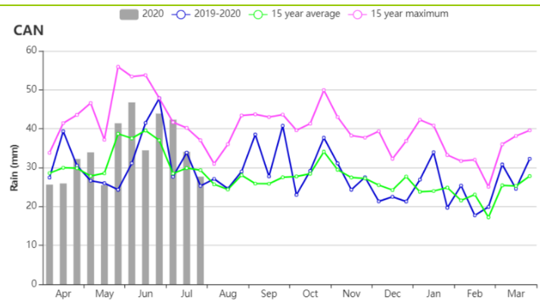
(c) Maximum VCI

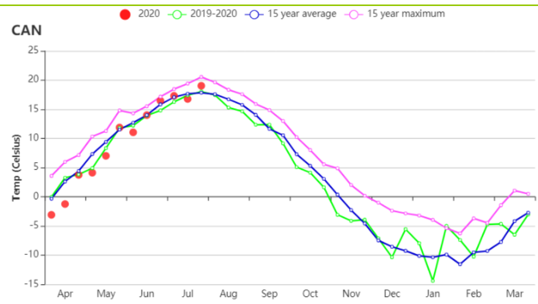



(d) Spatial NDVI patterns compared to 5YA

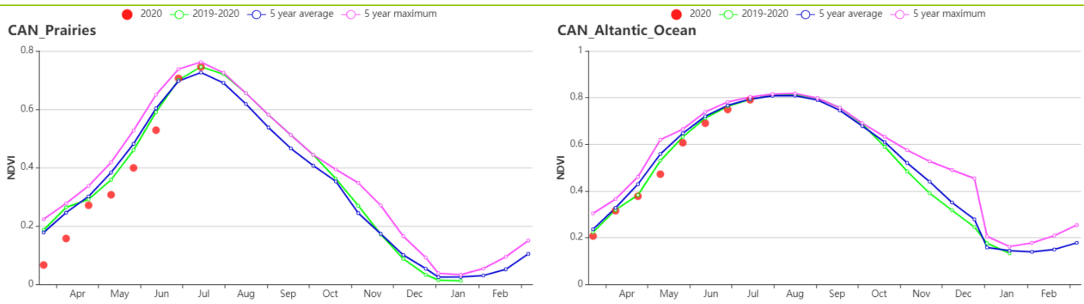
(e) NDVI profiles




(f) Rainfall profiles

(g) Temperature profiles




(h) Crop condition development graph based on NDVI (Canadian Prairies region (left) and Saint Lawrence basin region (right))

**Table 3.15 Canada's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2020**

| Region | RAIN | | TEMP | | RADPAR | | BIOMSS | |
|---|---|---|---|---|---|---|---|---|
| | Current (mm) | Departure (%) | Current (°C) | Departure (°C) | Current ($MJ/m^2$) | Departure (%) | Current ($gDM/m^2$) | Departure (%) |
| Saint Lawrence basin | 379 | -15 | 10.8 | -0.6 | 1118 | 0 | 391 | 1 |
| Prairies | 452 | 30 | 10.3 | -1.5 | 1168 | -6 | 399 | -11 |

**Table 3.16 Canada's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2020**

| Region | Cropped arable land fraction | | Maximum VCI |
|---|---|---|---|
| | Current (%) | Departure (%) | Current |
| Saint Lawrence basin | 100 | 0 | 0.96 |
| Prairies | 99 | 2 | 0.96 |

AFG AGO ARG AUS BGD BLR BRA CAN **DEU** EGY ETH FRA GBR HUN IDN IND IRN ITA KAZ KEN KGZ KHM LKA MAR MEX MMR MNG MOZ NGA PAK PHL POL ROU RUS THA TUR UKR USA UZB VNM ZAF ZMB

# [DEU] Germany

This monitoring period covers the sowing of spring crops and the key growth of fall-sown and fall-harvested crops. Winter wheat and barley were at the late vegetative stages in late April and reached maturity in July. Based on the agroclimatic and agronomic indicators, the crop conditions in Germany were generally below the 5-year average between April and June in most regions, and even worse than in 2018. This applies to already harvested winter wheat and spring wheat.

At the national level, total precipitation was significantly below average (RAIN, -22%), temperature was slightly below average (TEMP, -0.4°C) and radiation above average (RADPAR, +2%). It can be seen from the time series rainfall profile for Germany that the precipitation was significantly below average during the monitoring period, except in early June, mid-June, and early July. The temporal and spatial distribution of precipitation shows that above-average precipitation occurred in most parts of Germany in early May and mid-June, and southeast of Bavaria, Hesse, north of Lower Saxony, Schleswig-Holstein and Mecklenburg-Western Pomerania in early June and early July. However, most parts of Germany experienced a precipitation deficit in mid- and late May and mid-July. Most of the country experienced cooler-than-usual conditions during this reporting period, except for April, mid-June and late June. The temporal and spatial distribution of temperature shows that the regions with significantly cooler-than-usual weather were mainly distributed in the northern part of Germany in mid-May and after July, and the southern part of Germany from early May to early June, and mid-July. Due to cooler-than-usual conditions and precipitation deficit, the biomass production potential (BIOMSS) is estimated to decrease by 4% nationwide as compared to the fifteen-year average.

As shown in the crop condition development graph and the NDVI profiles at the national level, NDVI values were below the 5YA and last year's average until mid-June, then close to average from late June to early July, and below average again after mid-July. These observations are confirmed by the clustered NDVI profiles: 87.6% of regional NDVI values were below average from mid-April to early June, then 71.3% of regional NDVI values were above average. These observations are also confirmed by lower VCI value area in the spatial distribution of maximum VCI map due to the effect of superimposed changes from precipitation and temperature. Overall VCIx for Germany was 0.91. CALF during the reporting period was the same as for the recent five-year average.

Generally, the agronomic indicators show unfavorable conditions for most winter and summer crops in Germany. More rain will be needed to ensure an adequate soil moisture supply for the reproductive phase of the summer crops.

**Regional analysis**

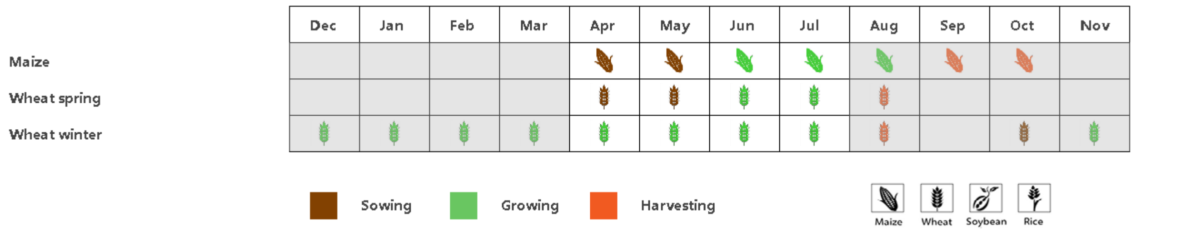
Based on cropping systems, climatic zones, and topographic conditions, six sub-national agro-ecological regions are adopted for Germany. They include: the Wheat Zone of Schleswig-Holstein and the Baltic coast, Mixed Wheat and Sugar beet Zone of the Northwest, Central Wheat Zone of Saxony and Thuringia, Sparse Crop Area of the East-German Lake and Heathland area, Western Sparse Crop Area of the Rhenish Massif and the Bavarian Plateau.

According to the CropWatch agroclimatic indicators, these six regions experienced the same trend of precipitation and temperature, compared to the average of the past 15 years. RAIN was below average by -27%, -25%, -13%, -14%, -28% and -21%, respectively; Temperature was below average by -0.7°C, -0.3°C, -0.6°C, -0.7°C, -0.2°C and -0.4°C, respectively; RADPAR was above average by 0%, +3%, +1%, +1%, +3% and +2%, respectively. Due to cooler-than-usual conditions and precipitation deficit, the biomass production potential (BIOMSS) in the six regions was below average by -6%, -2%, -7%, -7%, -1% and -4%, respectively.

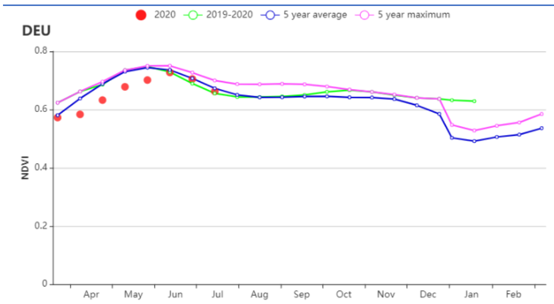
As shown in the crop condition development graph based on NDVI, all six regions had the same trend of change, that is, NDVI values were below average and last year until mid-June, then stayed close to average before they dropped to below average again.

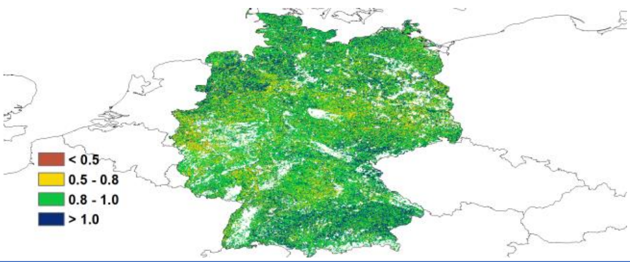
CropWatch agronomic indicators show that CALF of all six regions reached 100%, with a zero departure from their 5YA. As mentioned above, they also recorded a favorable VCIx value at 0.92, 0.90, 0.89, 0.90, 0.89 and 0.93, respectively.

**Figure 3.13 Germany's crop condition, April - July 2020**



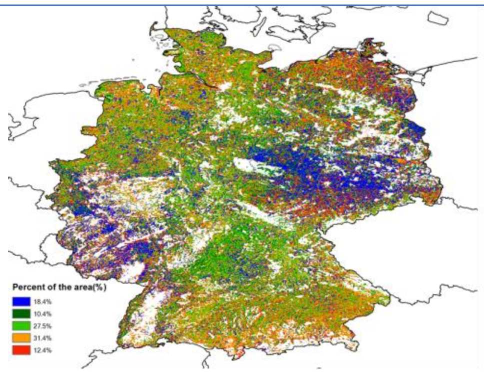

(a). Phenology of major crops

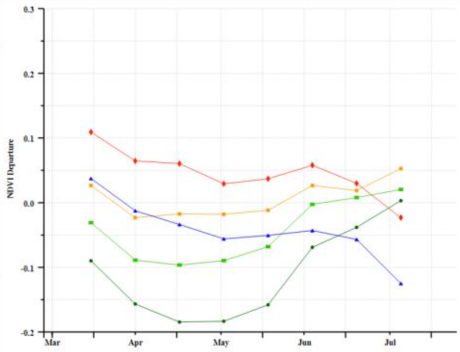



(b) Crop condition development graph based on NDVI

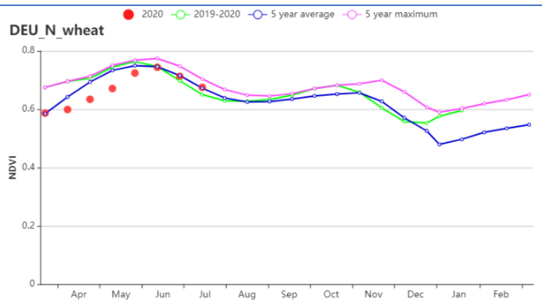
(c) Maximum VCI

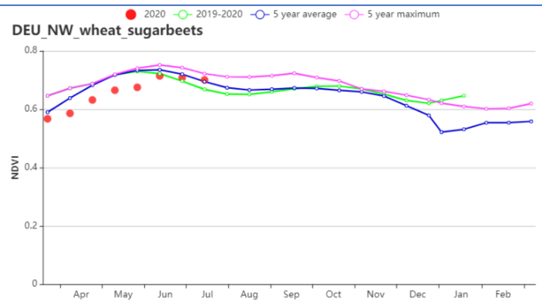


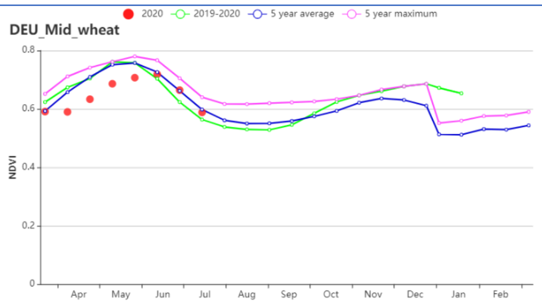

(d) Spatial NDVI patterns compared to 5YA

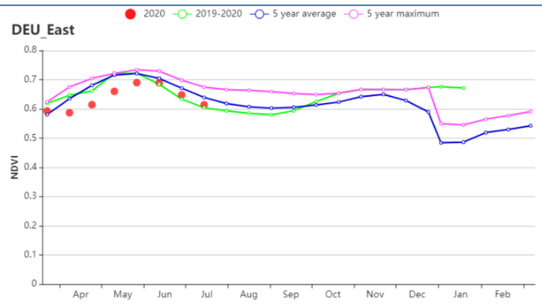
(e) NDVI profiles



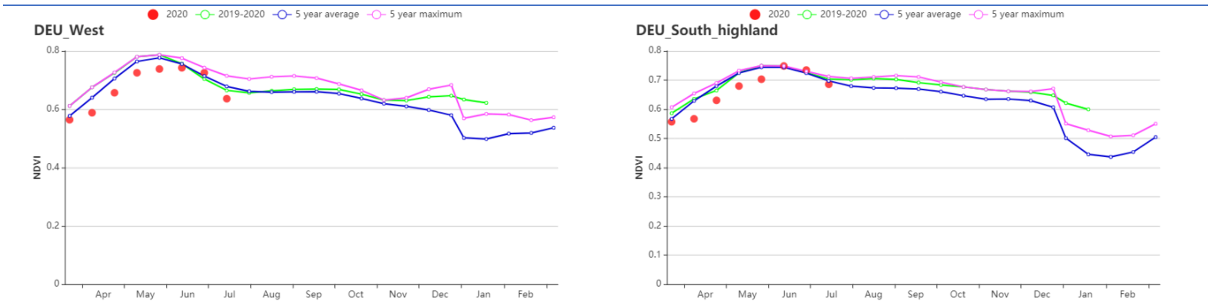




(f) Crop condition development graph based on NDVI (Wheat zone of Schleswig-Holstein and the Baltic coast (left) and Mixed wheat and sugar beets zone of the north-west(right))

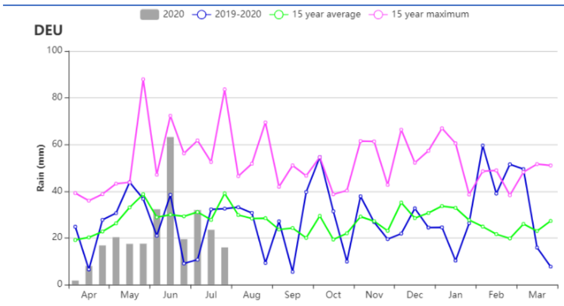


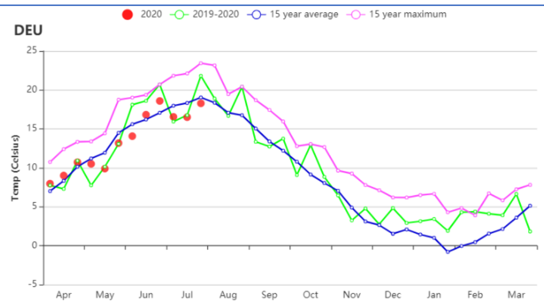

(g) Crop condition development graph based on NDVI (Central wheat zone of Saxony and Thuringia(left) and Sparse crop area of the east-German lake and Heathland (right))




(h) Crop condition development graph based on NDVI (Western sparse crop area of the Rhenish massif (left) and Bavarian Plateau (right))




(f)Time series profile of rainfall




(g)Time series profile of temperature

**Table 3.17 Germany agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2020**

| Region | RAIN | | TEMP | | RADPAR | | BIOMSS | |
|---|---|---|---|---|---|---|---|---|
| | Current (mm) | Departure (%) | Current (°C) | Departure (°C) | Current (MJ/m²) | Departure (%) | Current (gDM/m²) | Departure (%) |
| Wheat zone of Schleswig-Holstein and the Baltic coast | 210 | -27 | 13.2 | -0.7 | 1155 | 0 | 417 | -6 |
| Mixed wheat and sugarbeets zone of the north-west | 216 | -25 | 13.7 | -0.3 | 1174 | 3 | 432 | -2 |
| Central wheat zone of Saxony and Thuringia | 234 | -13 | 13.5 | -0.6 | 1202 | 1 | 441 | -7 |
| East-German lake and Heathland sparse crop area | 253 | -14 | 13.8 | -0.7 | 1202 | 1 | 449 | -7 |
| Western sparse crop area of the Rhenish massif | 208 | -28 | 13.7 | -0.2 | 1237 | 3 | 456 | -1 |
| Bavarian Plateau | 365 | -21 | 13.2 | -0.4 | 1266 | 2 | 452 | -4 |

**Table 3.18 Germany's agronomic indicators by sub-national regions, current season's value and departure from 5YA, April - July 2020**

| Region | Cropped arable land fraction | | Maximum VCI |
|---|---|---|---|
| | Current (%) | Departure (%) | Current |
| Wheat zone of Schleswig-Holstein and the Baltic coast | 100 | 0 | 0.92 |
| Mixed wheat and sugarbeets zone of the north-west | 100 | 0 | 0.90 |
| Central wheat zone of Saxony and Thuringia | 100 | 0 | 0.89 |
| East-German lake and Heathland sparse crop area | 100 | 0 | 0.90 |
| Western sparse crop area of the Rhenish massif | 100 | 0 | 0.89 |
| Bavarian Plateau | 100 | 0 | 0.93 |

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# [EGY] Egypt

During this April - July monitoring period, winter wheat reached maturity and was harvested in April and May. It was followed by the planting of rice and maize. The cumulative rainfall reached 6 mm (-24%). The rainfall index graph shows that most of the rainfall fell during April and May. The average temperature reached 23.2°C (-0.3°C), and the photosynthetically active radiation was 1561 MJ/m$^2$ (-2.1%).

The NDVI spatial pattern shows that 50.4% of the cultivated area was above the 5-year average, 24.1% fluctuated around the 5-year average and 25.5% were below. The best Vegetation Condition Index (VCIx) map shows that the conditions of the current crops, mainly maize and rice, are good. This agrees with the whole country VCIx value (0.84). Overall, the crop conditions are favorable.

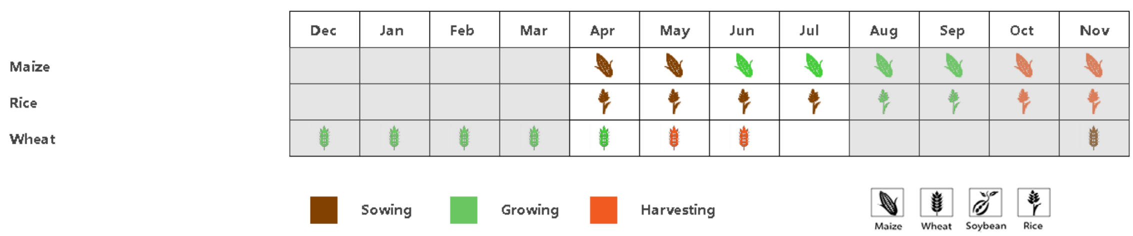
**Regional Analysis**

Based on crop planting systems, climate zones, and topographical conditions, Egypt can be divided into three agro-ecological zones (AEZs), two of which are suitable for crop cultivation, namely the **Nile Delta and the southern coast of the Mediterranean** and the **Nile Valley**.

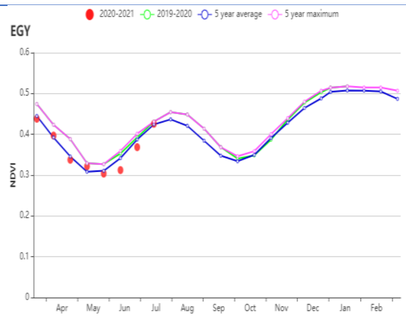
In the **Nile Delta and Mediterranean coast**, the average rainfall was 7 mm (-15%) and the temperature was 23.1°C, while in the **Nile Valley** the average rainfall recorded only 1 mm (-17%) and the temperature was 26.4°C.

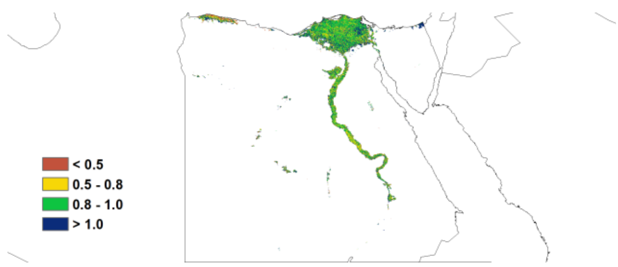
Since virtually all crops in Egypt are irrigated crops, the impact of precipitation on crop yield is limited but additional precipitation is nevertheless always useful. Although the cumulative photosynthetically active radiation in both regions was slightly below the average (-2% in the Nile Delta and Mediterranean coastal strip and -1% in the Nile Valley), BIOMSS increased by 28% and 25% for the first and second regions respectively. The NDVI development graph shows that crop conditions fluctuated around the average in the Delta from April to May; in the Nile Valley, it was first close to but then fell below average and recovered to average levels by the end of this monitoring period.

**Figure 3.14 Egypt's crop condition, April - July 2020**



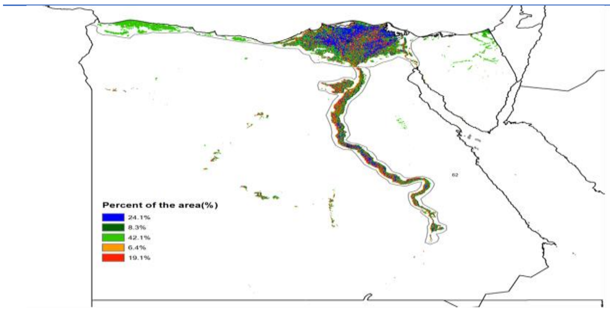

(a). Phenology of major crops



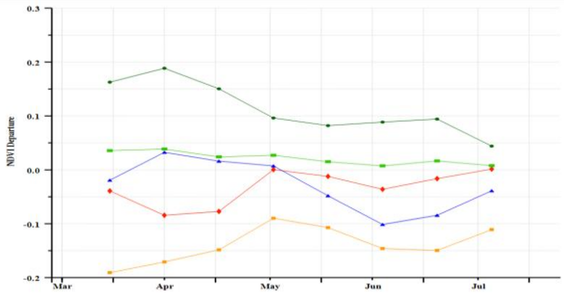




(b) Crop condition development graph based on NDVI

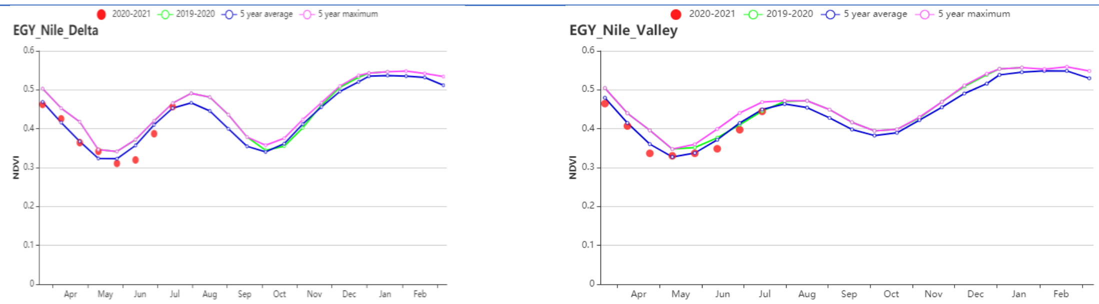
(c) Maximum VCI



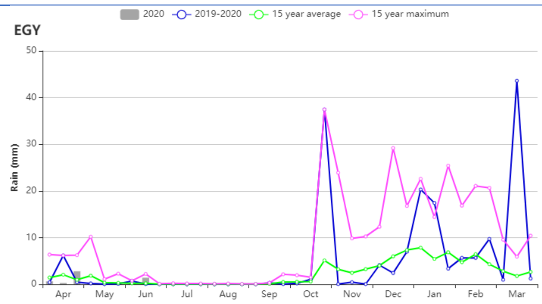

(d) Spatial NDVI patterns compared to 5YA



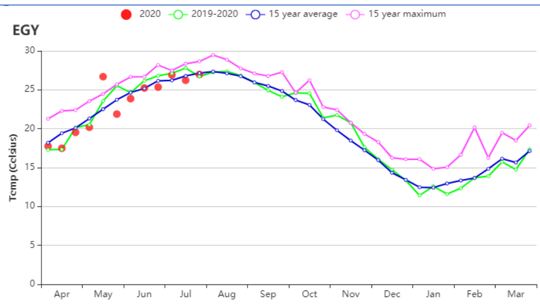

(e) NDVI profiles




(f) Crop condition development graph based on NDVI (Nile Delta (left) and Nile Valley (right))




(g) Time series profile of rainfall




(h) Time series profile of temperature

**Table 3.19 Egypt's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2020**

| Region | RAIN | | TEMP | | RADPAR | | BIOMSS | |
|---|---|---|---|---|---|---|---|---|
| | Current (mm) | Departure (%) | Current (°C) | Departure (°C) | Current (MJ/m²) | Departure (%) | Current (gDM/m²) | Departure (%) |
| Nile Delta and Mediterranean coastal strip | 7 | -15 | 23.1 | -0.3 | 1556 | -2 | 513 | 28 |
| Nile Valley | 1 | -17 | 26.4 | -.01 | 1610 | -1 | 174 | 25 |

**Table 3.20 Egypt's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2020**

| Region | Cropped arable land fraction | | Maximum VCI |
|---|---|---|---|
| | Current (%) | Departure (%) | Current |
| Nile Delta and Mediterranean coastal strip | 68 | 7 | 0.87 |
| Nile Valley | 72 | 8 | 0.84 |

AFG AGO ARG AUS BGD BLR BRA CAN DEU EGY **ETH** FRA GBR HUN IDN IND IRN ITA KAZ KEN KGZ KHM LKA MAR MEX MMR MNG MOZ NGA PAK PHL POL ROU RUS THA TUR UKR USA UZB VNM ZAF ZMB

# [ETH] Ethiopia

Ethiopia has two main agricultural seasons which are Belg (February to May) and Meher (June-October). This reporting period corresponds to the late Belg production time, as well as land preparation and sowing for Meher crops, which are maize (Meher), wheat, teff, and barley. At the national level, rainfall increased by 14%, but estimated biomass remained near the 15YA. According to the NDVI-based development graph, crop conditions were above the five-year average before mid-June before it started to drop below the average A high maximum VCI value was recorded at 0.90. According to NDVI clusters and profiles, 30.8% of the country experienced favorable crop conditions. This positive NDVI cluster occurred around the central and northern parts of the country which is commonly known for Belg production. However, in other parts of the country such as northern Tigray, central Oromia and the eastern parts of the country the conditions were not favorable. In the Belg production regions, maximum VCI ranged from 0.8 to 1.0. Conditions were less favorable in the south, for which low VCIx values were observed. In general, it is still too early to assess the outcome of the Belg crops in this reporting period, but the CropWatch indicators are favorable and the land preparation and sowing of Meher crops is taking place under favorable conditions.

**Regional analysis**

Based on agro-climatic patterns and cropping practices, CropWatch divided the country in the following regions: The semi-arid pastoral zone, southeastern Mendebo highlands, southeastern mixed-maize zone, western mixed maize regions, and central-northern maize teff highlands.

**Semi-aridpastoral**

The semi-arid pastoral zone is commonly known for its livestock production. In this zone, all the CropWatch agronomic and agroclimatic indicators were higher than the 15YA, except for RADPAR (-6%). The biomass in this region increased by 9% and cropped arable land fraction (CALF) increased to 63%, a large increase by 96% over the 5YA. The maximum VCIx was recorded as 1.0 and the NDVI-based crop condition development graph was above average as well. The conditions were favorable.

**South-eastern Mendebo highlands**

The southeastern Mendebo highlands are major maize and teff producing areas. During the reported period, they received 757 mm, which was above-average (RAIN, 39%). Temperature (-0.4°C), RADPAR (-7%) and BIOMASS (-7%) were below the 15YA. The Cropped arable land fraction (CALF) increased by 1% as compared to the five-year average and the maximum VCIx was at 0.95. The NDVI crop condition development graph was above the five years average from April to June, but sharply dropped in from June to July. In this highland zone, the crop conditions are promising. Crops will be harvested during the next reporting period.

**South-eastern mixed maize zone**

In this zone, the average rainfall was 773 mm, which was 66% above average. The temperature (-0.4°C) was slightly below average. RADPAR (-6%) and the total biomass production (-6%) were below average for this zone. The NDVI-based Crop condition development graphs was above its five years average. The maximum VCIx value was at 1.04% and the CALF also increased by 7%. The crop conditions in this zone are favorable and average yields are expected.

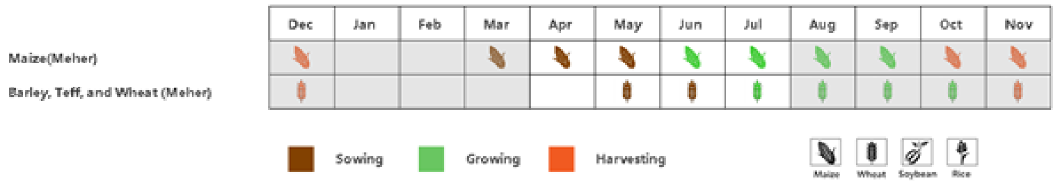
**Western mixed maize zone**

In this zone, maize is the most important crop grown during the Belg and early Meher seasons. At the end of this reporting period, Belg maize was still growing and early Meher maize was planted. The total amount of rainfall was recorded at 1216 mm, an increase by 2%. Temperatures were below average (TEMP -0.5°C) so was RADPAR (-4%). Total biomass production decreased by -2%. Overall, even though a maximum VCIx at 0.97% is good, the NDVI-based Crop condition development graph was below the average of the past five years. All in all, crop conditions were favorable for the western maize zone.

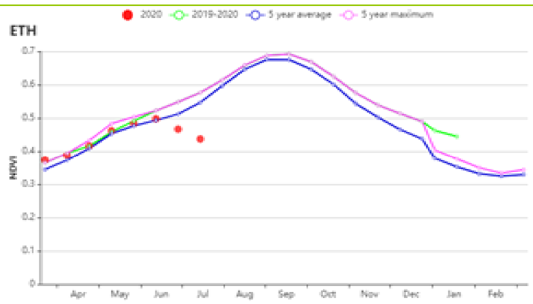
**Central-northern maize-teff highlands**

During this reporting period, the total rainfall was recorded at 800 mm (+12%). The total biomass production also increased by 3%. However, the total arable land fraction dropped (CALF, -6%). VCIx was at 0.86. The NDVI crop condition development graph indicates above-average conditions in April and May, and below-average conditions from mid May to July. Crop conditions are normal for this region, but yields will depend on favorable rainfall during the coming months.

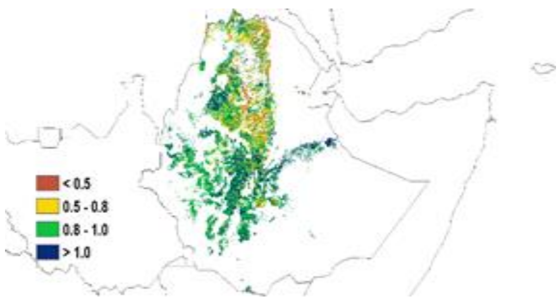
**Figure 3.15 Ethiopia's crop condition, April - July 2020**



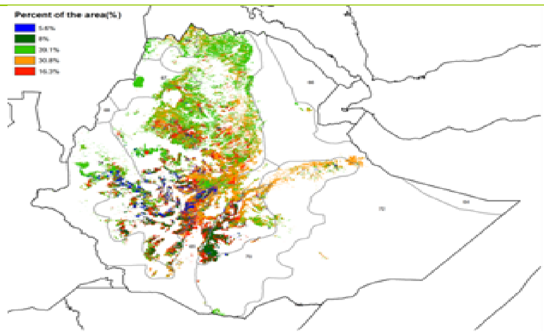

(a). Phenology of major crops



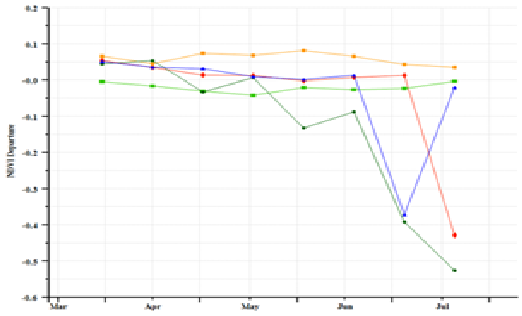

(b) Crop condition development graph based on NDVI



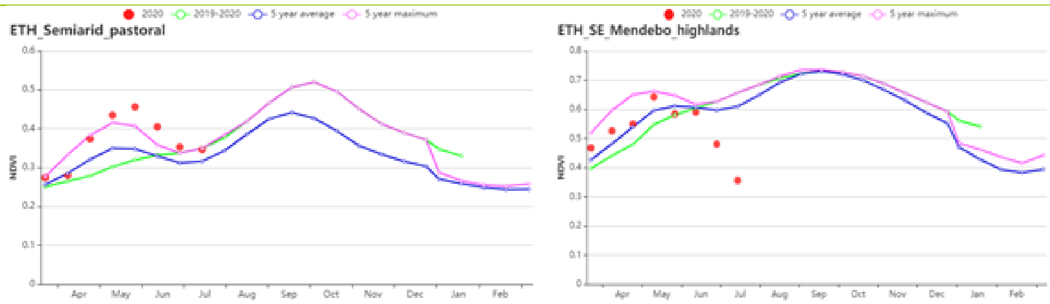

(c) Maximum VCI



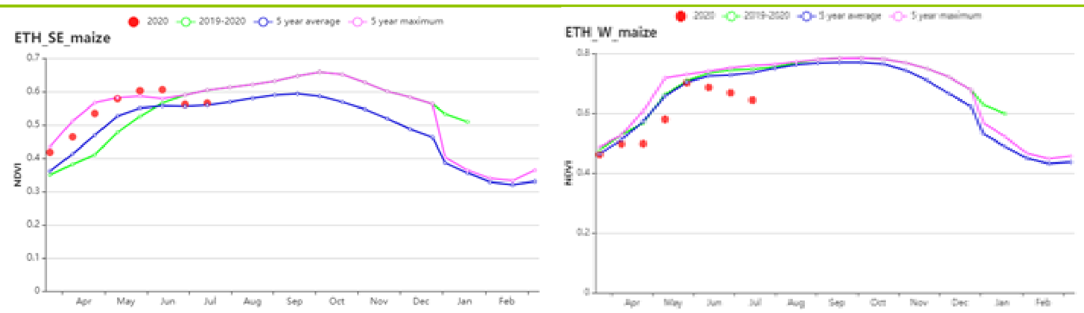

(d) Spatial NDVI patterns compared to 5YA



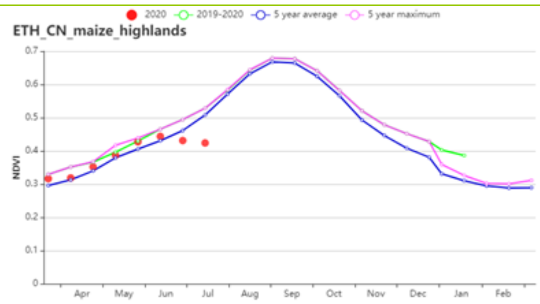

(e) NDVI profiles




(f) Crop condition development graph based on NDVI (Semi-arid pastoral (left) South-eastern Mendebo highlands (right))




(g) Crop condition development graph based on NDVI (South-eastern mixed maize zone (left) and Western maize zone (right))




(h) Crop condition development graph based on NDVI (Central-northern maize-Teff highlands)

**Table 3.21 Ethiopia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2020**

| Region | RAIN | | TEMP | | RADPAR | | BIOMSS | |
|---|---|---|---|---|---|---|---|---|
| | Current (mm) | Departure (%) | Current (°C) | Departure (°C) | Current ($MJ/m^2$) | Departure (%) | Current ($gDM/m^2$) | Departure (%) |
| Semi-arid pastoral | 334 | 72 | 23.7 | 0.1 | 1313 | -6 | 698 | 9 |
| South-eastern Mendo highlands | 757 | 39 | 15.3 | -0.4 | 1101 | -7 | 434 | -7 |
| South-eastern mixed maize zone | 773 | 66 | 18.5 | -0.4 | 1137 | -6 | 557 | -6 |
| Western mixed maize zone | 1216 | 2 | 21.1 | -0.5 | 1076 | -4 | 607 | -2 |
| Central-northern maize-teff | 800 | 12 | 19.1 | -0.4 | 1227 | -6 | 571 | 3 |

**Table 3.22 Ethiopia's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2020**

| Region | Cropped arable land fraction | | VCIx |
|---|---|---|---|
| | Current (%) | Departure (%) | Current |
| Semi-arid pastoral | 63 | 96 | 1.01 |
| South-eastern Mendo highlans | 99 | 1 | 0.95 |
| South-eastern mixed maize zone | 99 | 7 | 1.04 |
| Western mixed maize zone | 100 | 0 | 0.97 |
| Central-northern maize-teff highlands | 78 | -6 | 0.86 |

# [FRA] France

The monitoring period covers winter wheat, which had reached maturity by July. The planting of maize and spring wheat was completed in May. The harvest of the summer crops including rice, potatoes and sunflower, starts in July and extends into September.

CropWatch agro-climatic indicators show above-average temperature over the period, along with significantly lower RAIN in July as compared to 2019 and the 15YA. Dry conditions had already been observed for the previous reporting period.

Overall, the national-scale NDVI development graph shows that NDVI trended below last year's and the 5-year average. However, it recovered to close to average in July. All regions were affected, with the exception of the Mediterranean zone. This pattern is confirmed by VCIx, ranging from 0.8 to 0.96 across the regions.

**Regional analysis**

Considering cropping systems, climatic zones and topographic conditions, additional sub-national details are provided for eight agro-ecological zones. They are identified on the maps by the following numbers: (78) **Northern barley region**, (82) **Mixed maize/barley and rapeseed zone from the Center to the Atlantic Ocean**, (79) **Maize-barley and livestock zone along the English Channel**, (80) **Rapeseed zone of eastern France**, (75) **Massif Central dry zone**, (81) **Southwestern maize zone**, (76) **Eastern Alpes region** and (77) the **Mediterranean zone**.

In the Northern barley region, RAIN over the monitoring period was below average (-40%) while temperature and RADPAR were above average (0.7°C and 9%, respectively). Land was fully cropped and BIOMSS increased by 10%, but the regional NDVI was below the 5-year average across the entire season, indicating a below-average production.

In the Mixed maize/barley and rapeseed zone from the Center to the Atlantic Ocean, a slightly warmer (TEMP 0.7°C above average) but drier (RAIN 14% lower than average) period was observed, with RADPAR (4%) and BIOMSS (6%) slightly higher than the 15-year average. The regional NDVI profile recovered to average levels starting in late June.

The Maize-barley and livestock zone along the English Channel had less rain (-13%), increased temperature (0.7°C), increased RADPAR (6%) and BIOMSS (8%) and overall high VCIx (0.91), indicating close-to-average crop conditions. This is supported by the regional NDVI profile, which was close to average in July.

In the Rapeseed zone of eastern France, the NDVI profile had also recovered to close-to-average levels starting in June. Overall, RAIN in this period was 26% lower than the 15-year average, while TEMP increased by 0.5°C and RADPAR increased by 7%, indicating a relatively dry and warm season. BIOMSS was about 5% higher than average with a moderate VCIx level (0.86).

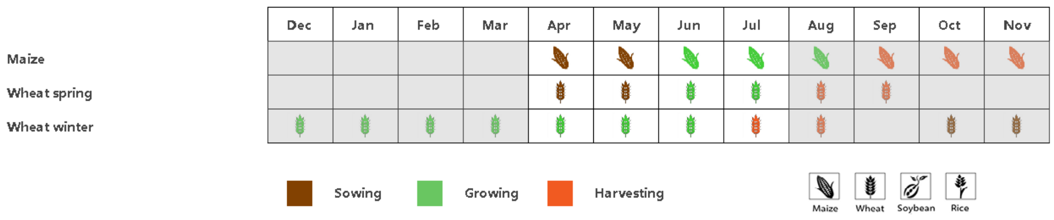
In the Massif Central dry zone, the VCIx was recorded at a high level (0.95) and the NDVI profile was showing an average level, indicating overall close-to-average crop conditions. The RAIN was 9% lower than the average, while TEMP and RADPAR increased slightly by 0.6°C and 4%, respectively. BIOMSS increased by 4% which is also indicating a normal cropping season in the region.

The Southwestern maize zone is one of the major irrigated maize regions in France. Overall favorable conditions were observed during the period, characterized by a slight increase in RAIN (9%), TEMP (0.7°C) and BIOMSS (4%). The regional NDVI profile presented an overall close-to-average trend and the VCIx was recorded at a relative high level (0.91), all indicating average crop conditions.

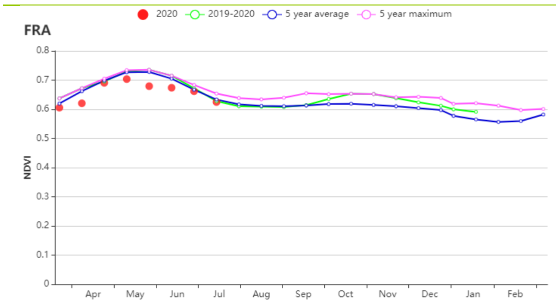
In the Eastern Alpes region, the NDVI profile presented overall close-to but below average trend. VCIx for the region was recorded at 0.89, indicating an overall average crop condition. RAIN in the region was 7% lower than average, while TEMP and RADPAR was 0.4°C and 2% higher than their averages. BIOMSS was slightly higher than the 15-year average (+1%).

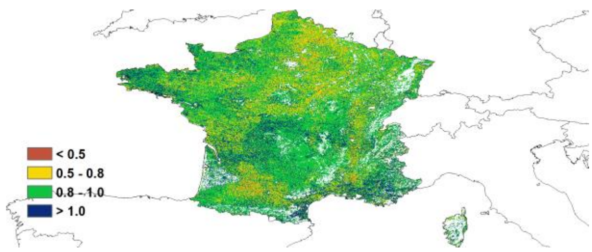
The Mediterranean zone is the only region which recorded an overall above-average NDVI profile. The region also recorded high VCIx level (0.96). RAIN and TEMP were 18% and 0.2 oC higher than average, while RADPAR was slightly lower (-2%) than average. BIOMSS was equal to average. This region is showing average to above average crop conditions.

**Figure 3.16 France's crop condition, April - July 2020**



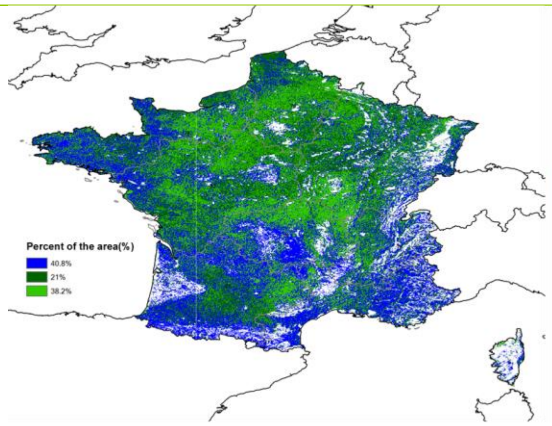

(a). Phenology of major crops

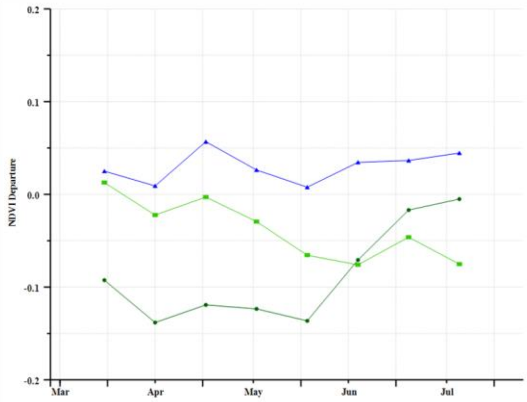



(b) Crop condition development graph based on NDVI

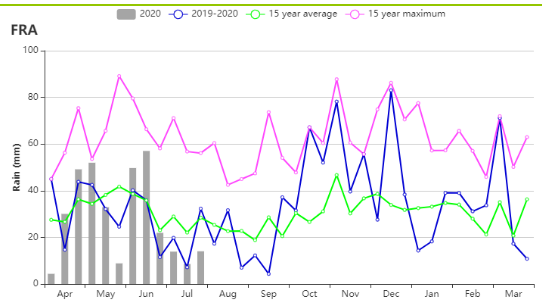
(c) Maximum VCI




(d) Spatial NDVI patterns compared to 5YA

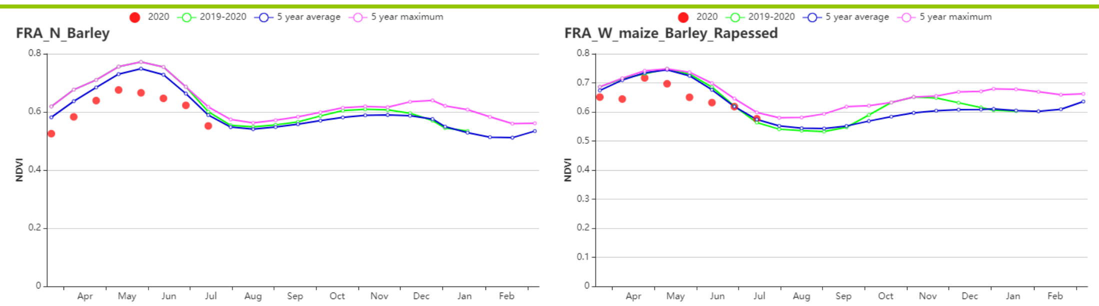
(e) NDVI profiles



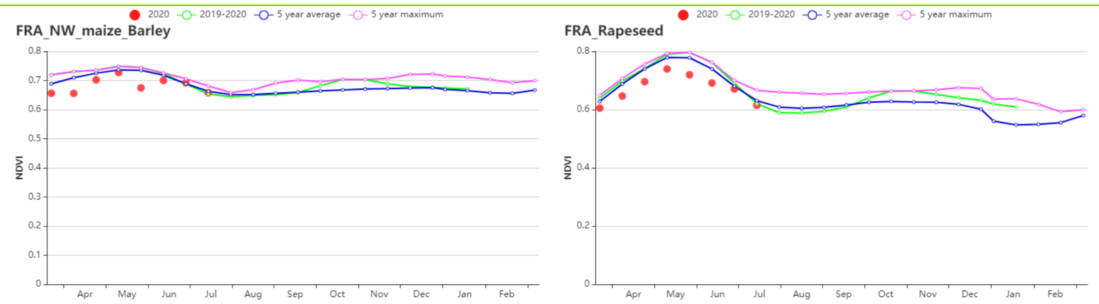


(f) Rainfall profiles

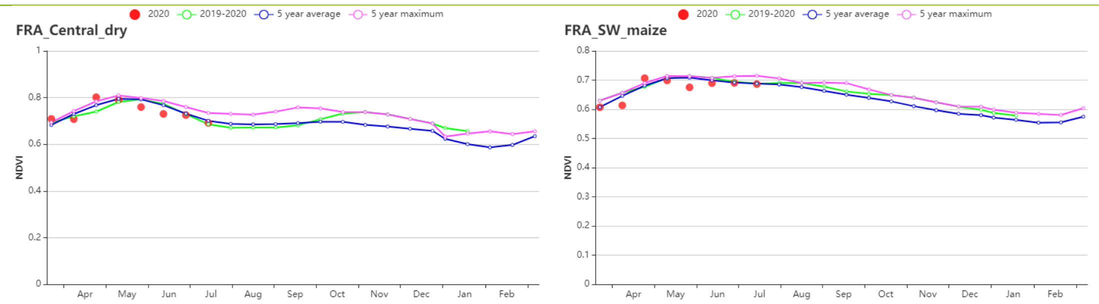
(g) Temperature profiles



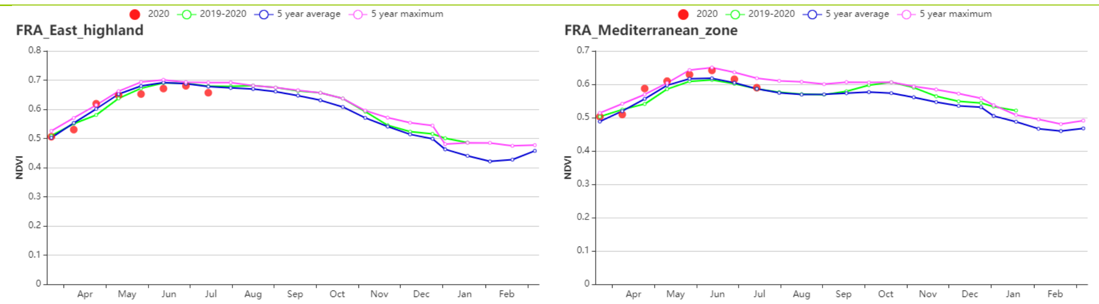

(h) Crop condition development graph based on NDVI (Northern barley region (left) and Mixed maize, Barley and Rapeseed zone (right))




(i) Crop condition development graph based on NDVI (Maize, barley and livestock zone (left) and Rapeseed zone (right))




(j) Crop condition development graph based on NDVI (Dry Massif Central zone (left) and Southwest maize zone (right))




(k) Crop condition development graph based on NDVI (Eastern Alpes region (left) and Mediterranean zone (right))

**Table 3.23 France's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2020**

| Region | RAIN | | TEMP | | RADPAR | | BIOMSS | |
|---|---|---|---|---|---|---|---|---|
| | Current (mm) | Departure (%) | Current (°C) | Departure (°C) | Current (MJ/m²) | Departure (%) | Current (gDM/m²) | Departure (%) |
| Northern Barley zone | 187 | -40 | 15.0 | 0.7 | 1258 | 9 | 497 | 10 |
| Mixed maize/barley and rapessed zone from the Centre to the Atlantic Ocean | 278 | -14 | 15.9 | 0.7 | 1250 | 4 | 531 | 6 |
| Maize barley and livestock zone along the English Channel | 248 | -13 | 14.5 | 0.7 | 1223 | 6 | 470 | 8 |
| Rapeseed zone of eastern France | 317 | -26 | 14.9 | 0.5 | 1288 | 7 | 508 | 5 |
| Massif Central Dry zone | 385 | -9 | 14.6 | 0.6 | 1300 | 4 | 508 | 4 |
| Southwest maize zone | 455 | 9 | 16.2 | 0.7 | 1281 | 0 | 566 | 4 |
| Alpes region | 491 | -7 | 13.9 | 0.4 | 1340 | 2 | 498 | 1 |
| Mediterranean zone | 408 | 18 | 15.3 | 0.2 | 1369 | -2 | 571 | 0 |

**Table 3.24 France's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2020**

| Region | Cropped arable land fraction | | Maximum VCI |
|---|---|---|---|
| | Current (%) | Departure (%) | Current |
| Northern Barley zone | 100 | 0 | 0.80 |
| Mixed maize/barley and rapessed zone from the Centre to the Atlantic Ocean | 100 | 0 | 0.87 |
| Maize barley and livestock zone along the English Channel | 100 | 0 | 0.91 |
| Rapeseed zone of eastern France | 100 | 0 | 0.86 |
| Massif Central Dry zone | 100 | 0 | 0.95 |
| Southwest maize zone | 100 | 0 | 0.91 |
| Alpes region | 98 | 0 | 0.89 |
| Mediterranean zone | 97 | 2 | 0.96 |

# [GBR] Kingdom

During this report monitoring period, winter wheat reached the flowering stage in early May. Subsequent grainfilling was completed by late June and harvest started in July. According to the crop condition development graph, crops experienced unfavorable conditions. NDVI values were below average from April to June and attained average values in July. Agro-climatic indicators show that rainfall was below average (RAIN, -18%), radiation was above average (RADPAR, +2%), temperature and BIOMSS were close to average. The seasonal RAIN profile presents overall below-average rainfall except for June and July.

The national average VCIx was 0.89. CALF (100%) was unchanged compared to its five-year average. The NDVI departure cluster profiles indicate that: (1) 31.9% of arable land, scattered around Scotland (South Ayrshire, East Ayrshire, Scottish Borders), Wales, South West England (Cornwall), South East England (East Sussex), experienced average crop conditions. (2) 5% of arable land experienced slightly below-average crop conditions from April to mid-July, mainly in the East of England (Norfolk). (3) 22.2% of arable land experienced slightly below-average crop conditions, mainly in South East England. (4) 40.9% of arable land experienced below-average crop conditions from April to June, then recovered to slightly above-average crop conditions, mainly in West Midlands, East Midlands and East of England. Altogether, the conditions for wheat in the UK are assessed as below average.

**Regional analysis**

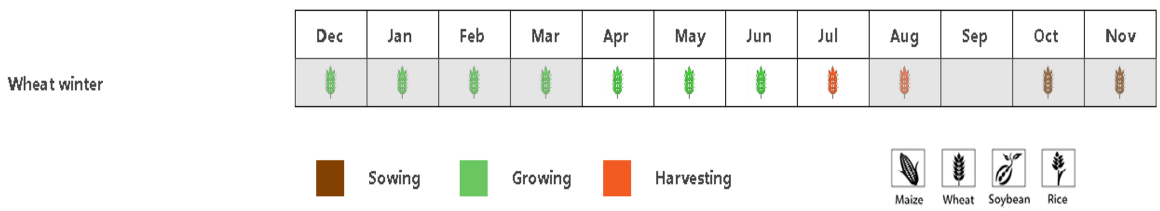
Based on cropping systems, climatic zones, and topographic conditions, three sub-national regions can be distinguished: Central sparse crop region, Northern barley region, and Southern mixed wheat and barley region. All three sub-regions were characterized by unchanged fractions of arable land (CALF) compared to the 5-year average.

The **Central sparse crop region** is one of the country's major agricultural regions in terms of crop production. Crop conditions were below the five-year average according to the NDVI development graph. Rainfall was below average (RAIN -13%) with close to average temperature and radiation. Biomass was below average (BIOMSS, -2%). The VCIx was at 0.92.

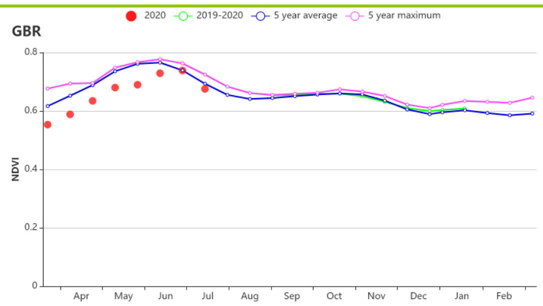
In the **Northern barley region**, NDVI was below average or close to average. Rainfall was below average (RAIN -14%) with average temperature and radiation. Biomass was below average (BIOMSS, -2%). The VCIx was at 0.95.

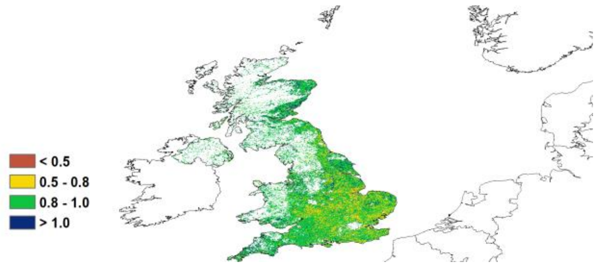
In the **Southern mixed wheat and barley zone**, NDVI was below average according to the crop condition graph. This region experienced the largest rainfall deficit (RAIN -26%), temperature was slightly above average (TEMP +0.2°C) and radiation was above average (RADPAR +4%). The above-average radiation and temperature resulted in the above-average biomass (BIOMSS +2%). The region had above-average VCIx (0.86).

**Figure 3.17 United Kingdom's crop condition, April - July 2020**

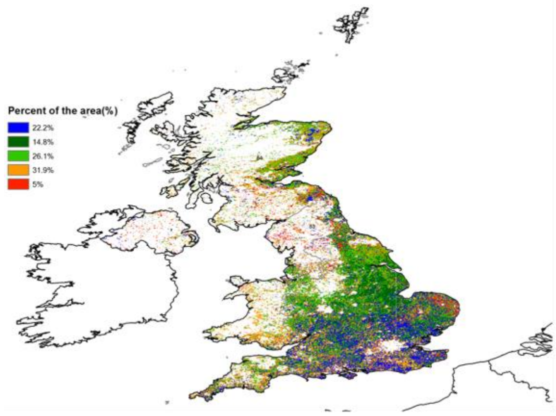


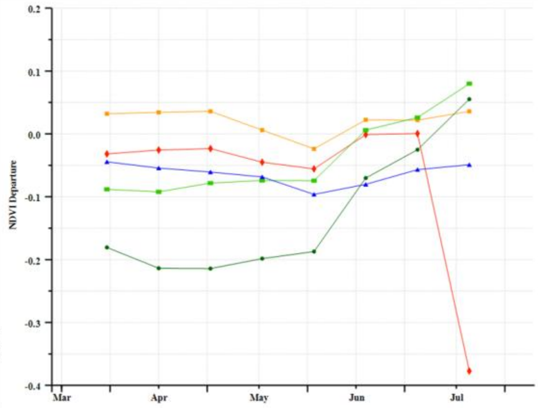

(a). Phenology of major crops



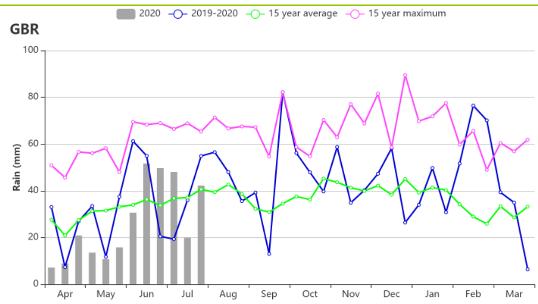



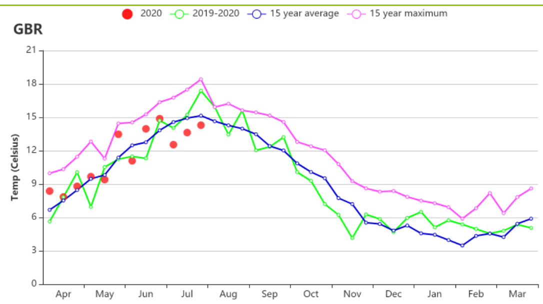

(b) Crop condition development graph based on NDVI (c) Maximum VCI



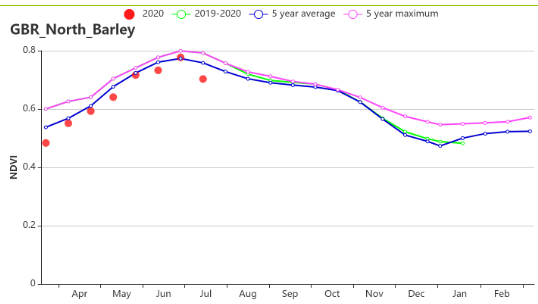



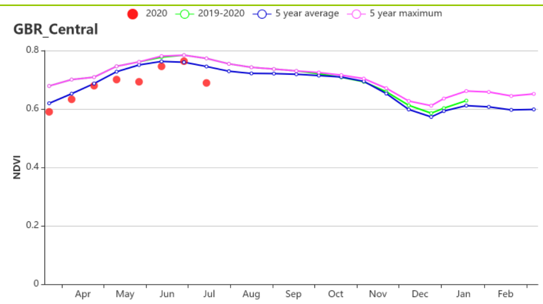

(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



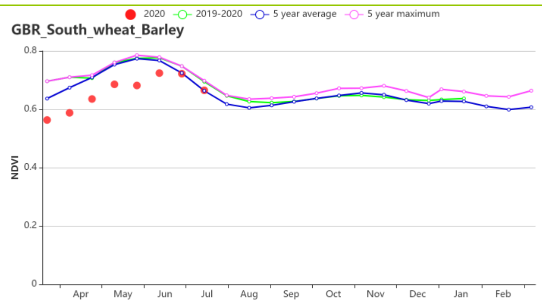




(f) Rainfall profiles (g) Temperature profiles




(h) Crop condition development graph based on NDVI (Northern Barley region (left) and Central sparse crop region (right))




(i) Crop condition development graph based on NDVI (Southern mixed wheat and Barley zone)

**Table 3.25 United Kingdom's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2020**

| Region | RAIN | | TEMP | | RADPAR | | BIOMSS | |
|---|---|---|---|---|---|---|---|---|
| | Current (mm) | Departure (%) | Current (°C) | Departure (°C) | Current ($MJ/m^2$) | Departure (%) | Current ($gDM/m^2$) | Departure (%) |
| Northern Barley region (UK) | 389 | -14 | 10.0 | 0.0 | 906 | 0 | 266 | -2 |
| Central sparse crop region (UK) | 355 | -13 | 11.3 | 0.0 | 948 | 0 | 299 | -2 |
| Southern mixed wheat and Barley zone (UK) | 242 | -26 | 12.6 | 0.2 | 1076 | 4 | 370 | 2 |

**Table 3.26 United Kingdom's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2020**

| Region | Cropped arable land fraction | | Maximum VCI |
|---|---|---|---|
| | Current (%) | Departure (%) | Current |
| Northern Barley region (UK) | 100 | 0 | 0.8 |
| Central sparse crop region (UK) | 100 | 0 | 0.5 |
| Southern mixed wheat and Barley zone (UK) | 100 | 0 | 0.9 |

AFG AGO ARG AUS BGD BLR BRA CAN DEU EGY ETH FRA GBR **HUN** IDN IND IRN ITA KAZ KEN KGZ KHM LKA MAR MEX MMR MNG MOZ NGA PAK PHL POL ROU RUS THA TUR UKR USA UZB VNM ZAF ZMB

# [HUN] Hungary

Summer crops were planted in April and May and winter wheat was harvested in June and July.

Accumulated rainfall was above average (RAIN +17%) while temperature and radiation were below (TEMP -1.2°C, RADPAR -2%), resulting in a decrease in biomass (BIOMSS -14%). According to the national NDVI development graphs, crop conditions were below average from April to mid-June, while from late June to July, they improved to be above but close to average. Some spatial and temporal detail is provided by NDVI clusters: NDVI was above average throughout the reporting period on 22.7% of arable land; 13.4% of cropland was above average from April to early June and below average from mid-June to July; About 20.3% of arable land was below average throughout the reporting period; 28.8% of cropland was below average from April to early June and above average from mid June to July; 14.9% of cropland was below average from April to June and above average in July.

With the maximum VCI value at the national level reaching 0.92 and the cropped arable land fraction (CALF) at 100% (unchanged compared to the recent five-year average) crop conditions are assessed as favorable for the summer crops. However, the below-average crop conditions between April and mid-June indicate lower winter wheat yields, due to dry conditions observed in the spring.

**Regional analysis**

Based on cropping systems, climatic zones, and topographic conditions, Hungary is divided into four sub-regions: North Hungary, Central Hungary, the Great Plain (Puszta) and Transdanubia. Specific observations for the reporting period are included for each region. All sub-regions are characterized by unchanged fractions of cultivated arable land (CALF) compared to average, i.e. 100%, indicating full cropping.

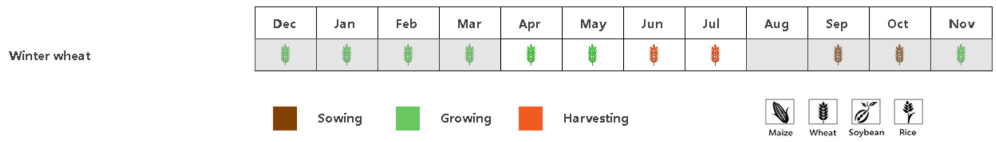
**Central Hungary** is one of the major agricultural regions in terms of crop production. A sizable share of winter wheat, maize and sunflower is planted in this region. The NDVI was below average from April to mid June and above from late June to July. Agro-climatic conditions include below-average radiation (RADPAR -1.7%), temperature (TEMP -1.3°C), biomass (BIOMSS -14%) and above-average rainfall (RAIN, +27%). The VCIx was just fair at 0.92. CropWatch expects slightly unfavorable conditions

**Northern Hungary** is another important winter wheat region. During this reporting period, the crops showed the same patterns in the crop condition graph as **Central Hungary**. Temperature, radiation and biomass had negative departures (TEMP -1.4°C, RADPAR -1.6%, BIOMSS, -14%) while rainfall increased (RAIN +29%). The VCIx was favorable at 0.90. CropWatch expects normal production.

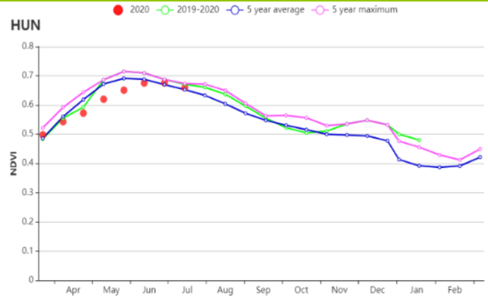
**The Puszta** region grows mostly winter wheat, maize and sunflower especially in the counties of Jaz-Nagykum-Szolnok and Bekes. The NDVI was below average from April to mid-June and above from late June to July. Temperature, radiation and biomass had negative anomalies (TEMP -1.4°C, RADPAR -2.0%, BIOMSS, -15%) while rainfall increased (RAIN +30%). The VCIx was favorable at 0.94. CropWatch expects normal production.

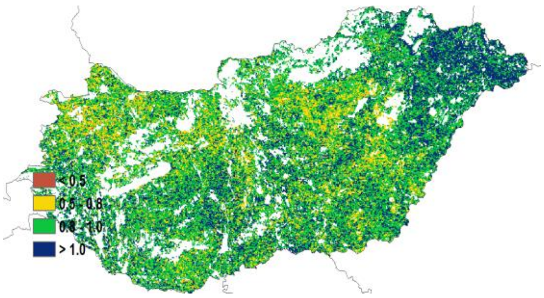
**Southern Transdanubia** cultivates winter wheat, maize, and sunflower, mostly in Somogy and Tolna counties. Crop conditions were generally below average from April to July in this region. All agro-climatic conditions were below average, including RAIN (-8%), TEMP (-0.9°C), RADPAR (-1.9%) and BIOMSS (-12%). The maximum VCI was favorable at 0.90. CropWatch expects slighlty unfavorable conditions.

**Figure 3.18 Hungary's crop condition, April - July 2020**

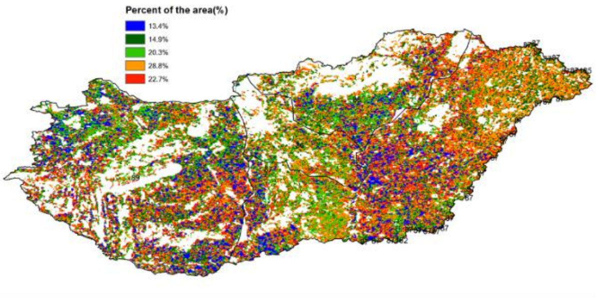


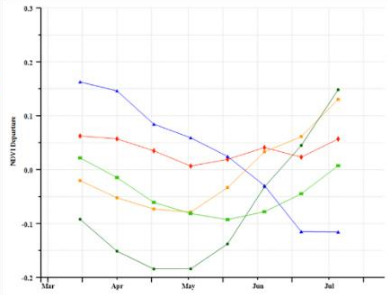

(a). Phenology of major crops



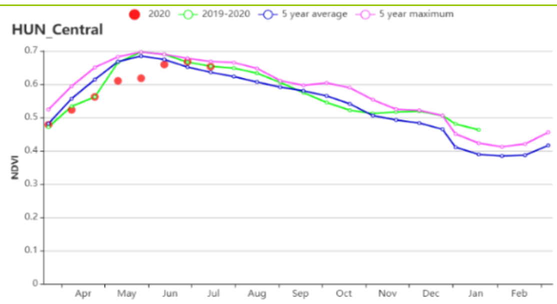



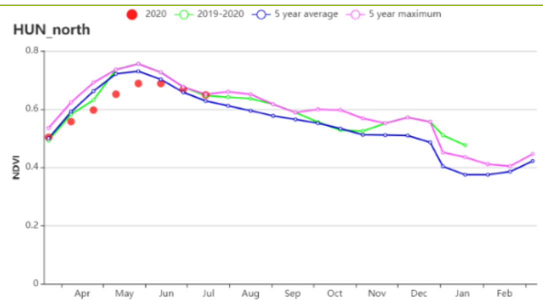

(b) Crop condition development graph based on NDVI (c) Maximum VCI



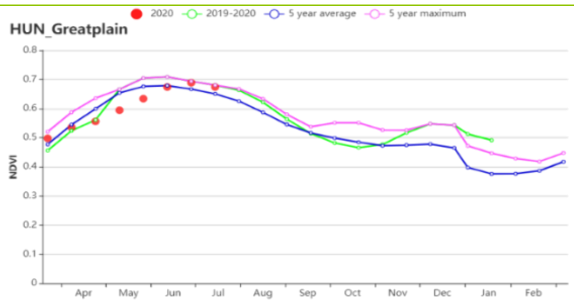



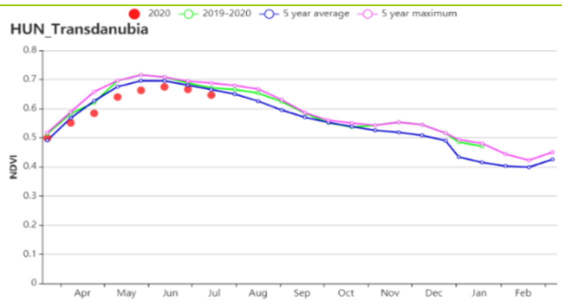

(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles




(f) Crop condition development graph based on NDVI (Central Hungary Region (left) and North Hungary Region (right))




(g) Crop condition development graph based on NDVI (Great Plain Region (left) and Transdanubia Region (right))

**Table 3.27 Hungary's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2020**

| Region | RAIN | | TEMP | | RADPAR | | BIOMSS | |
|---|---|---|---|---|---|---|---|---|
| | Current (mm) | Departure (%) | Current (°C) | Departure (°C) | Current (MJ/m²) | Departure (%) | Current (gDM/m²) | Departure (%) |
| Central Hungary | 307 | 27 | 16.4 | -1.3 | 1297 | -1.7 | 545 | −14 |
| North Hungary | 364 | 29 | 15.5 | -1.4 | 1281 | -1.6 | 511 | −14 |
| The Puszta | 376 | 30 | 16.5 | -1.4 | 1261 | -2.0 | 545 | −15 |
| Transdanubia | 214 | -8 | 16.3 | -0.9 | 1307 | -1.9 | 548 | −12 |

**Table 3.28 ungary's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2020**

| Region | Cropped arable land fraction | | Maximum VCI |
|---|---|---|---|
| | Current (%) | Departure (%) | Current |
| Central Hungary | 100 | 0 | 0.92 |
| North Hungary | 100 | 0 | 0.90 |
| The Puszta | 100 | 0 | 0.94 |
| Transdanubia | 100 | 0 | 0.90 |

AFG AGO ARG AUS BGD BLR BRA CAN DEU EGY ETH FRA GBR HUN **IDN** IND IRN ITA KAZ KEN KGZ KHM LKA MAR MEX MMR MNG MOZ NGA PAK PHL POL ROU RUS THA TUR UKR USA UZB VNM ZAF ZMB

# [IDN] Indonesia

During the monitoring period, the harvest of the main rice and maize crops was completed, and secondary rice and maize were planted in June and July.

RADPAR was near the average, whereas temperature (TEMP +0.2°C) and precipitation (RAIN +6%) were above the 15YA. This increased the potential cumulative biomass by about 1%. The NDVI growth curve shows that the crop conditions were below average, especially in June and July, during the sowing season of the second rice crop. According to the NDVI profiles, crop conditions on 57.4% of the arable land around the country were close to average. 22.7% of cultivated areas were below average at the beginning of the monitoring period and then improved to average in May. To the contrary, NDVI dropped to below average in June and July in 19.9% of the area. Almost all the arable land in Indonesia was cropped, and the maximum VCI value was 0.98.

Overall, the current agro-climatic indicators show favorable agro-climatic conditions in this region, especially for the growth period of main rice and maize crops.

**Regional analysis**

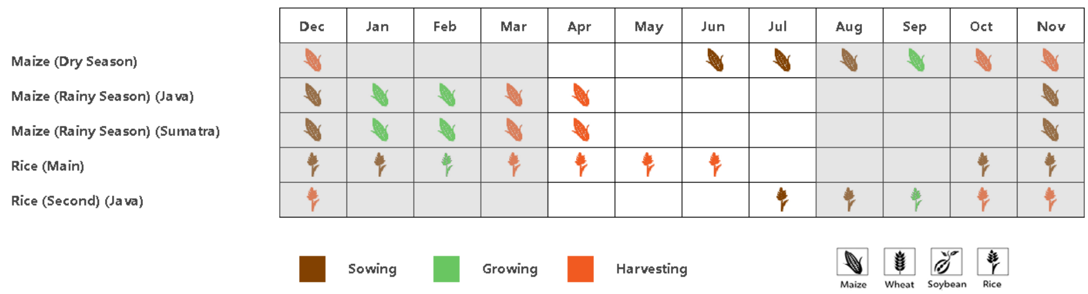
The analysis below focuses on four agro-ecological zones, namely **Sumatra** (92), **Java** (90), the main agricultural region in the country, **Kalimantan** and **Sulawesi** (91) and **West Papua** (93), among which the first three are relevant for crop production. The numbers correspond to the labels on the VCIx and NDVI profile maps. The NDVI tended to be slightly below average in all areas except for **Java** during this monitoring period.

The **Java** region recorded 586 mm of RAIN (-8%), with slightly higher average TEMP at 25.2°C (+0.4°C) and RADPAR of 1176 MJ/m$^2$ (+3%). In agreement with the slightly above-average NDVI values observed in the second half of this monitoring period, BIOMASS (+1%) was also slightly higher than the 5YA and crop prospects are favorable.

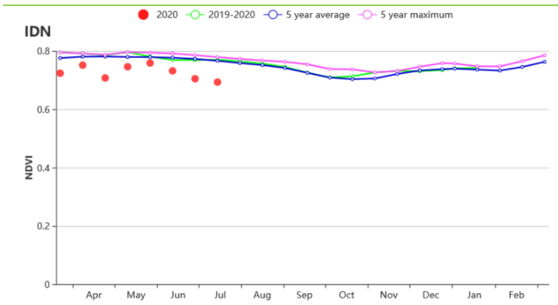
Precipitation (RAIN +8%) and temperature (TEMP +0.2°C) in **Kalimantan** and **Sulawesi** were above the 15-year average. RADPAR was the same as the average for the past 15 years. BIOMASS (+1%) was slightly higher than the average. The abundant precipitation helped create favorable conditions for the planting of the second season crops. However, the NDVI growth curve shows that the overall crop conditions were below average at the end of this monitoring period.

The **Sumatra** region recorded 1108 mm of RAIN (14% higher than the average) and 24.8°C of TEMP (+0.2°C). But RADPAR (-3%) was below the 15-year average during this monitoring period. BIOMASS (-2%) was slightly lower than the average. NDVI was also close to, but slightly below the 5YA for most of this monitoring period. Hence, the crop conditions were normal for this monitoring period.

**Figure 3.19 Indonesia's crop condition, April - July 2020**



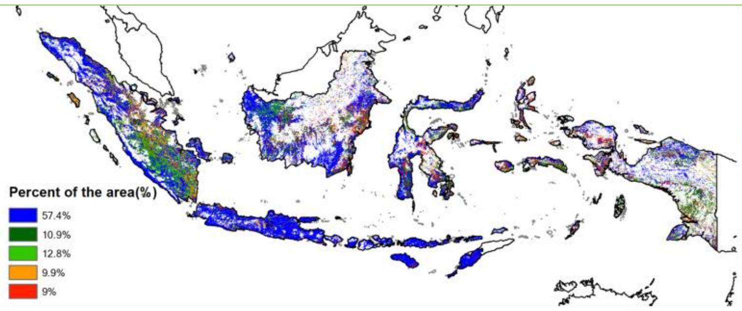

(a). Phenology of major crops

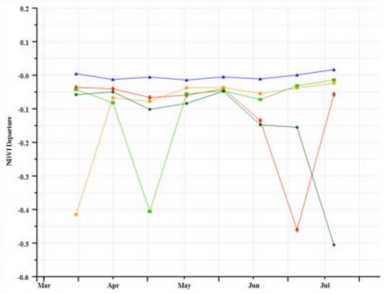




(b) Crop condition development graph based on NDVI

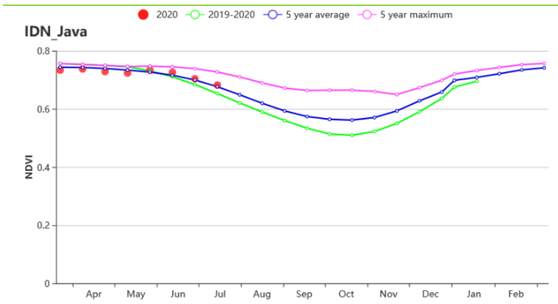
(c) Maximum VCI

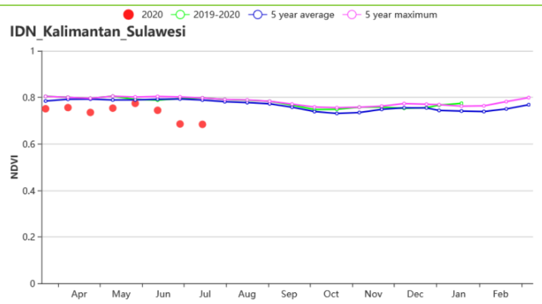


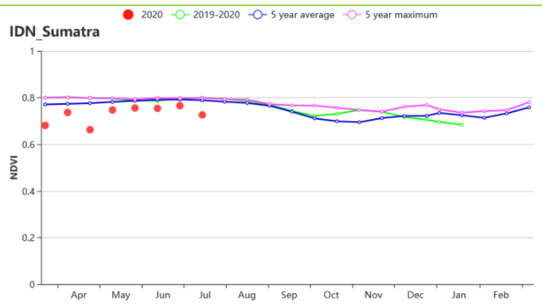

(d) Spatial NDVI patterns compared to 5YA

(e) NDVI profiles




(f) Crop condition development graph based on NDVI (Java (left) and Kalimantan-Sulawesi (right))




(g) Crop condition development graph based on NDVI (Sumatra)

**Table 3.29 Indonesia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2020**

| Region | RAIN | | TEMP | | RADPAR | | BIOMSS | |
|---|---|---|---|---|---|---|---|---|
| | Current (mm) | Departure (%) | Current (°C) | Departure (°C) | Current (MJ/m²) | Departure (%) | Current (gDM/m²) | Departure (%) |
| **Java** | 586 | -8 | 25.2 | 0.4 | 1176 | 3 | 726 | 1 |
| **Kalimantan and Sulawesi** | 1252 | 8 | 24.6 | 0.2 | 1104 | 0 | 728 | 1 |
| **Sumatra** | 1108 | 14 | 24.8 | 0.2 | 1106 | -3 | 734 | -2 |
| **West Papua** | 1635 | 1 | 23.5 | 0.4 | 917 | 3 | 589 | 4 |

**Table 3.30 Indonesia's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2020**

| Region | Cropped arable land fraction | | Maximum VCI |
|---|---|---|---|
| | Current (%) | Departure (%) | Current |
| Java | 99 | 0 | 0.98 |
| Kalimantan and Sulawesi | 100 | 0 | 0.98 |
| Sumatra | 100 | 0 | 0.98 |
| West Papua | 100 | 0 | 0.98 |

AFG AGO ARG AUS BGD BLR BRA CAN DEU EGY ETH FRA GBR HUN IDN **IND** IRN ITA KAZ KEN KGZ KHM LKA MAR MEX MMR MNG MOZ NGA PAK PHL POL ROU RUS THA TUR UKR USA UZB VNM ZAF ZMB

# [IND] India

The current monitoring period covers the harvest of rabi rice and wheat in April and May, as well as the sowing of maize, kharif rice and soybean. The graph of NDVI development indicates that the crop conditions for rabi rice and wheat were favorable. Crop conditions were generally above average and even above the 5-year maximum during this reporting period, as indicated by the graph of NDVI development at the national level.

The CropWatch agroclimatic indicators show that nationwide TEMP and RADPAR were close to average (-0.5°C and -1%, respectively). India recorded abundant RAIN (+15%) after May, which exceeded the 15-year average for the same monitoring period, resulting in a BIOMSS increase by 11% compared with 15YA. Moreover, the overall VCIx was high, with a value of 1.05. As can be seen from the spatial distribution, only the South, Northeast and Northwest recorded values below 0.80. Most of India had high values in VCIx. These spatial patterns of VCIx were thus generally consistent with those of NDVI. Almost all areas experienced continuously above-average crop conditions until June. In July, 63% of the areas recorded below-average crop conditions in the Southwest and Northeast regions due to the heavy precipitation. CALF increased by 12% compared to 5YA. Crop production for this season is estimated to be above average.

The sown area of early spring crops in India increased by 9% from the same period last year. However, in May, India was affected by a second wave of locust plagues and some areas were hit by floods as well. Floods occured mainly in the northeastern region which hampered crop conditions.

**Regional analysis**

India is divided into eight agro-ecological zones: the Deccan Plateau (94), the Eastern coastal region (95), the Gangetic plain (96), Assam and north-eastern regions (97), Agriculture areas in Rajasthan and Gujarat (98), the Western coastal region (99), the North-western dry region (100) and the Western Himalayan region (101).

The four agro-ecological zones of the Deccan Plateau, the Gangetic plain, Agriculture areas in Rajasthan and Gujarat, and the North-western dry region show similar trends in agricultural indices. Compared to the same period of previous years, RAIN had increased significantly, especially in the Gangetic plain (more than +30%). Although TEMP and RADPAR were lower, abundant rainfall compensated for their effects and caused BIOMSS to be much higher than the 15-year average. However, CALF showed different trends. The highest increases had been observed for the Deccan Plateau and agricultural areas in Rajasthan and Gujarat (more than +18%). The graph of NDVI development shows that the crop growth of these four agro-ecological regions during this monitoring period exceeded the 5-year maximum in most months. Generally, the crop production is expected to be above average.

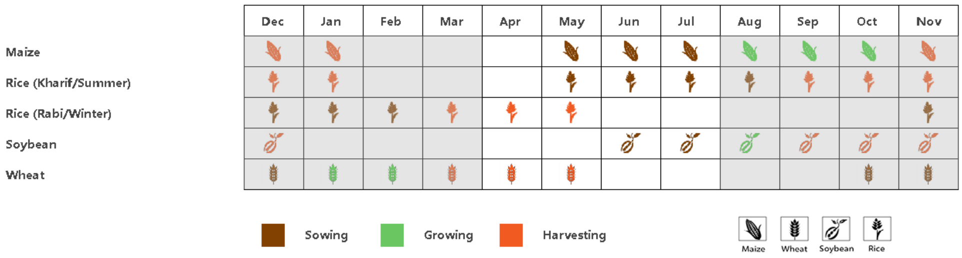
The Eastern coastal region and the Western coastal region recorded similar trends of agricultural indices in this monitoring period. Compared to the same period of previous years, RAIN had increased, especially for the Eastern coastal region (+25%). TEMP was slightly below average (-0.5°C) in the Eastern coastal region and near average (+0.4°C) in the Western coastal region. RADPAR was lower, but BIOMSS still increased. Both regions recorded increases of CALF (+16% and +19%, respectively). VCIx was higher than 1.02. The graph of NDVI development shows that the crop growth for the two regions exceeded the 5-year average. The crop production is expected to be above average.

The Assam and Northeastern region recorded 2250.6 mm of RAIN (+14%), with lower average TEMP at 23.9°C (-0.5°C) and RADPAR of 1051.5 MJ/m² (-7%). BIOMSS was below the 5YA (-9%). Increased rainfall was not enough to compensate for reduced temperature and sunshine. CALF reached 95% which was as average, and VCIx was 0.92. The outlook of crop production in this region is unfavorable due to the heavy precipitation.

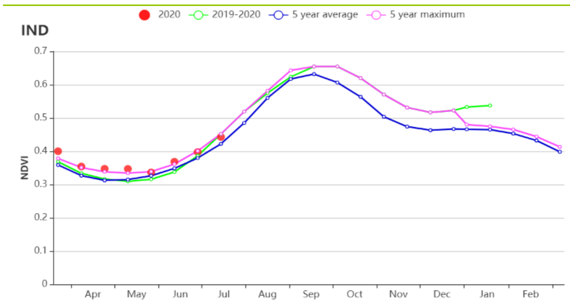
The Western Himalayan region recorded 343 mm of RAIN (-40% below average), with lower average TEMP at 19.1°C (-1.3°C) and RADPAR of 1461 MJ/m² (+1%). The BIOMSS was higher than the average

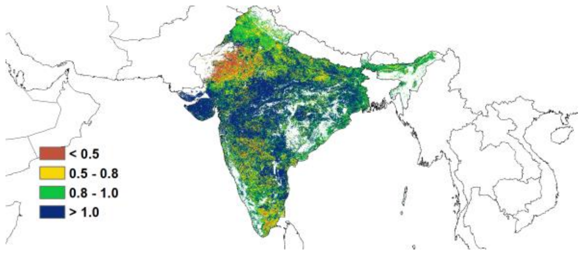
(+3%) due to more sunshine. CALF reached 98% and VCIx was 0.86. Crop condition as assessed by NDVI was above the 5-year average and even exceeded the 5-year maximum in April to May. Therefore, crop production conditions are favorable.

**Figure 3.20 India's crop condition, April - July 2020**

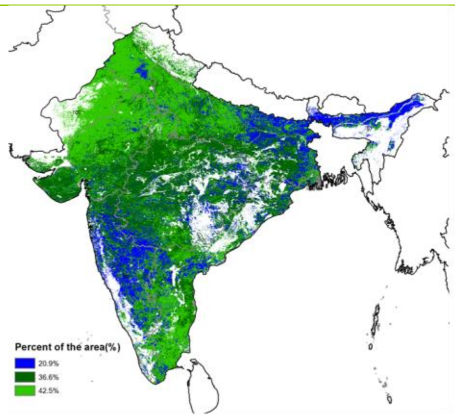


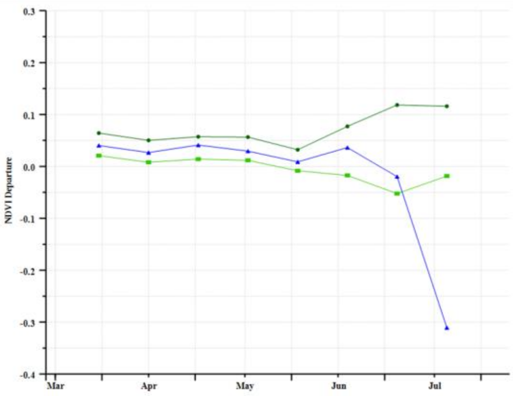

(a). Phenology of major crops



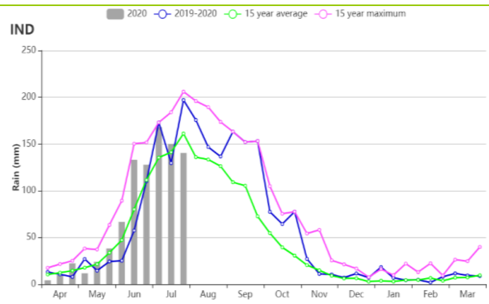



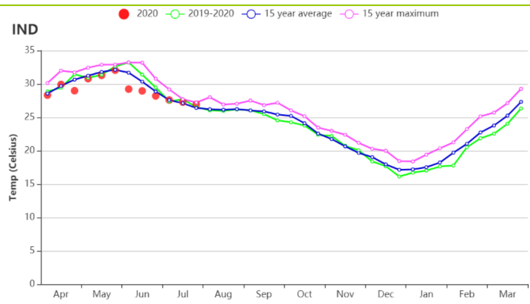

(b) Crop condition development graph based on NDVI (c) Maximum VCI



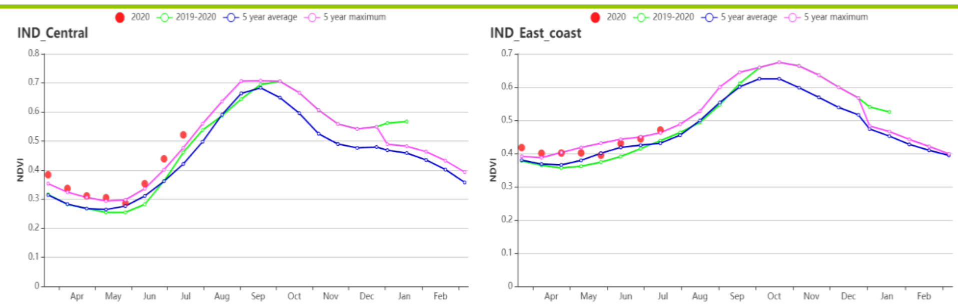




(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles

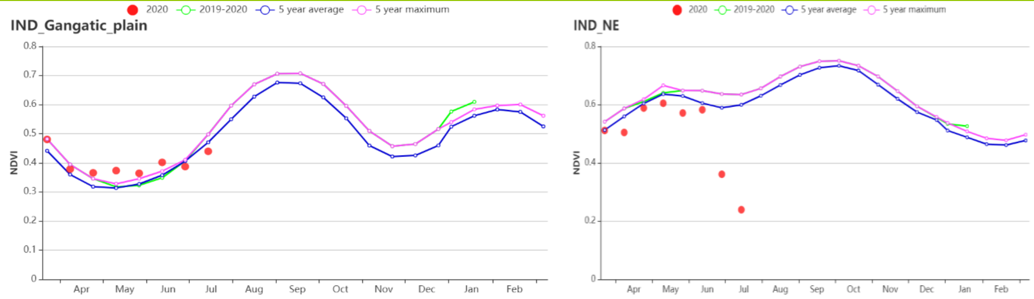


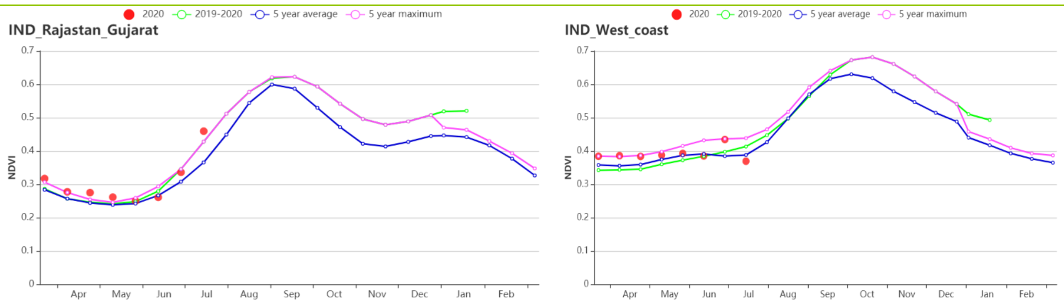

(f) Rainfall profiles (g) Temperature profiles



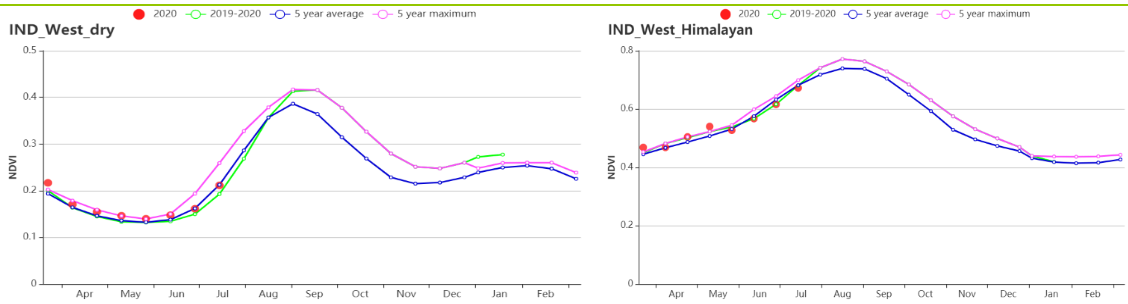

(h) Crop condition development graph based on NDVI (Deccan Plateau (left) and Eastern Coastal Region (right))




(i) Crop condition development graph based on NDVI (Gangetic Plains (left) and Assam and north-eastern regions (right))




(j) Crop condition development graph based on NDVI (Agriculture areas in Rajasthan and Gujarat (left) and Western Coastal Region (right))




(k) Crop condition development graph based on NDVI (North-western dry region (left) and Western Himalayan Region (right))

**Table 3.31 India's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2020**

| Region | RAIN | | TEMP | | RADPAR | | BIOMSS | |
|---|---|---|---|---|---|---|---|---|
| | Current (mm) | Departure (%) | Current (°C) | Departure (°C) | Current (MJ/m²) | Departure (%) | Current (gDM/m²) | Departure (%) |
| Deccan Plateau | 701 | 18 | 31.0 | -0.5 | 1293 | 3 | 728 | |
| Eastern coastal region | 689 | 25 | 30.0 | -0.5 | 1238 | 1 | 744 | |
| Gangetic plain | 770 | 32 | 31.0 | -1.4 | 1312 | -3 | 814 | |
| Assam and north-eastern regions | 2251 | 14 | 24.0 | -0.5 | 1051 | -7 | 633 | |
| Agriculture areas in Rajasthan and Gujarat | 571 | 13 | 32.0 | 0.1 | 1356 | 0 | 646 | |
| Western coastal region | 991 | 2 | 27.0 | 0.4 | 1184 | 0 | 666 | |
| North-western dry region | 161 | 12 | 34.0 | 0.2 | 1454 | -2 | 802 | |
| Western Himalayan region | 343 | -41 | 19.0 | -1.3 | 1462 | 1 | 595 | |

**Table 3.32 India's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2020**

| Region | Cropped arable land fraction | | Maximum VCI |
|---|---|---|---|
| | Current (%) | Departure (%) | Current |
| Deccan Plateau | 86 | 25 | 1.19 |
| Eastern coastal region | 77 | 16 | 1.01 |
| Gangetic plain | 82 | -2 | 0.99 |
| Assam and north-eastern regions | 96 | 0 | 0.92 |
| Agriculture areas in Rajasthan and Gujarat | 62 | 18 | 1.11 |
| Western coastal region | 69 | 19 | 1.02 |
| North-western dry region | 7 | -42 | 0.86 |
| Western Himalayan region | 98 | 0 | 0.86 |

# [IRN] Iran

This monitoring period covers the grain filling period and harvest of winter wheat, as well as the planting and early establishment of the rice crop. According to the NDVI based crop condition development graph, the crop conditions in Iran during this whole monitoring period were better than the 5-year average, even better than 5-year maximum in late April. The cumulative rainfall was 117 mm, which was 33% above average. The average temperature was 21.0°C (0.3°C below average), whereas the photosynthetically active radiation was 1571 MJ/m2 (down 4%). The potential biomass was 10% higher than the 15-year average. The national maximum vegetation condition index (VCIx) was 0.94, while the cropped arable land fraction (CALF) was 34% higher than the average of the past 5-years.

The NDVI spatial patterns show that from April to July, crop conditions in 58.5% of the cropped area were average or above the 5-year average (marked in light green, dark green and orange). 31.5% of the cropped areas (marked in red) experienced slightly below-average crop conditions until the end of the monitoring period, mainly located in west and northwest parts of Iran, including provinces of Khuzestan, Ilam, Lorestan, Kermanshah, Kordestan, and East Azarbaijan. 10% of the cultivated area suffered from below-average crop conditions until the end of the monitoring period, mainly located in northern and northwestern parts of Iran, including the provinces of West Azarbaijan, East Azarbaijan, Ardebil, Gilan, and Mazandaran. The abundant rainfall in April ensured favorable conditions for rice and wheat, as confirmed by the NDVI profiles. The spatial pattern of maximum Vegetation Condition Index (VCIx) was in accord with the spatial distribution of the NDVI profiles.

When it comes to the proportion of NDVI anomaly categories compared with 5-year average, the first four 16-day phases all had more than 20% of the cropped area with slightly below or below average crop conditions. During the 2nd and 6th phase, more than 10% of the cultivated area experienced slightly above or above average crop condition. As for the proportion of VHIm categories compared with 5-year average, more than 90% of the cropped area had no drought at all during the first six weekly phases, then the ratio of cropped area suffering from moderate to severe drought rose gradually to more than 10% during the remaining weekly phases.

In general, crop growth conditions were favorable. All agronomic indicator values were positive.

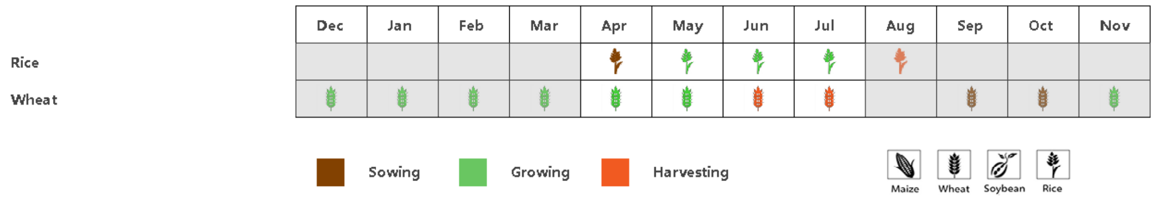
**Regional Analysis**

Based on farming system, climate, and topographic conditions, Iran can be subdivided into three regions, two of which are the main growing areas for crop production, namely the **semi-arid to the subtropical hilly region in the west and the north** and the **coastal lowland in the arid red sea plain area**.

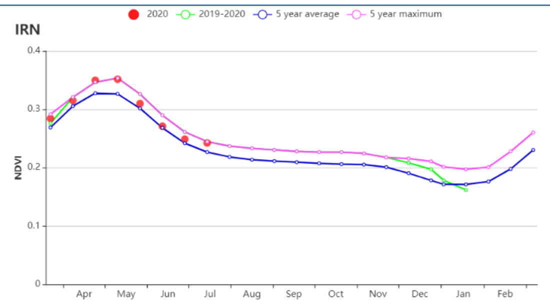
In the **Western and northern semi-arid subtropical hilly areas**, the cumulative precipitation during the monitoring period was 135 mm, 31% higher than average, while the temperature was 19.1°C (-0.4°C) and photosynthetically active radiation (-4%) were both below the 15YA. The potential biomass was 5% higher than average. Crop conditions were better than the 5-year average, even better than the 5-year maximum in late April. The proportion of cultivated land was 44%, which is 30% higher than the 5YA. The average VCIx for this region was 0.94, indicating favorable crop conditions.

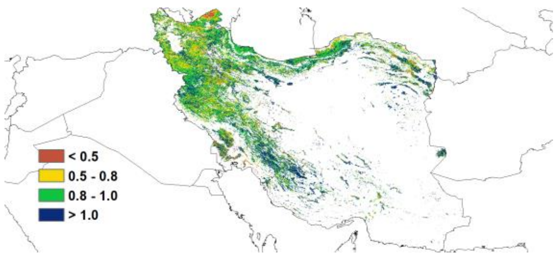
In the **Coastal lowland and plain areas of the arid Red Sea**, the temperature was 0.1°C above average, while the accumulated precipitation was 6% below average and the photosynthetically active radiation (-2%) was also below average. The potential biomass was 33% higher than the 15-year average. Crop conditions were generally better than the 5-year average. During the monitoring period, CALF was 95% higher than the average of the last 5-years, and the VCIx was 0.93, also indicating a good crop prospect.

**Figure 3.21 Iran's crop condition, April - July 2020**



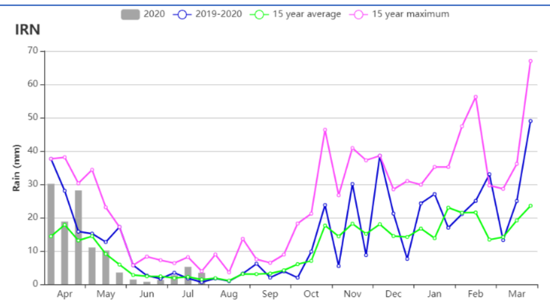

(a) Phenology of major crops

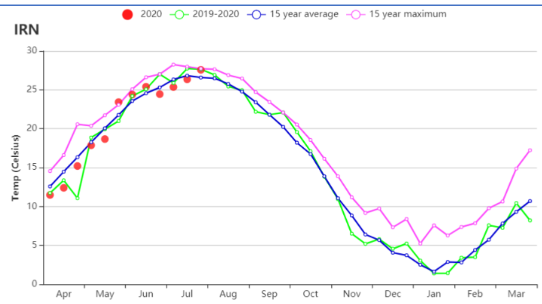



(b) Crop condition development graph based on NDVI

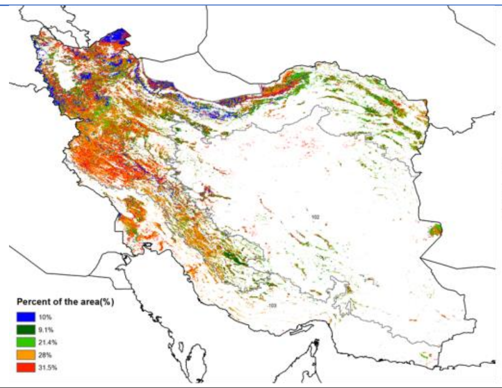
(c) Maximum VCI

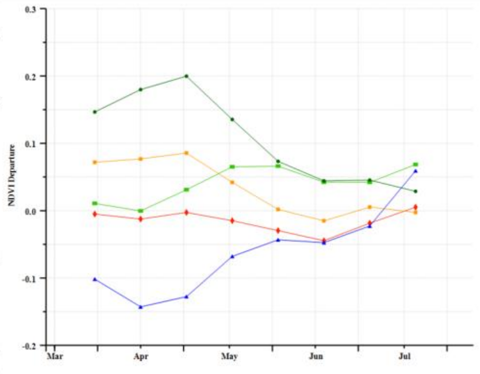



(d) Rainfall time series profile

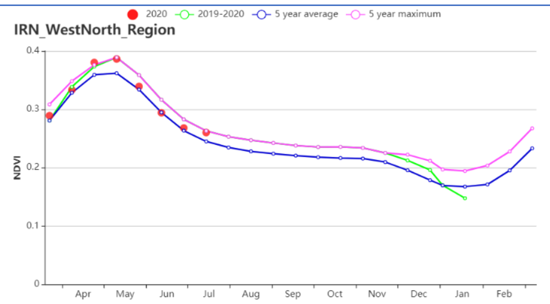
(e) Temperature time series profile

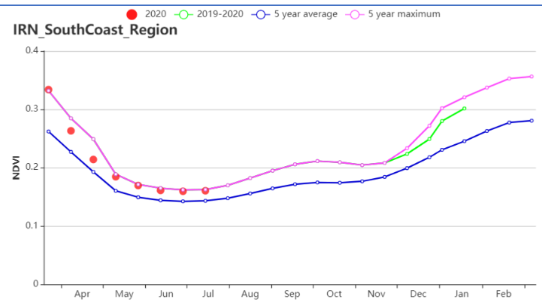


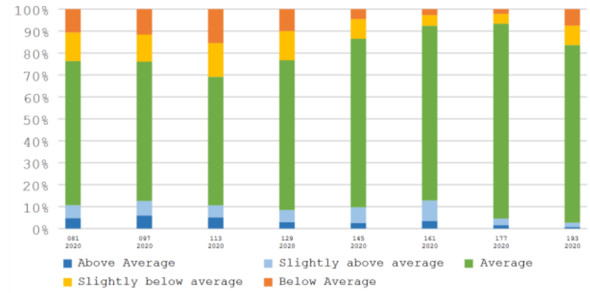

(f) Spatial NDVI patterns compared to 5YA

(g) NDVI profiles

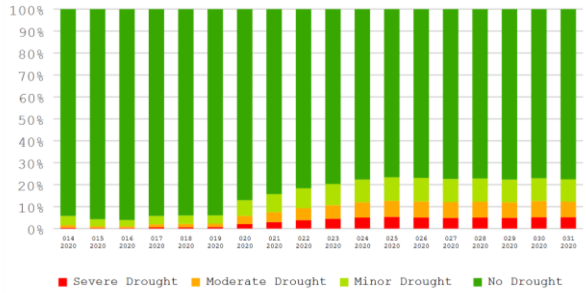



(h) Crop condition development graph based on NDVI (Semi-arid to sub-tropical hills of the west and north region (left) and Arid Red Sea coastal low hills and plains region (right))




(i) Proportion of NDVI anomaly categories compared with 5YA




(j) Proportion of VHIm categories compared with 5YA

**Table 3.33 Iran's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2020**

| Region | RAIN | | TEMP | | RADPAR | | BIOMSS | |
|---|---|---|---|---|---|---|---|---|
| | Current (mm) | Departure (%) | Current (°C) | Departure (°C) | Current (MJ/m²) | Departure (%) | Current (gDM/m²) | Departure (%) |
| Semi-arid to sub-tropical hills of the west and north | 135 | 31 | 19.1 | -0.4 | 1555 | -4 | 481 | 5 |
| Arid Red Sea coastal low hills and plains | 26 | -6 | 31.8 | 0.1 | 1611 | -2 | 416 | 33 |

**Table 3.34 Iran's agronomic indicators by sub-national regions, current season's value and departure from 5YA, April - July 2020**

| Region | Cropped arable land fraction | | Maximum VCI |
|---|---|---|---|
| | Current (%) | Departure from 5YA (%) | Current |
| Semi-arid to sub-tropical hills of the west and north | 44 | 30 | 0.94 |
| Arid Red Sea coastal low hills and plains | 18 | 95 | 0.93 |

AFG AGO ARG AUS BGD BLR BRA CAN DEU EGY ETH FRA GBR HUN IDN IND IRN **ITA** KAZ KEN KGZ KHM LKA MAR MEX MMR MNG MOZ NGA PAK PHL POL ROU RUS THA TUR UKR USA UZB VNM ZAF ZMB

# [ITA] Italy

During this reporting period, winter wheat was harvested in June and July while summer crops, especially maize, rice, sunflower and soybeans are still in the field. According to the NDVI development graph, crop conditions were below average in April and May and close to average in June and July.

Rainfall (-10%) and temperature (-0.2°C) were below and solar radiation (RADPAR +0.3%) above the 15YA. This resulted in a 5% reduction in potential biomass production. CALF was 99%, and VCIx was 0.90. The overall crop conditions during this period were near average.

About 19.4% of the crops, mainly located in the Po Valley in the Northwest, showed a positive departure from the 5-year trend. Another 30.6%, which trended near average, was predominantly concentrated in the hilly region, stretching from the north to the south along the center of the peninsula. About 16.1% of the area, located in the northeast, center, and east constantly stayed below average. The rice fields (12.2%) in the Po Valley are planted in late April or early May and the steady increase in NDVI depicts the growth of the rice crops. The wheat fields, which are followed by a summer fallow, are depicted by the curve representing 21% of the area. They are in the south of Italy.

**Regional analysis**

Based on cropping systems, climatic zones and topographic conditions, four sub-national regions can be distinguished for Italy. These four regions are East coast, Po Valley, Islands and Western Italy.

On **the East coast**, RAIN, TEMP and RADPAR were all below average (RAIN -8%, TEMP -0.5°C, RADPAR -2%). Biomass was the same as the 5YA. Overall conditions stayed close to average in this region: VCIx is 0.89 and high CALF (0.99) indicate full crop cultivation. According to the NDVI development graph, crop conditions were below but close to the 5YA average during this growth period. Crop production is expected to be near average.

Crop production in the **Po Valley** was mainly affected by low rainfall (RAIN -9%) and below average temperature (-0.2°C). RADPAR increased by 3% as compared to the 15YA, which resulted in a slight BIOMSS decrease (-2%). The NDVI curve closely followed the longterm average. The area has a high CALF (100%) and the VCIx of 0.90 for this region also shows favorable crop prospects. The output for winter wheat is expected to be average.

For the **Islands** warmer temperatures (+0.2°C) and less rainfall (RAIN -20%) were observed. Together with lower RADPAR (-2%), less biomass (BIOMSS -11%) was estimated. NDVI followed the average trend. The VCIx was 0.91 and CALF reached 0.98. Hence, near-average conditions were observed.

The situation in **Western Italy** is as follows: Rainfall (RAIN -12%) and temperature (TEMP -0.3°C) were below the 15YA. Accordingly, BIOMSS (-6%) was also lower. As in the other regions, the NDVI curve followed the average trend. The area has a high CALF (100%) and VCIx was 0.89. Crop conditions were normal.

Winter wheat production can be expected to be near average and the prospects for the summer crops also follow the long-term average.

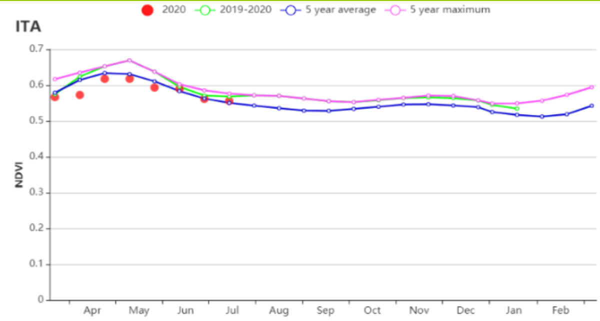
**Figure 3.22 Italy's crop condition, April -July2020**

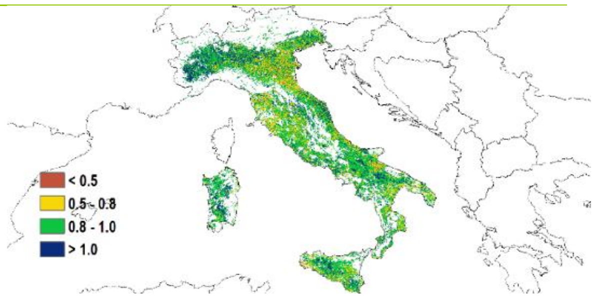
| | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Winter wheat | | | | | | | | | | | | |

Sowing Growing Harvesting

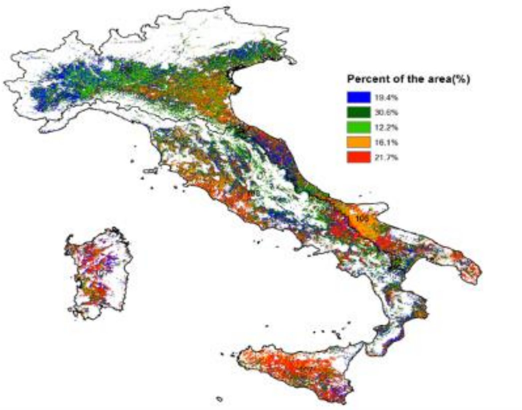
Maize Wheat Soybean Rice

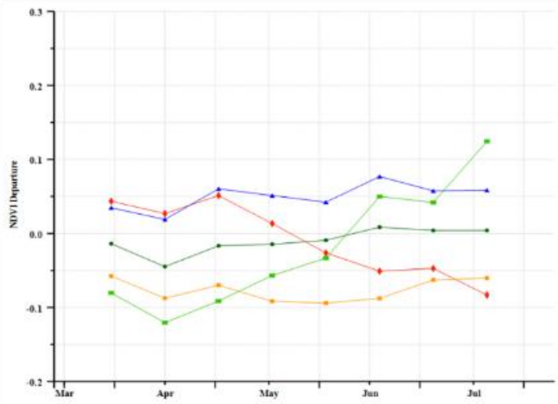
(a). Phenology of major crops



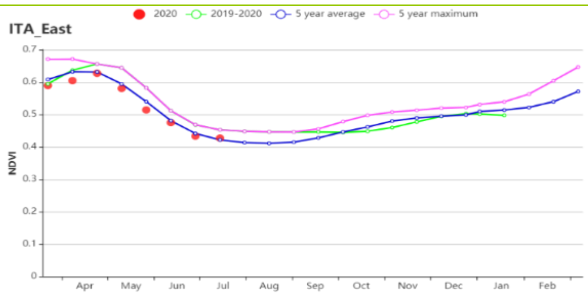



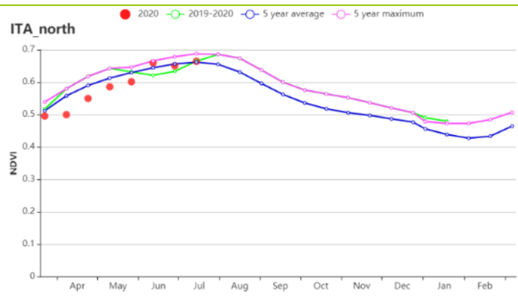

(b) Crop condition development graph based on NDVI (c) Maximum VCI



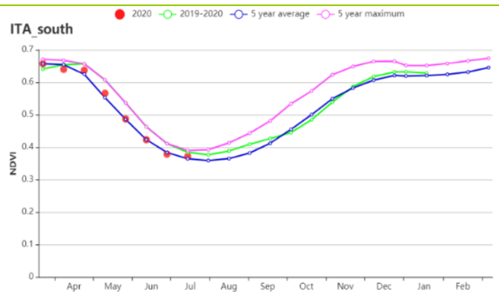



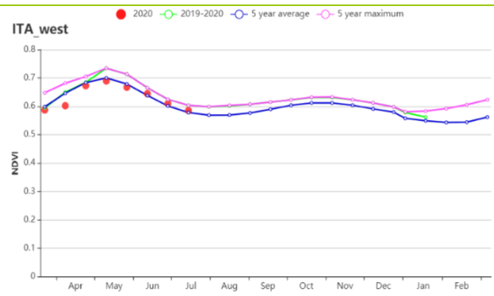

(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles




(f) Crop condition development graph based on NDVI (East coast Region (left) and Po Valley Region (right))




(g) Crop condition development graph based on NDVI (Islands Region (left) and Western Italy Ragion (right))

**Table 3.35 Italy's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April -July 2020**

| Region | RAIN | | TEMP | | RADPAR | | BIOMSS | |
|---|---|---|---|---|---|---|---|---|
| | Current (mm) | Departure (%) | Current (°C) | Departure (°C) | Current ($MJ/m^2$) | Departure (%) | Current ($gDM/m^2$) | Departure (%) |
| **East Coast** | 258 | -8 | 17.4 | -0.5 | 1406 | -2 | 669 | 0 |
| **Po Valley** | 508 | -9 | 15.4 | -0.2 | 1366 | 3 | 553 | 2 |
| **Islands** | 93 | -20 | 19.4 | 0.2 | 1508 | -2 | 562 | -11 |
| **Western Italy** | 263 | -12 | 16.8 | -0.3 | 1425 | 0 | 590 | -6 |

**Table 3.36 Italy's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2020**

| Region | Cropped arable land fraction | | Maximum VCI |
|---|---|---|---|
| | Current (%) | Departure (%) | Current |
| **East Coast** | 99 | 0 | 0.89 |
| **Po Valley** | 100 | 0 | 0.90 |
| **Islands** | 98 | 0 | 0.91 |
| **Western Italy** | 100 | 0 | 0.89 |

# [KAZ] Kazakhstan

The crop conditions were generally above or close to average from April to May, and then changed to below average from late June to July. This report covers the sowing and growth of spring wheat In Kazakhstan. In June, harvest of winter rye and winter wheat started in the southern regions of the country.

Compared to the 15-year average, accumulated rainfall and temperature were above average (RAIN +41%, TEMP +0.3°C), while radiation was close to average. Precipitation was above the 15-year maximum in late April and mid-May. The temperature fluctuated in the reporting period: above average from late April to May and mid-July, below average from mid-June to early July and late July. The agro-climatic conditions resulted in an increase in the BIOMSS index by 2%.

The national average maximum VCI index was 0.77, and the Cropped Arable Land Fraction (CALF) went down by 4% over the recent five-year average. The spatial VCIx map matched well with the national crop condition development graphs. Crop conditions on about 33.7% of croplands were below average from May to early July, mainly in most of Batysdy Kazakhstan, some parts of Kostanay, Soltustik Kazakhstan, Akmola, Pavlodar, and Almaty States. About 47.3% of croplands, which were distributed across the central northern region, and the south of Ongtustik Kazakhstan and Almaty States, experienced favorable crop conditions from late April to May and dropped to below average from June to early July. Remaining croplands (about 19%) experienced favorable crop conditions from late April to July, mainly in some patches of Kostanay, Soltustik Kazakhstan, Akmola, Shyghys Kazakhstan States. The negative deviation of NDVI from the 5YA starting in June indicates that conditions for spring wheat started to deteriorate and that its prospects are below average.

**Regional analysis**

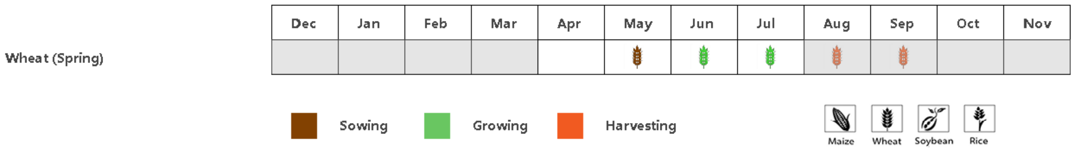
Based on cropping systems, climatic zones and topographic conditions, four sub-national agro-ecological regions can be distinguished for Kazakhstan, among which three are relevant for crop cultivation: the Northern region (112), the Eastern plateau and southeastern region (111) and the South region (110).

The **Northern region** is the main spring wheat production area. Accumulated rainfall (RAIN +48%) and temperature (TEMP +0.5°C) were above average, but RADPAR was close to average. The agro-climatic indicators resulted in an increase of the BIOMSS index by 4%. According to NDVI profiles, crop conditions were close to or above average from April to May, but dropped to below average from June to July. The average VCIx for this region was 0.75, and the proportion of cultivated land was 4% lower than the average. Production is estimated to be below average.

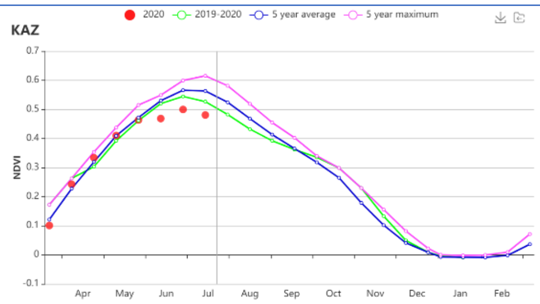
Crop conditions in the **Eastern plateau** and **Southeastern region** were mostly below average during this reporting period. The accumulated rainfall in the region was above average (32%), while radiation was below average (RADPAR -3%). The average VCIx for this region was 0.83, and CALF was below average by 4%. Outputs for spring wheat are expected to be below average.

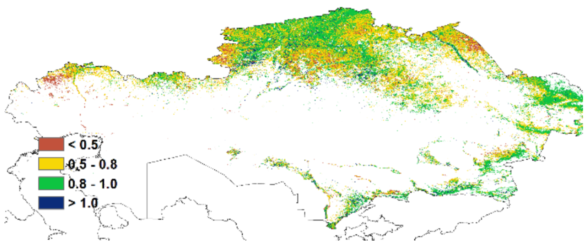
The **South region** received 155 mm of rainfall, which was far above average (up 78%). Temperature and radiation were below average. The average VCIx for this region was 0.79. NDVI profiles show the poor crop condition from April to July.

**Figure 3.23 Kazakhstan's crop condition, April-July 2020**



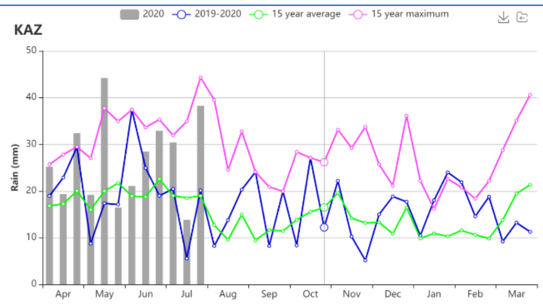

(a). Phenology of major crops

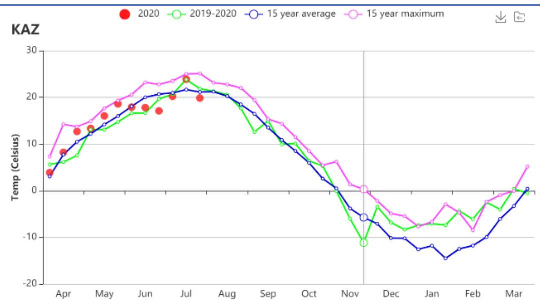



(b) Crop condition development graph based on NDVI

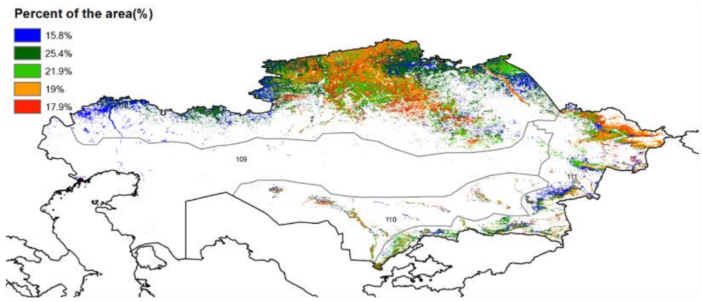
(c) Maximum VCI

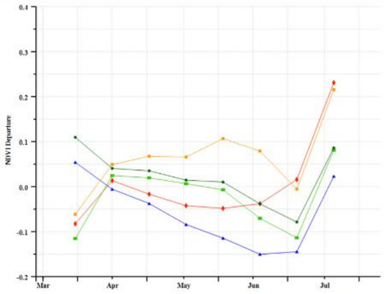



(d) Rainfall dex

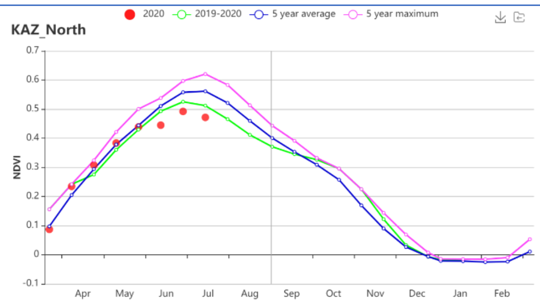
(e) Temperature Index

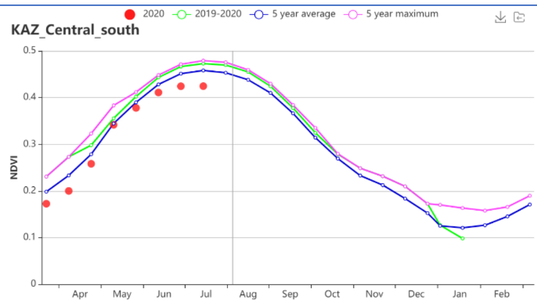


(f) Spatial NDVI patterns compared to 5YA

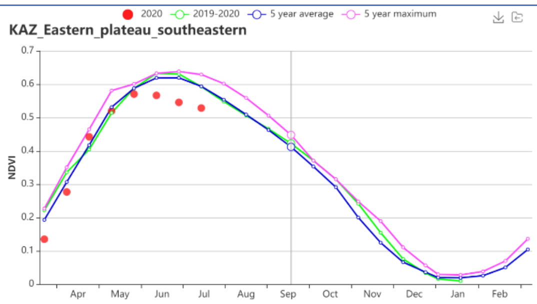
(g) NDVI profiles




(h) Crop condition development graph based on NDVI (Northern zone)

(i) Crop condition development graph based on NDVI (South zone)




(j) Crop condition development graph based on NDVI (Eastern plateau and southeastern zone)

**Table 3.37 Kazakhstan agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April-July 2020**

| Region | RAIN | | TEMP | | RADPAR | | BIOMSS | |
|---|---|---|---|---|---|---|---|---|
| | Current (mm) | Departure (%) | Current (°C) | Departure (°C) | Current (MJ/m²) | Departure (%) | Current (gDM/m²) | Departure (%) |
| Northern region | 299 | 48 | 15.6 | 0.5 | 1254 | 0 | 561 | 4 |
| Eastern plateau and southeastern region | 416 | 32 | 14.9 | 0.0 | 1376 | -3 | 549 | -1 |
| South region | 155 | 78 | 22.5 | -0.1 | 1473 | -3 | 685 | -2 |

**Table 3.38 Kazakhstan, agronomic indicators by sub-national regions, current season's values and departure from 5YA, April-July 2020**

| Region | Cropped arable land fraction | | Maximum VCI |
|---|---|---|---|
| | Current (%) | Departure (%) | Current |
| Northern region | 85 | -4 | 0.75 |
| Eastern plateau and southeastern region | 91 | -4 | 0.83 |
| South region | 61 | 0 | 0.79 |

# [KEN] Kenya

Kenya has a short- a long-rain season. The long-rain crops (mostly maize and wheat) are planted from March to April to be harvested in October and November. For this reporting period, the national total rainfall was recorded at 838 mm, which is above the 15YA by 41%. Both the temperature (TEMP, -0.5°C) and RADPAR (-4%) were below average. Estimated biomass production was 4% below the 15YA. The cropped arable land fraction remained constant and CALF increased by 5%. The NDVI development graph at the national level stayed above average during the entire monitoring period. According to the NDVI clusters and the map of NDVI profiles, 90.7% of the country experienced favorable crop conditions from April - July. The spatial NDVI patterns indicate that NDVI was above average in the central areas. This spatial pattern was only partially reflected by VCIx. Its national average had reached 0.99. It was slightly lower in the pastoral areas of the Rift Valley (Laikipia, Nakuru, and Trans-Nzioia), where wheat is an important crop, but also in some western areas, for instance in Bungoma, where maize and cattle are the main-stays of the agricultural economy. All in all, the conditions were favorable.

### Regional analysis

Considering the cropping system, climatic zones and topographic conditions we divided this country into four agro-ecological zones (AEZ): The Coast, Highland agriculture zone, Northern rangelands, and Southwest.

### Coast

The Coast includes the districts of Kilifi, Kwale, and Malindi. During this reporting period the total amount of rainfall was 302 mm, 9% below average. This led to a slight drop in total biomass production (-3%). The temperature (+0.1°C) and RADPAR (-1%) were near average. The Cropped arable land fraction increased by 2%. The NDVI-based crop condition development was above average in the first part and then dropped to below average in June and July. The maximum VCI was 1.01. Overall, the coastal area had favorable conditions for livestock and crops.

### Highland agriculture zone

In this zone, the total rainfall during the reporting period was recorded at 897 mm, 44% above average, whereas the temperature was below average (-0.4°C). Estimated biomass production decreased by 4%. The maximum VCIx value was recorded at 0.99. The NDVI-based Crop condition development graph shows that the NDVI profile was above the five years average during the entire monitoring period. Moreover, large parts of the arable land in this region have high VCIx values, indicating good crop conditions. Overall, crop conditions were favorable for this region.

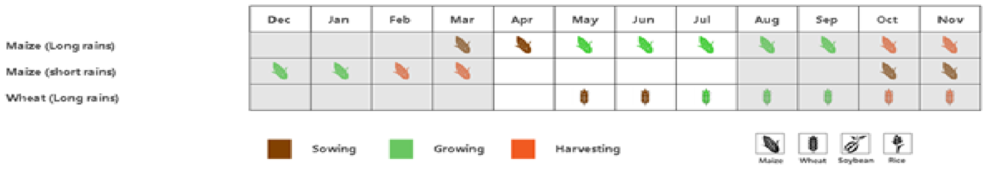
### Northern rangelands

The Northern rangeland covers the districts Turkana, Samburu, and Baringo. Rainfall (+53%) was above average, wheras temperatures (-0.4°C) and solar radiation (-4%) were slightly below the 15YA. As a result, estimated biomass (-3%) was also slightly lower. The NDVI development curve stayed above the average of the last 5 years. The maximum VCI was at 1.06. The cropped arable land fraction rose by 25%. This region is mainly used by pastoralists. Conditions for livestock production were favorable.

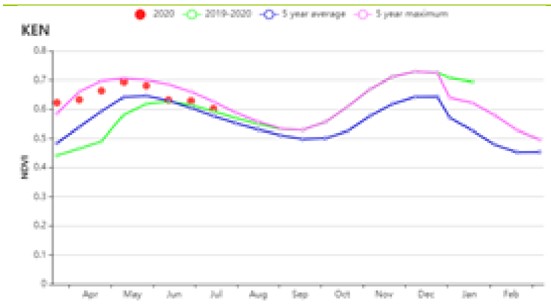
### South-west

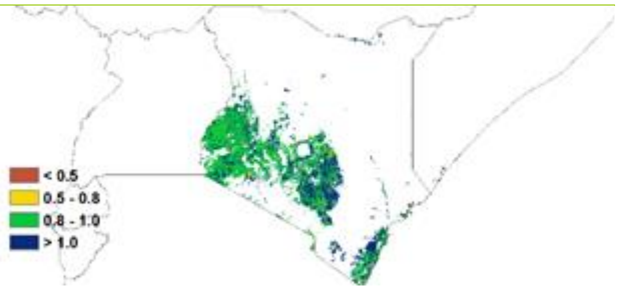
The South-west districts include Kisumu, Migori, Siaya, and Busia. These districts are major producers of wheat and maize. In the costal area, the total amount of rainfall was high at 1375 mm (+44%). The other parameters, temperature (-1.1°C), RADPAR (-3%) and the estimated biomass (-9%) were below average. The Cropped arable land fraction remained constant. The NDVI development curve was above the 5YA throughout this monitoring period. The maximum observed VCI was 0.95. Overall, conditions are assessed as favorable.

**Figure 3.24 Kenya's crop condition, April - July 2020**



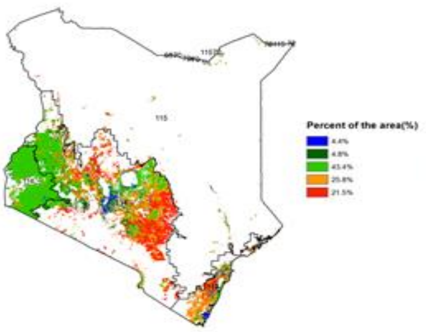

(a). Phenology of major crops

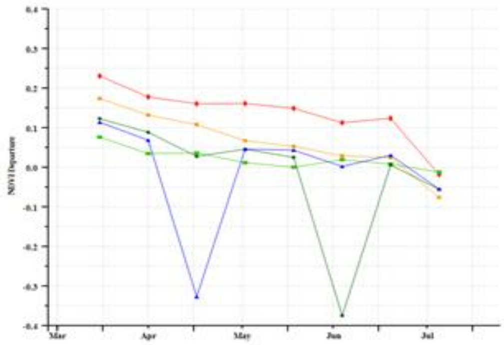



(b) Crop condition development graph based on NDVI

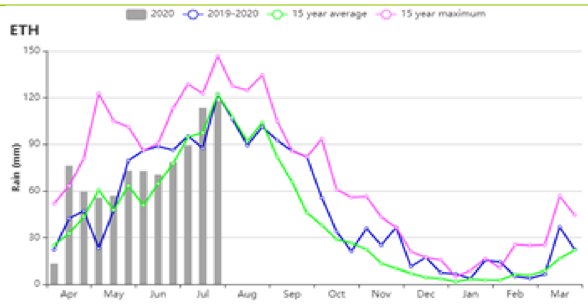
(c) Maximum VCI

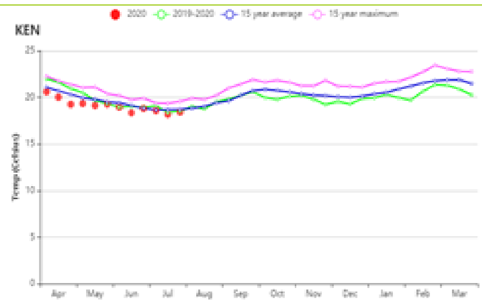



(d) Spatial NDVI patterns compared to 5YA

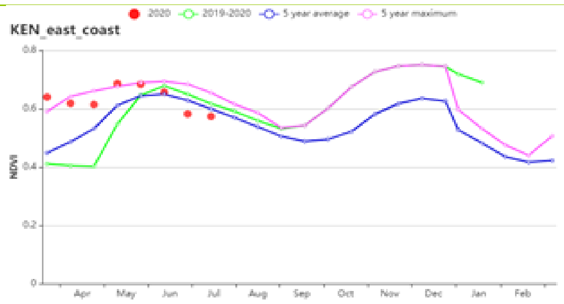
(e) NDVI profiles

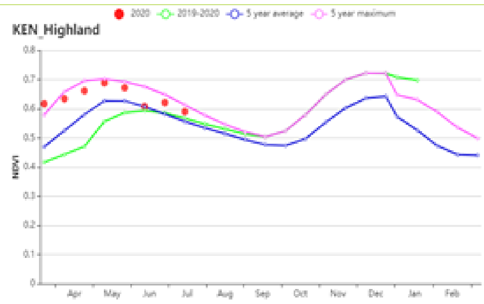


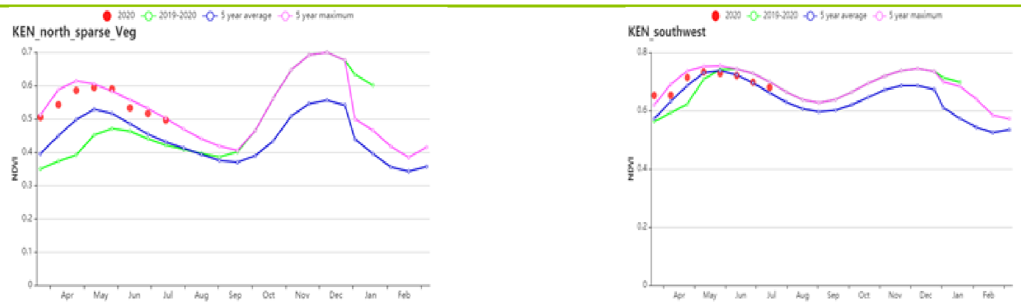

(f)Rainfall time series

(g) Temperature time series




(h) Crop condition development graph based on NDVI (east coast(left)and Highland agriculture zone(right))



(i) Crop condition development graph based on NDVI (Northern region with sparse vegetation(left), Southwest of Kenya(right))

**Table 3.39 Kenya's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2020**

| Region | RAIN | | TEMP | | RADPAR | | BIOMSS | |
|---|---|---|---|---|---|---|---|---|
| | Current (mm) | Departure (%) | Current (°C) | Departure (°C) | Current (MJ/m²) | Departure (%) | Departure (%) | Current (°C) |
| **Coast** | 302 | -9 | 25.0 | 0.1 | 1129 | -1 | 718 | -3 |
| **Highland agriculture zone** | 897 | 44 | 17.8 | -0.4 | 1042 | -4 | 497 | -4 |
| **Northern rangelands** | 646 | 53 | 22.2 | -0.4 | 1148 | -4 | 670 | -3 |
| **South-west** | 1375 | 44 | 17.8 | -1.1 | 1121 | -3 | 523 | -9 |

**Table 3.40 Kenya's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2020**

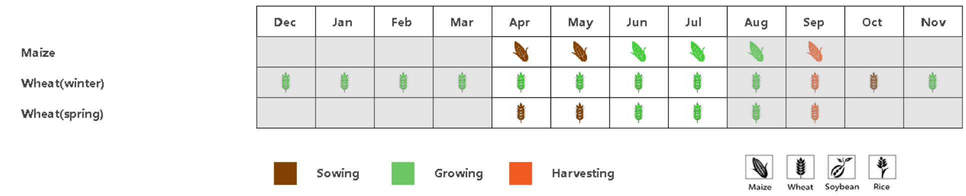
| Region | Cropped arable land fraction | | Maximum VCI |
|---|---|---|---|
| | Current (%) | Departure (%) | Current |
| **Coast** | 100 | 2 | 1.01 |
| **Highland agriculture zone** | 100 | 6 | 0.99 |
| **Northern rangelands** | 97 | 25 | 1.06 |
| **South-west** | 100 | 0 | 0.95 |

AFG AGO ARG AUS BGD BLR BRA CAN DEU EGY ETH FRA GBR HUN IDN IND IRN ITA KAZ KEN **KGZ** KHM LKA MAR MEX MMR MNG MOZ NGA PAK PHL POL ROU RUS THA TUR UKR USA UZB VNM ZAF ZMB

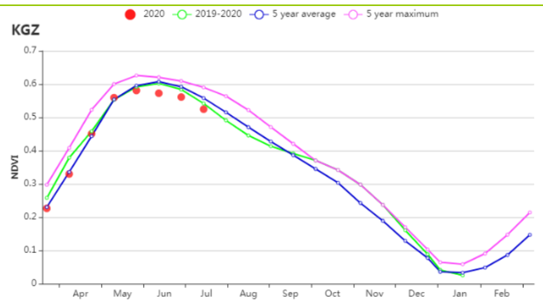
# [KGZ] Kyrgyzstan

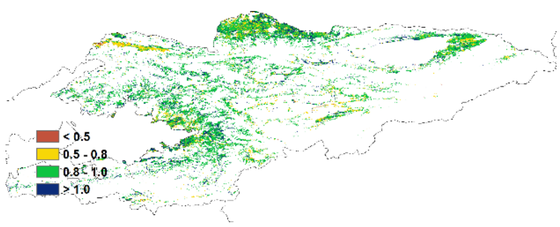
The reporting period covers the sowing and growing stages of maize and the growth and harvest of wheat. Among the CropWatch agro-climatic indicators, RAIN (+29%) and RADPAR (+1%) were above average, while TEMP (-0.4°C) was slightly below average. The combination of the factors resulted in below average BIOMSS (-4%) compared to the 15YA. As we can see from the figure f, the precipitation for the analyzed period was higher than the 15-year average and the temperature (figure g) was lower than the 15-year average. The lower tempreature was favorable for pastures, but due to the lack of heat, the glaciers were melting more slowly resulting in a hydrological drought caused by low water levels in the rivers. That influences irrigation and therefore, NDVI for June and July was slightly lower than the average of the last 5 years. The spatial NDVI clustering profile shows that in the northern region, the large area marked with red and blue color experienced a decrease from May to June, and an increase in July. In the eastern region, the area marked with dark green showed average or above average conditions. This situation is largely confirmed by the VCIx map which shows high values (>0.8) in the Chuy, Issyk-Kul, and Osh, Batken regions, while low values were observed in the Talas Region and the central part of Naryn Region. CALF increased by 1% and the nationwide VCIx average was 0.90, which is in line with the favorable NDVI trend. Crop conditions in Kyrgyzstan can be assessed as favorable. Good wheat yields can be expected and maize will be harvested in August.

**Figure 3.25 Kyrgyzstan's crop condition, April - July 2020**

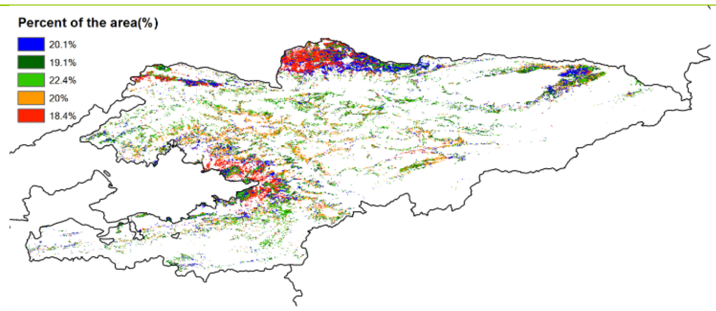


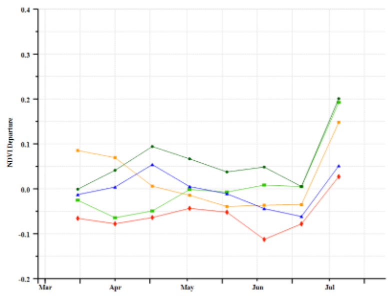

(a). Phenology of major crops



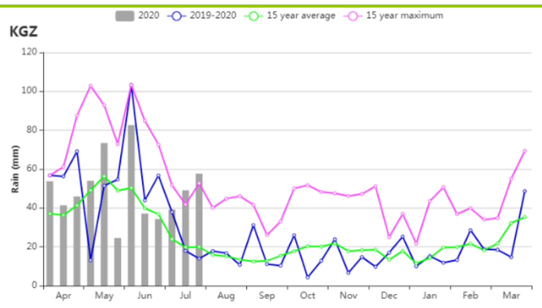




(b) Crop condition development graph based on NDVI (c) Maximum VCI

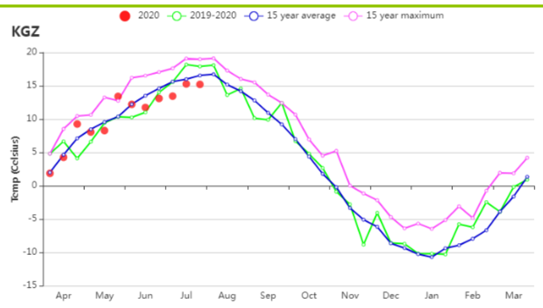



(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles




(f) Rainfall profiles




(g) Temperature profiles

**Table 3.41 Kyrgyzstan agro-climatic indicators, current season's values and departure from 15YA, April - July 2020**

| Region | RAIN | | TEMP | | RADPAR | | BIOMSS | |
|---|---|---|---|---|---|---|---|---|
| | Current (mm) | Departure (%) | Current (°C) | Departure (°C) | Current (MJ/m²) | Departure (%) | Current (gDM/m²) | Departure (%) |
| **Kyrgyzstan** | 592 | 29 | 10.5 | -0.4 | 1419 | -4 | 452 | |

**Table 3.42 Kyrgyzstan agronomic indicators, current season's values and departure from 5YA, April - July 202**

| Region | Cropped arable land fraction | | Maximum VCI |
|---|---|---|---|
| | Current (%) | Departure (%) | Current |
| **Kyrgyzstan** | 98 | 1 | 0.90 |

# [KHM] Cambodia

The wet season in Cambodia usually lasts from May to October. Within this monitoring period, the Early Rice (dry season) and Dry Season Maize were harvested in the end of April. The beginning of the wet season governs the planting of the wide variety of rice that is grown in this country. Wet Season Maize and Early Season Rice are planted in May, followed by Floating Rice and Medium Rice. Wet Season Maize reached silking by the end of this monitoring period. Soybean reached maturity by late July.

The overall rainfall in this period was less than the average (RAIN -19%) while the temperature was 0.8°C above the 15YA. The rainfall deficit was mainly due to below-average rainfall in April, May and early June. It subsequently reached average levels. The drought conditions were exacerbated by the prolonged record low water levels of the Mekong River. The inflow of water from the Mekong River into the Tonle Sap Lake usually starts in May. This year, the reversed flow has not yet started as of August 3, 2020. The RADPAR was 4% above the 15YA. Estimated biomass for the country was 5% above the 15YA, but it was 2% below the 15YA for the important Tonle Sap Lake region.

The crop condition development graph based on NDVI for Cambodia reveals the poor crop conditions during the period from April to June. Conditions improved to average in July. VCIx nationwide reached 0.88. It varied greatly within the regions. The NDVI development curve stayed below the trend of the 15YA until the end of June. This is probably due to the delayed planting of Early Rice and Floating Rice. The NDVI departure clustering map and its development profiles reveal the noticeable changes of crop condition across regions and time. There are two main remarkable areas where the NDVI departure across the period was significant: As shown in Figure 8, the blue area has excellent crop conditions (12.8% of the area), where the NDVI departure was above the average and shows an increasing trend. The red and orange color region (36.7%) represents poor crop conditions.

The proportion of NDVI anomaly categories also shows the noticeable changes of crop conditions. It reveals that 25% of cropped land was below or slightly below average, while 30% of cropped land was above or slightly above the average. As seen in Figure 9, cropped land with poor conditions was mainly distributed around the Tonle Sap region and the southern part of the Mekong valley. The cropped land with above average crop conditions was mainly distributed in the eastern part of the Mekong Valley.

Drought conditions caused a delay in planting in May and slow crop development. Conditions returned to average by the end of July. It remains to be seen whether farmers were able to fully overcome the challenges posed by the lack of water and whether this will have an impact on rice production in Cambodia.

**Regional analysis**

**Tonle-Sap region:**

This region is mostly flat and is the main rice production region of Cambodia. The rainfall was 13% below average, temperature was 0.9°C above average and RADPAR was near average compared to the 15YA. Serious rainfall deficits occurred in April and May. The NDVI development profile reflects the impact of lack of rainfall and lack of water inflow from the Mekong River into the lake region. NDVI was far below the 5YA until mid June, but reached above-average levels by late July. During this period, 90% of arable land was cropped and the fraction of cropped land was only 1% below the average compared to the 5YA.

**Northern Plain and Northeast:**

This region is an area of hilly highland and mountains such as the Dangrek Mountains. It is mostly covered by forest and some major crops such as rubber, cassava, cashew nuts and avocado. During this period, the rainfall was 25% below the average while the temperature (+0.8°C) and RADPAR (+7%) were above the 15YA. Due to the serious deficit of rainfall in this monitoring period, crop conditions were below average as indicated by NDVI development profile. CALF was high, at 99%.

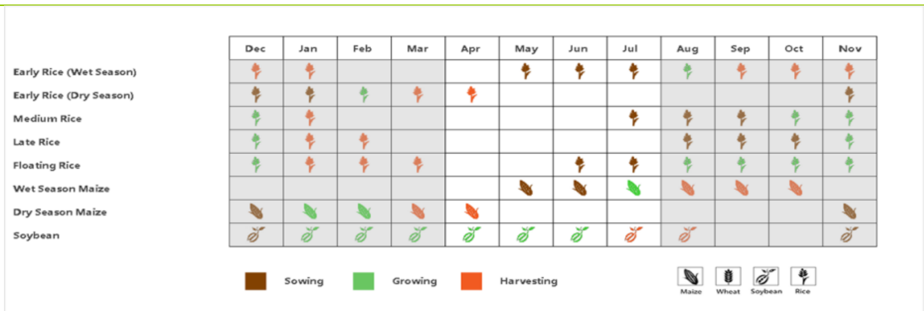
**Mekong valley between Tonle-sap and Vietnam border:**

This region mainly includes the Mekong Delta along the river. The area is generally flat and the major crop is rice. The rainfall was 14% below the average while temperature and RADPAR were 0.8°C and 2% above the 15YA. According to the NDVI development graph, the crop conditions were below the 5YA from April to the middle of June and recovered to last year's level by the end of July. During this period, 89% of arable land was cropped, near the 5YA.

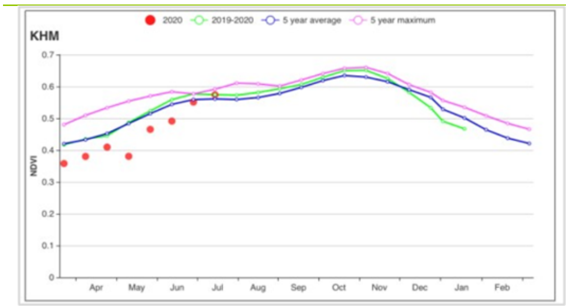
Southwest Hilly region:

This region contains a range of hills and mountains with forests that cover the Cardamom and Elephant Mountains. Various crops are grown, spices (pepper) and fruits (durian). The rainfall was 16% below average, while temperature (+ 0.8°C) and RADPAR (+6%) were above the 15YA. Due to the significant increase of RADPAR, the potential biomass was 7% above the 15YA. The NDVI development profile in this region indicates that crop conditions were generally below the 5YA, while they recovered to the 5YA by the end of July.

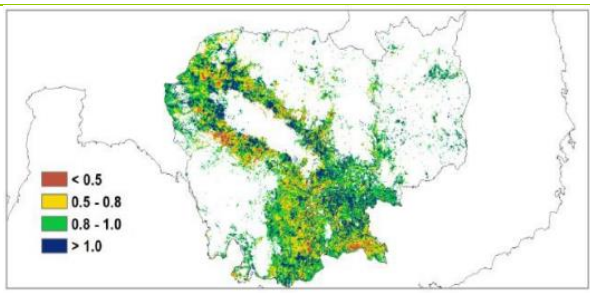
**Figure 3.26 Cambodia's crop condition, April - July 2020**



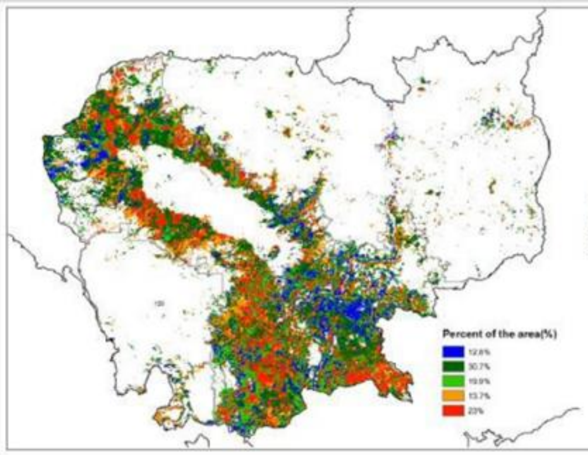

(a). Phenology of major crops



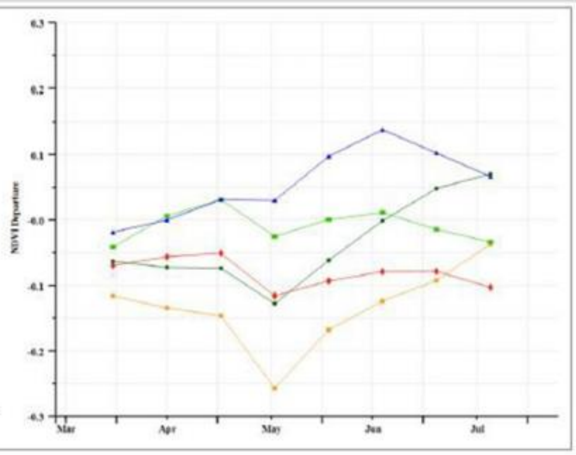

(b) Crop condition development graph based on NDVI



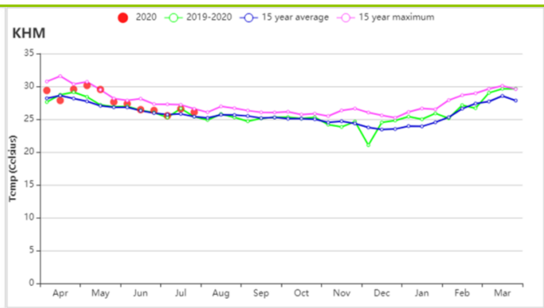

(c) Maximum VCI



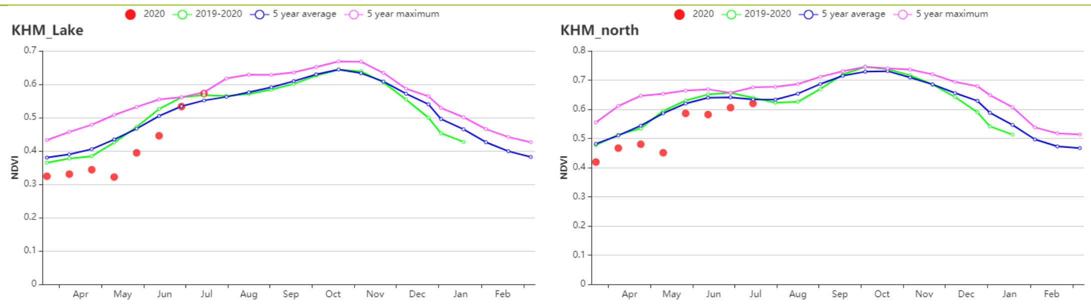

(d) Spatial NDVI patterns compared to 5YA



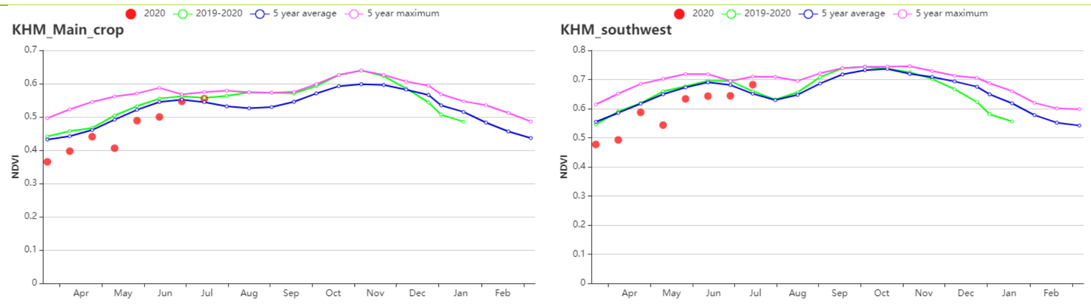

(e) NDVI profiles


(f) Rainfall profiles (g) Temperature profiles




(h) Crop condition development graph based on NDVI Tonle-Sap region (left) and Northern Plain and Northeast (right)




(i) Crop condition development graph based on NDVI Mekong valley (left) and Southwest Hilly region(right)

**Table 3.43 Cambodia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2020**

| Region | RAIN | | TEMP | | RADPAR | | BIOMSS | |
|---|---|---|---|---|---|---|---|---|
| | Current (mm) | Departure (%) | Current (°C) | Departure (°C) | Current (MJ/m²) | Departure (%) | Current (gDM/m²) | Departure (%) |
| Tonle-Sap | 737 | -13 | 28.0 | 0.9 | 1173 | 0 | 800 | 1 |
| Mekong valley | 832 | -14 | 28.0 | 0.8 | 1198 | 2 | 819 | 3 |
| Northern Plain and Northeast | 914 | -25 | 27.6 | 0.8 | 1209 | 7 | 813 | 7 |
| Southwest Hilly region | 869 | -16 | 26.2 | 0.8 | 1251 | 6 | 864 | 7 |

**Table 3.44 Cambodia's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2020**

| Region | Cropped arable land fraction | | Maximum VCI |
|---|---|---|---|
| | Current (%) | Departure (%) | Current |
| Tonle-Sap | 93 | -1 | 0.88 |
| Mekong valley | 89 | 0 | 0.88 |
| Northern Plain and Northeast | 99 | 0 | 0.89 |
| Southwest Hilly region | 99 | 0 | 0.92 |

# [LKA] Sri Lanka

This report covers the second season (Yala) sowing for rice and maize in June and July. According to the CropWatch monitoring results, crop conditions were normal for the period from April to July.

This period is dominated by the south-western monsoon, which is active between May and September. At the national level, precipitation (RAIN +9%) and temperature (TEMP +0.3°C) experienced a slight increase, while radiation decreased (RADPAR -4%) as compared to the 15YA. The increase in rainfall mainly happened in May. The fraction of cropped arable land (CALF) remained nearly comparable to the 5YA. BIOMSS was also comparable to the 15YA. As shown on the NDVI development graph, NDVI values were slightly below-average during April and were always near average from May to July. The below-average NDVI values in April can be regarded as a carry-over from the relatively poor crop conditions observed in the last monitoring period. The maximum VCI for the whole country was 0.98.

As shown by the NDVI clusters map and profiles, the trends were quite similar across the island. The whole country showed below-zero NDVI departure values in April. Nevertheless, most of the cropland showed better crop condition with NDVI departure values increasing and even above zero starting in May. 4% of cropland showed a large decline of NDVI values in early July, as well as the 12.5% of cropland in late July - although this may have been an outlier to due cloud cover. These croplands were distributed mainly in the southwest part of the country, including Western Province, west of Southern Province and south of Central Province. Moreover, 28.5% of cropland showed consistent below-zero NDVI departure values for the entire period. These croplands were distributed throughout the whole country except for the southwest region.

**Regional analysis**

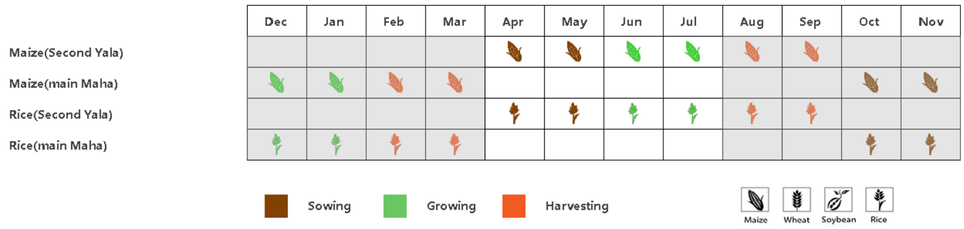
Based on the cropping system, climatic zones and topographic conditions, three sub-national agroecological regions can be distinguished for Sri Lanka. They are the Dry zone, the Wet zone, and the Intermediate zone.

In the **Dry zone**, the recorded RAIN (440 mm) was 4% above average and amounted to more than 3 mm per day, which was close to the water demand of the growth of maize in this region. TEMP was 0.2°C above average with RADPAR down (-5%) and BIOMSS increased by 1% as compared to the 15YA. CALF was 1% up compared to the 5YA level and cropland was near fully utilized. NDVI followed a similar trend as the whole county. The VCIx for the zone was 0.96. Overall, crop conditions were average for this zone.

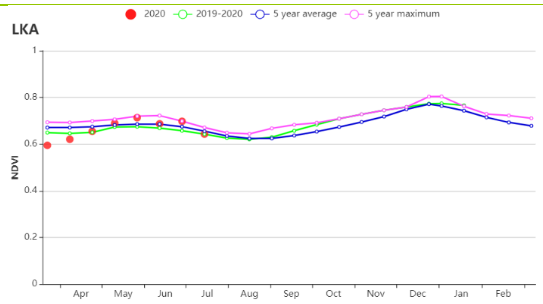
The **Wet zone** continued to go through the rainy season during this monitoring period. RAIN (2070 mm) was up by 11% as compared to the 15YA. TEMP (+0.5°C) was higher and RADPAR was near average. BIOMSS was comparable to the 15YA and cropland was fully utilized as usual. NDVI followed a similar trend as the whole county. The VCIx value was 0.99. Crop conditions were favorable for this zone.

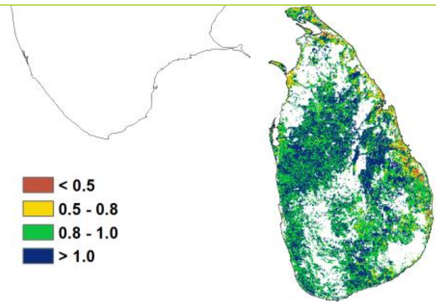
The **Intermediate zone** also experienced abundant rain (RAIN 1060 mm), 16% above the 15YA. This is more than 8 mm per day and is more than sufficient for rice and maize. TEMP was up by 0.1°C and RADPAR down by 5% compared to the 15YA. With full use of cropland, BIOMSS was 2% below average. The NDVI values fluctuated around the average. The VCIx value for the zone was 1. Condition of crops was assessed as average.

**Figure 3.27 Sri Lanka crop condition, April 2020 - July 2020**



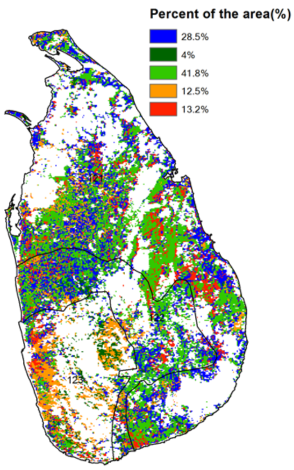

(a). Phenology of major crops

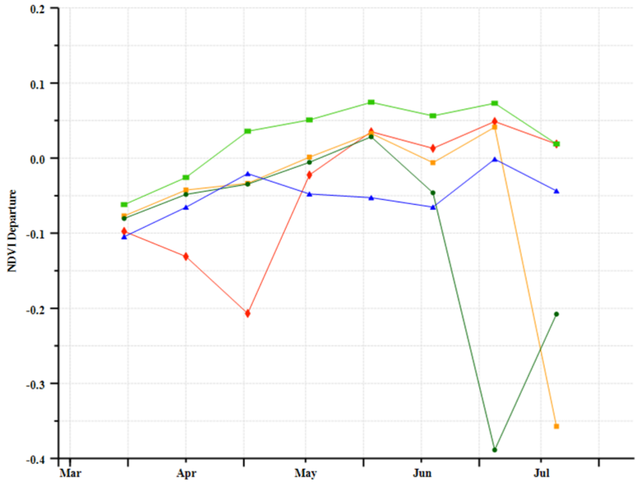



(b) Crop condition development graph based on NDVI

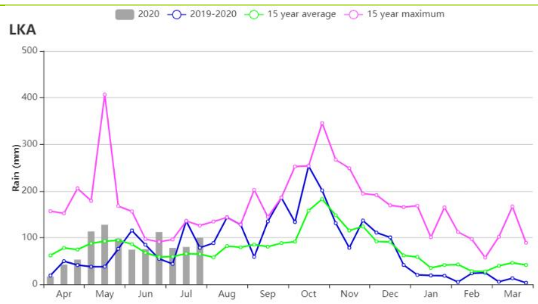
(c) Maximum VCI

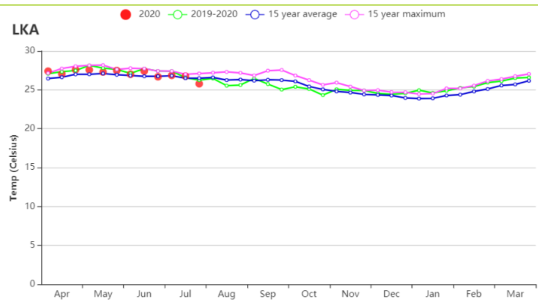



(d) Spatial NDVI patterns compared to 5YA

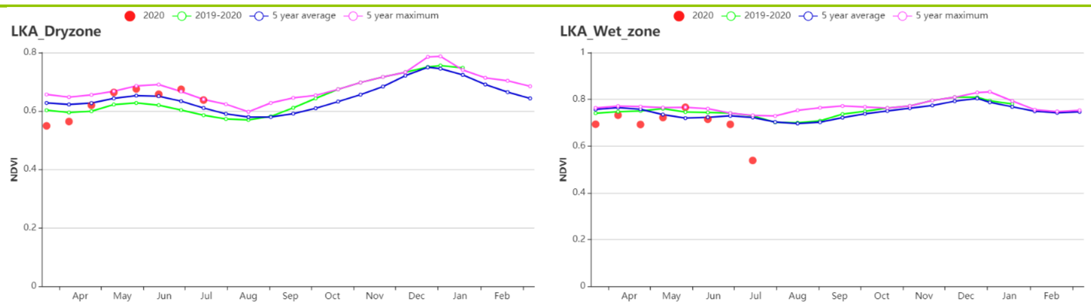
(e) NDVI profiles



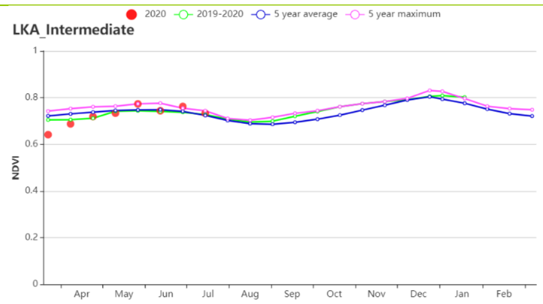




(f) Rainfall profiles

(g) Temperature profiles




(h) Crop condition development graph based on NDVI (Dry zone (left) and Wet zone (right))




(i) Crop condition development graph based on NDVI (Intermediate zone)

**Table 3.45 Sri Lanka agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2020**

| Region | RAIN | | TEMP | | RADPAR | | BIOMSS | |
|---|---|---|---|---|---|---|---|---|
| | Current (mm) | Departure (%) | Current (°C) | Departure (°C) | Current (MJ/m²) | Departure (%) | Current (gDM/m²) | Departure (%) |
| **Dry zone** | 440 | 4 | 28.0 | 0.2 | 1249 | -5 | 857 | 1 |
| **Wet zone** | 2070 | 11 | 25.2 | 0.5 | 1155 | -1 | 784 | 0 |
| **Intermediate zone** | 1060 | 16 | 25.4 | 0.1 | 1136 | -5 | 763 | -2 |

**Table 3.46 Sri Lanka agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2020**

| Region | Cropped arable land fraction | | Maximum VCI |
|---|---|---|---|
| | Current (%) | Departure (%) | Current |
| **Dry zone** | 97 | 1 | 0.96 |
| **Wet zone** | 100 | 0 | 0.99 |
| **Intermediate zone** | 100 | 0 | 1.00 |

AFG AGO ARG AUS BGD BLR BRA CAN DEU EGY ETH FRA GBR HUN IDN IND IRN ITA KAZ KEN KGZ KHM LKA **MAR** MEX MMR MNG MOZ NGA PAK PHL POL ROU RUS THA TUR UKR USA UZB VNM ZAF ZMB

# [MAR] Morocco

During this monitoring period, wheat, barley and maize reached maturity. Harvest typically takes place in early May.

As reported in the previous bulletin, Morocco suffered from a severe drought during the January to February period, which caused crop failures (mainly wheat and barley) in the southern regions of the country. The situation was slightly better in the north. As the rainfall improved in March, some farmers replanted their fields with short season legume crops.

Overall crop conditions in Morocco during the monitoring period (April - July) were unfavourable. The cumulative rainfall reached 115 mm, which was 36% above the 15-year average (15YA). The rainfall index graph shows that the rainfall was higher than the 15YA during April and May. The average temperature reached 20.6°C (0.3°C above the 15YA). The RADPAR was 1543 MJ/m$^2$ (3.5% below the 15YA).

The nationwide NDVI development graph indicates below-average crop conditions during the whole monitoring period. The NDVI spatial pattern shows that only 30.5% of the cultivated area was above the 5YA crop conditions and 69.6% were below. Estimated BIOMSS (-2%) was below average for this monitoring period. The VCIx value was just 0.58, indicating poor nationwide crop conditions. The CALF was below the 5YA by 30%, which can be attributed to the crop failures observed during the previous monitoring period.

**Regional Analysis**

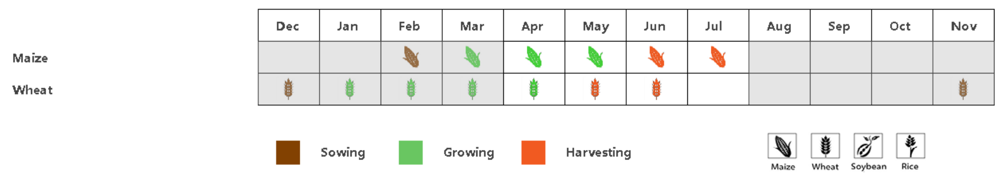
CropWatch delineates three agro −ecological zones (AEZs) relevant for crop production in Morocco: the Sub-humid northern highlands, the Warm semiarid zone, and the Warm subhumid zone.

Sub-humid northern highlands: rainfall was above the 15YA by 58%. The RADPAR reached 1500 MJ/m$^2$ (-5%) while the BIOMSS was near average. The NDVI profile confirms generally good crop conditions, as it was above the 5YA throughout the monitoring period. The CALF increased by 3% over the 5YA, and the average VCIx was 0.87, which confirms the near average conditions.

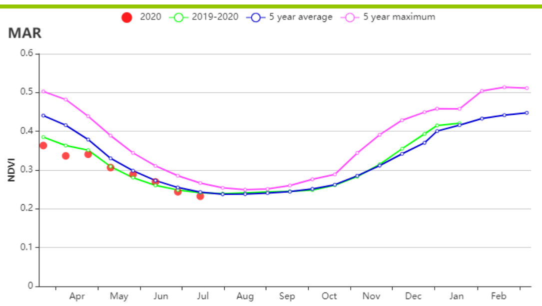
Warm semiarid zone: Rainfall was 16% higher than the 15YA; RADPAR was 3% below the 15YA. The resulting reduction in BIOMSS was 7%, mainly due to a reduction in RADPAR. CALF was 61% below the 5YA, which can be attributed to the severe drought observed in January and February. The maximum VCI for this zone was only 0.4, indicating below-average crop conditions. The NDVI profile confirms the generally poor crop conditions, as it was below the 5YA throughout the monitoring period.

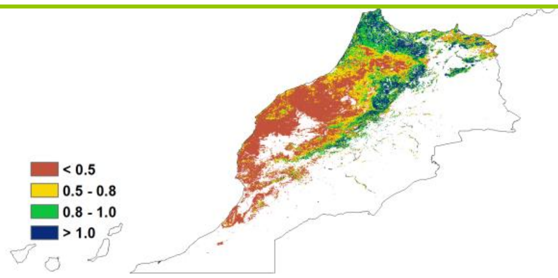
Warm sub-humid zone: the average rainfall was 150 mm (43% above the 5YA). The RADPAR was 4% below 15YA, while the BIOMSS was 3% above the average. The CALF was below the 5YA average by 26%. The estimated VCIx was moderate (0.7). The crop condition development graph based on NDVI indicated below-average conditions until May, when the crops were harvested. Conditions were unfavorable for this zone.

**Figure 3.28 Morocco's crop condition, April - July 2020**

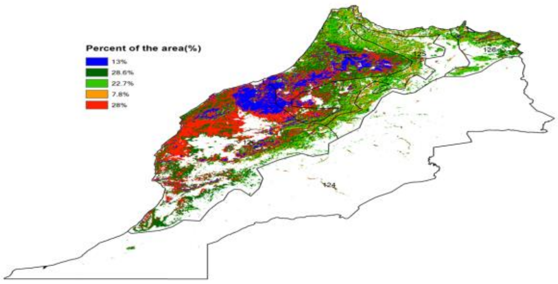


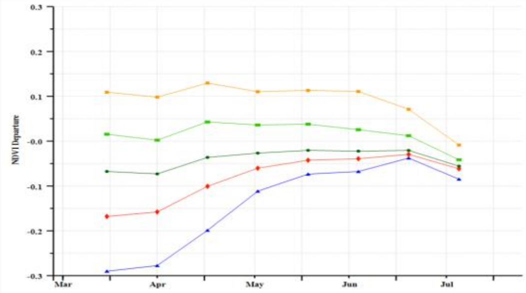

(a). Phenology of major crops



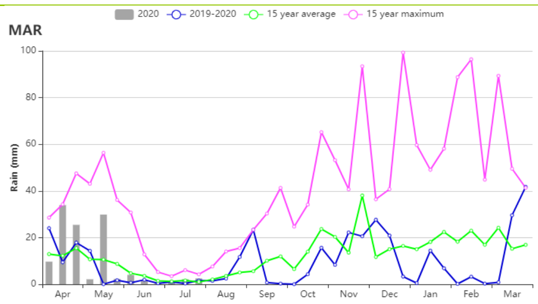



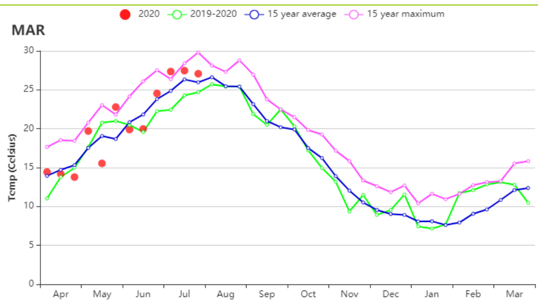

(b) Crop condition development graph based on NDVI (c) Maximum VCI



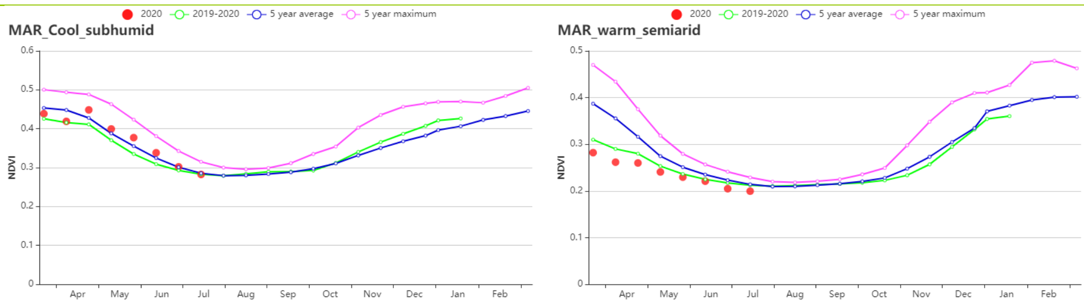




(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles

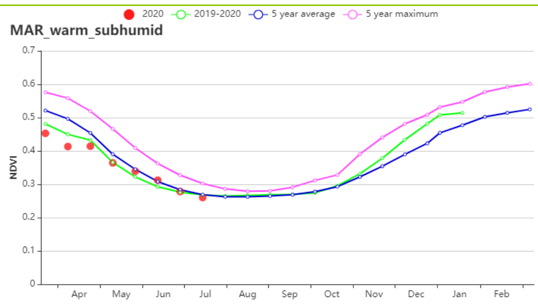



(f) Rainfall profiles (g) Temperature profiles




(h) Crop condition development graph based on NDVI (Sub-humid northern highlands (left) and Warm semiarid zones (right))




(i) Crop condition development graph based on NDVI (Warm subhumid zones)

**Table 3.47 Morocco's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2020**

| Region | RAIN | | TEMP | | RADPAR | | BIOMSS | |
|---|---|---|---|---|---|---|---|---|
| | **Current (mm)** | **Departure (%)** | **Current (°C)** | **Departure (°C)** | **Current (MJ/m²)** | **Departure (%)** | **Current (gDM/m²)** | **Departure (%)** |
| Sub-humid northern highlands | 184 | 58 | 20.0 | 0.0 | 1500 | -5 | 633 | 0 |
| Warm semiarid zones | 68 | 16 | 21.0 | 0.0 | 1578 | -3 | 590 | -7 |
| Warm sub-humid zones | 150 | 43 | 20.0 | 0.0 | 1517 | -4 | 679 | 3 |

**Table 3.48 Morocco's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2020**

| Region | Cropped arable land fraction | | Maximum VCI |
|---|---|---|---|
| | **Current (%)** | **Departure (%)** | **Current** |
| **Sub-humid northern highlands** | 58 | 3 | 0.87 |
| **Warm semiarid zones** | 10 | -61 | 0.40 |
| **Warm sub-humid zones** | 51 | -26 | 0.70 |

AFG AGO ARG AUS BGD BLR BRA CAN DEU EGY ETH FRA GBR HUN IDN IND IRN ITA KAZ KEN KGZ KHM LKA MAR **MEX** MMR MNG MOZ NGA PAK PHL POL ROU RUS THA TUR UKR USA UZB VNM ZAF ZMB

# [MEX] Mexico

In Mexico, winter wheat harvest began in April. Maize and soybean planting started in May and will reach maturity by September/October.

The CropWatch agroclimatic indicators show that TEMP (+0.6°C) and RADPAR (-1%) were close to average and RAIN was slightly above the 15YA (+6%), which was beneficial for crop growth. Accordingly, BIOMSS increased by 5% as comparted to the 15YA. However, VCIx was relatively low (0.76) and CALF decreased by 5% but still slight above the previous year. Reasons for this decline are not clear, but could be related to a negative impact of COVID-19 on the agricultural market. Crop conditions are mixed, ranging from slightly unfavorable to average.

At the national scale, the NDVI development graph trailed below average between April to July. But the conditions varied greatly across the country. According to its spatial pattern, the VCIx in the south was higher than that in the north. Very high values (greater than 1.0) occurred mainly in southeastern Mexico (including Veracruz, Tabasco and western Campeche), whereas extremely low values (less than 0.5) occurred in the drier north-east and center of the country (northwestern Coahuila, eastern Sonora, Sinaloa and eastern Coahuila ). The VCIx in other regions of Mexico was moderate, with values between 0.5 and 1.0. As shown in the spatial NDVI profiles and distribution map, about 29.2% of the total cropped areas were below average during the entire monitoring period, mainly distributed in the west of Guerrero, west of Oaxaca, west of Michoacán, Tamaulipas, Veracruz, Nuevo León while 17.9% of the total cropped areas, mainly in Chihuahua and Sonora provinces, were just slightly above average. An area accounting for 35.1% of the total region changed little and was close to average.

**Regional analysis**

Based on cropping systems, climatic zones and topographic conditions, Mexico is divided into four agro-ecological regions. They include the Arid and semi-arid region (128), Humid tropics with summer rainfall (129), Sub-humid temperate region with summer rains (130) and Sub-humid hot tropics with summer rains (131). Regional analyses of crop conditions can provide more detail for the production situation in Mexico.

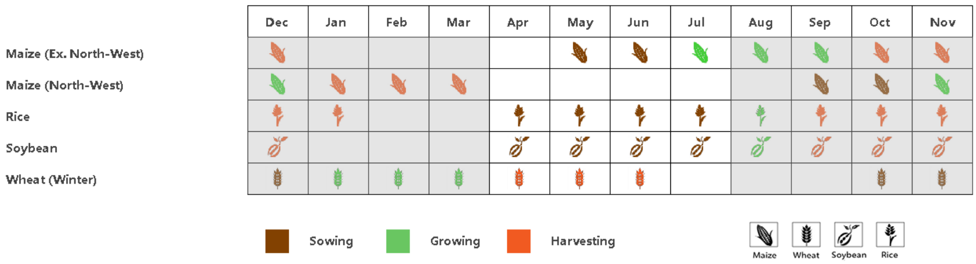
The Arid and semi-arid regions, located in northern and central Mexico, account for about half of planted areas in the country. According to the NDVI development graph, crop condition in this region was generally close to average during the reporting period. VCIx was relatively low with a value of 0.65 and CALF decreased by 13% compared with 5YA. RAIN and TEMP increased by 23% and 0.4°C respectively and RADPAR decreased by 3%, which all resulted in an increase of BIOMSS (+9%).

Theregion of Humid tropics with summer rainfall is located in southeastern Mexico. RAIN was significantly above average (+21%), TEMP was 0.6°C warmer and RADPAR near the fifteen-year average. As shown in the NDVI development graph, crop conditions were below average in April and closed to average from May to July. BIOMSS decreased by 3% and the VCIx (0.93) confirmed favorable crop condition in these regions.

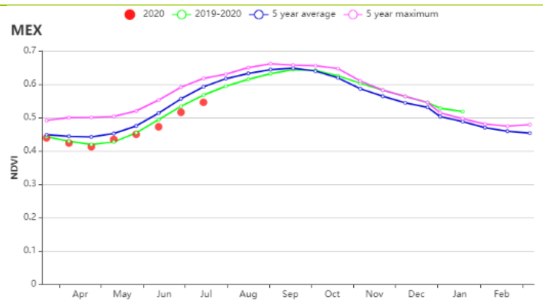
The Sub-humid temperate region with summer rains is situated in central Mexico. According to the NDVI development graph, crop conditions remained close to average in this region. The agro-climatic condition showed that RAIN decreased by 11% and TEMP increased by 0.7°C, respectively and RADPAR increased by 1% compared to average. BIOMSS also increased by 3% and CALF was 93%. The VCIx in these regions was low, only 0.73. The production of rice and soybean in the region is expected to decline.

The region called Sub-humid hot tropics with summer rains is located in southern Mexico. During the monitoring period, crop condition was below average since April, as shown by the NDVI time profiles. Agro-climatic conditions showed that RAIN was slightly below average (-6%) while TEMP and RADPAR were near average (+0.7°C and 0%). The VCIx in these areas were 0.84 and BIOMSS was near average.

**Figure 3.29 Mexico's crop condition, April - July 2020**



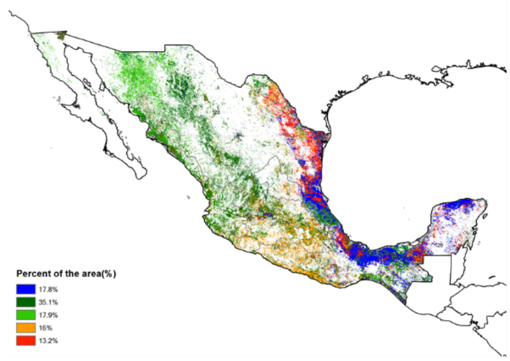

(a). Phenology of major crops

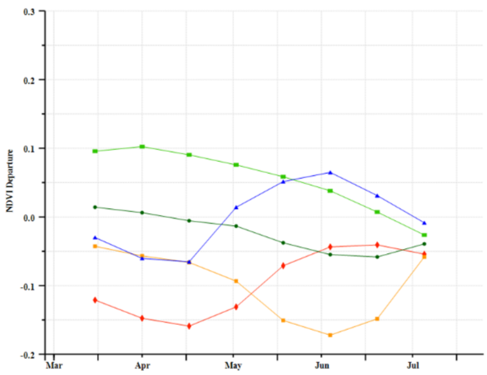




(b) Crop condition development graph based on NDVI

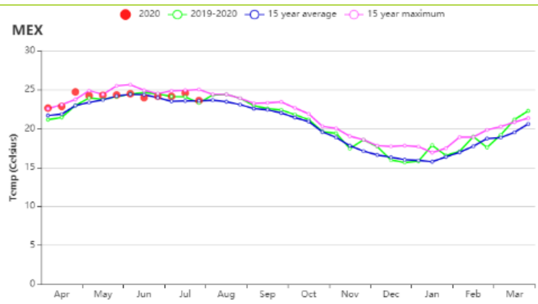
(c) Maximum VCI



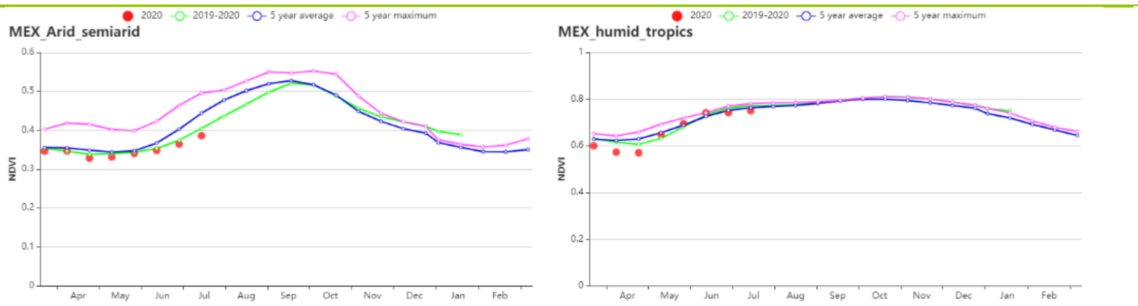

(d) Spatial NDVI patterns compared to 5YA

(e) NDVI profiles

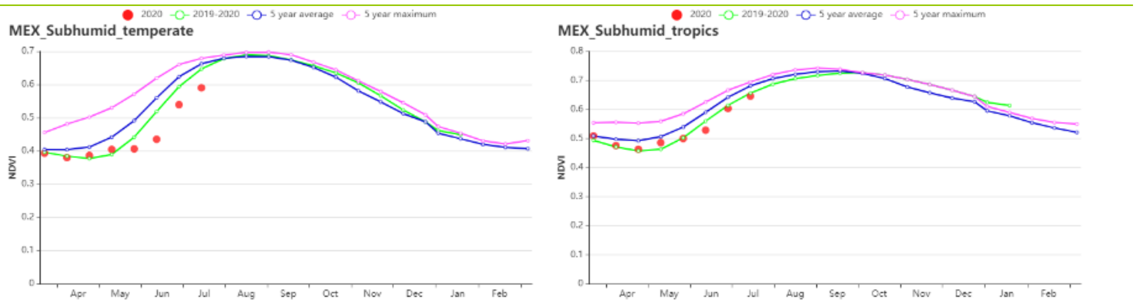




(f) Rainfall profiles

(g) Temperature profiles




(h) Crop condition development graph based on NDVI (Arid and semi-arid regions (left) and Humid tropics with summer rainfall (right))




(i) Crop condition development graph based on NDVI (Sub-humid temperate region with summer rains (left) and Sub-humid hot tropics with summer rains (right))

**Table 3.49 Mexico's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2020**

| Region | RAIN | | TEMP | | RADPAR | | BIOMSS | |
|---|---|---|---|---|---|---|---|---|
| | Current (mm) | Departure (%) | Current (°C) | Departure (°C) | Current (MJ/m²) | Departure (%) | Current (gDM/m²) | Departure (%) |
| **Arid and semi-arid regions** | 441 | 23 | 23.5 | 0.4 | 1518 | -3 | 736 | 9 |
| **Humid tropics with summer rainfall** | 1016 | 21 | 26.6 | 0.6 | 1368 | 0 | 845 | -3 |
| **Sub-humid temperate region with summer rains** | 635 | -11 | 21.3 | 0.7 | 1461 | 1 | 684 | 3 |
| **Sub-humid hot tropics with summer rains** | 628 | -6 | 24.2 | 0.7 | 1459 | 0 | 744 | 3 |

**Table 3.50 Mexico's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2020**

| Region | Cropped arable land fraction | | Maximum VCI |
|---|---|---|---|
| | Current (%) | Departure (%) | Current |
| Arid and semi-arid regions | 59 | -13 | 0.65 |
| Humid tropics with summer rainfall | 100 | 0 | 0.93 |
| Sub-humid temperate region with summer rains | 93 | -2 | 0.73 |
| Sub-humid hot tropics with summer rains | 95 | -1 | 0.84 |

# [MMR] Myanmar

This monitoring period covers the pre-monsoon and beginning of the monsoon season in Myanmar. Harvesting of maize was completed in April, while the second rice (summer rice) was harvested between April and June. The planting of main rice (monsoon rice) started in May to June. However, the planting period varies according to region and weather conditions.

RAIN (-18%) was considerably lower than the 15YA, whereas TEMP (+0.4°C) and RADPAR (+4%) were above the 15YA. Potential cumulative biomass (BIOMSS) was close to average (+1%). 28.8% of cropland showed a positive NDVI departure, mostly located in the Delta and Southern Coast region including Yangon, Bago, Ayeyarwady, part of Magwe, Sagaing, Thanintaryi and Shan State during June and July. Only 9.6% of the cropland, mainly in the Hills regions showed a negative NDVI departure throughout the monitoring period. The VCIx was less than 0.5 in the central dry zone. Higher values were observed in the other regions. There were large differences among the regions and the conditions vary from below average (Central Plain) to favorable (Delta and Southern Coast).

**Regional analysis**

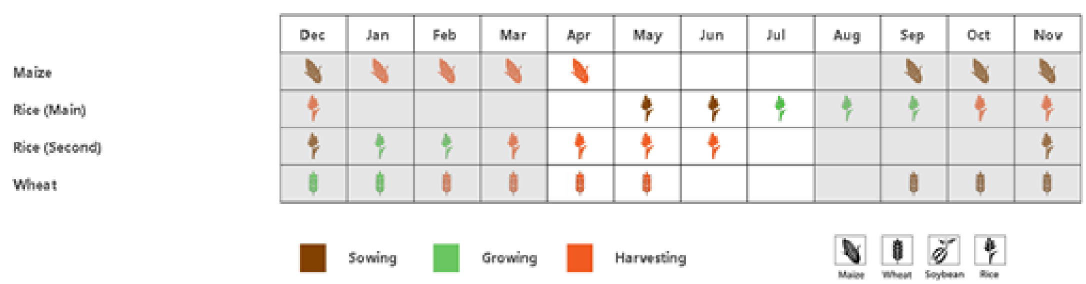
Three sub-national agro-ecological zones (AEZ) can be distinguished for Myanmar based on the cropping system, climatic zones and topographic conditions. They are the Central plain, the Hills and the Delta and Southern Coast regions.

The Central Plain had a rainfall deficit (RAIN -35%), while TEMP (+ 0.8°C) and RADPAR (+7%) were above the 15YA. The resulting BIOMSS was higher than the 15YA by 4%, which was the largest departure among the three sub-national regions. CALF (76%) was far away from full utilization, and 8% below the 5YA. NDVI was slightly below the 5YA level during the whole period. The crop condition is assessed as below the 5YA level.

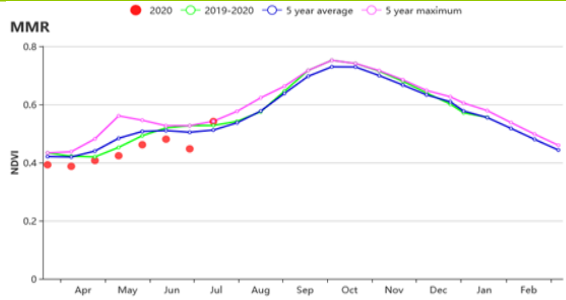
The Hills region had the highest RAIN (1473 mm) compared with the other two sub-national regions, but it was 4% below the 15YA, while TEMP was close to average and RADPAR was increased by 2%. As a result, the BIOMSS was at the same level as the 15YA. The cropland was almost fully used (CALF 95%). The development of NDVI was better than in the other regions and reached average levels in June. The VCIx was 0.92. The crop condition for this region is normal.

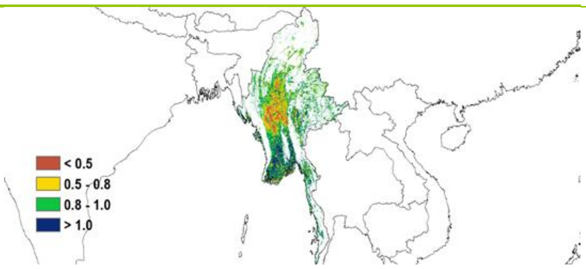
The Delta and Southern Coast region experienced a dry pre-monsoon season, with RAIN (-41%) far below the 15YA. TEMP and RADPAR increased by 0.7°C and 6%, respectively. BIOMSS was slightly higher (+1%) than the 15YA. The vast majority of cropland in this region is irrigated. Therefore, the lack of rainfall had a limited negative impact on crop growth and NDVI development. CALF was 14% above the 5YA and VCIx at 1.02. Hence, crop conditions in this region can be assessed as favorable.

**Figure 3.30 Myanmar's crop condition, April- July 2020**

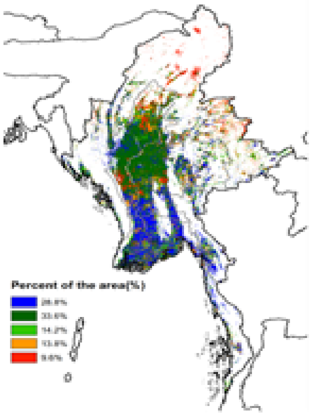


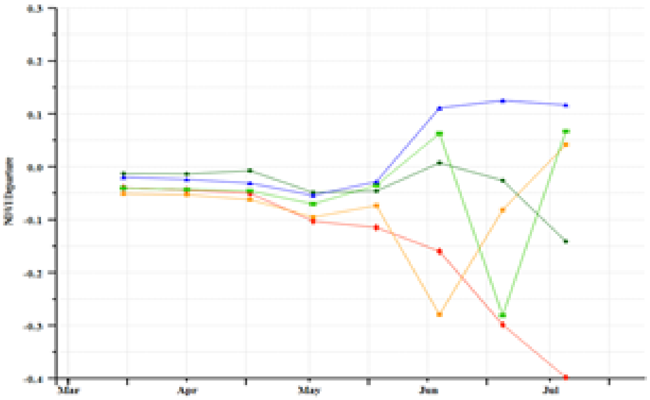

(a). Phenology of major crops



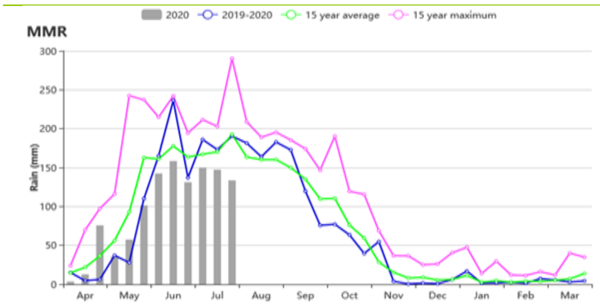



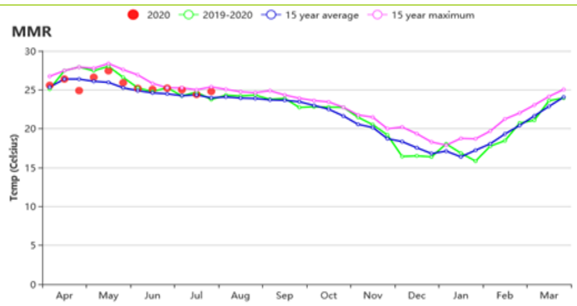

(b) Crop condition development graph based on NDVI (c) Maximum VCI



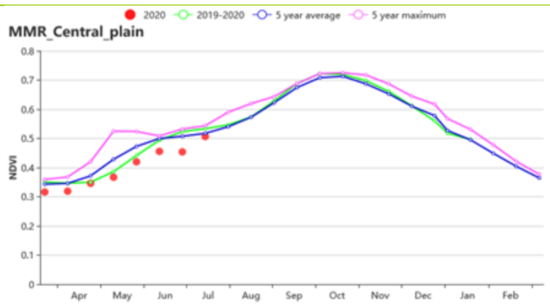



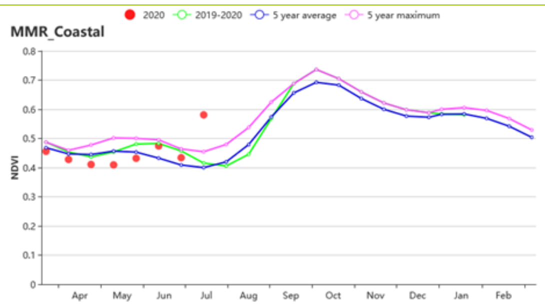
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



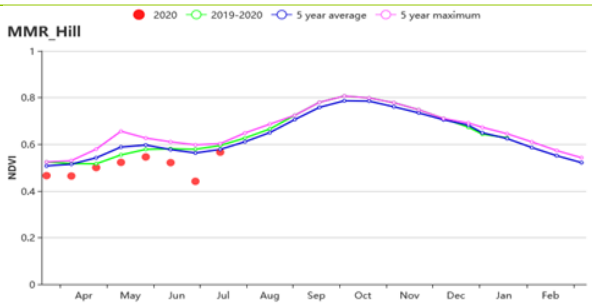




(f) Rainfall profiles (g) Temperature profiles




(h) Crop condition development graph based on NDVI (central plain (left) and delta and southern coast (right))




(i) Crop condition development graph based on NDVI (Hills region)

**Table 3.51 Myanmar's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2020**

| Region | RAIN | | TEMP | | RADPAR | | BIOMSS | |
|---|---|---|---|---|---|---|---|---|
| | Current (mm) | Departure (%) | Current (°C) | Departure (°C) | Current ($MJ/m^2$) | Departure (%) | Current ($gDM/m^2$) | Departure (%) |
| **Central plain** | 602 | -35 | 27.1 | 0.8 | 1263 | 7 | 767 | 4 |
| **Hills region** | 1473 | -4 | 23.8 | 0.0 | 1154 | 2 | 678 | 0 |
| **Delta and southern coast** | 1062 | -41 | 28 | 0.7 | 1285 | 6 | 761 | 1 |

**Table 3.52 Myanmar's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April- July 2020**

| Region | Cropped arable land fraction | | Maximum VCI |
|---|---|---|---|
| | Current (%) | Departure (%) | Current |
| **Central plain** | 76 | -8 | 0.80 |
| **Hills region** | 95 | 1 | 0.92 |
| **Delta and southern coast** | 88 | 14 | 1.02 |

AFG AGO ARG AUS BGD BLR BRA CAN DEU EGY ETH FRA GBR HUN IDN IND IRN ITA KAZ KEN KGZ KHM LKA MAR MEX MMR **MNG** MOZ NGA PAK PHL POL ROU RUS THA TUR UKR USA UZB VNM ZAF ZMB

# [MNG] Mongolia

This monitoring period covers the dry spring and wet summer season in Mongolia from April to July. Wheat, which is the main cereal crop, is sown in early May.

The agroclimatic indicators for this 4-month period show a large increase in rainfall (RAIN, +93%), slight incrase in temperature (TEMP, +0.1°C) and a decrease in radiation (RADPAR, -5%). The decline in solar radiation caused a reduction in estimated biomass by 7% as compared to the 15YA. The recorded crop arable land fractions (CALF, 98%-100%) and maximum vegetation condition index (VCIx, 0.83-0.94) were favorable. The crop condition development graph based on NDVI for the entire country indicates that crop conditions were close to the average of the past five years from April to June and surpassed the average in July.

The maximum VCIx map shows that relatively poor crop conditions (around 40%) were observed in the west of the Selenge-Onon region, and the middle and southern part of the Hangai Khuvsgul region. The eastern part of Selenge-Onon had favorable conditions and the northern part of Hangai Huvsgul slightly less favorable conditions. However, the conditions for almost all of the arable land improved at the end of June. Generally, crop conditions can be assessed as favorable in Mongolia.

**Regional analyses**

Taking into consideration the climate, vegetation, altitude, soil, and farming systems, Mongolia is divided into five agro-ecological zones (AEZ). Three of them (Selenge-Onon Region, Central, and Eastern Steppe, and Hangai Khuvsgul Region) are cultivated as cropland, and two (Altai and Gobi Desert) are non-agriculture land.

In the Selene-Onon region, RAIN was 107% above average, but temperature and radiation were below average (TEMP -0.1°C; RADPAR -0.6%). Estimated BIOMSS decreased by 9%, and the cropped arable land fraction was up by 4%. The maximum VCIx for this region was 0.94. The crop condition development graph indicates that the crop conditions gradually improved overtime and surpassed the 5YA in June and reached record levels in July.

RAIN and TEMP in the Hangai Khuvsgul region increased by 72% and 0.5% respectively, while the RADPAR was slightly lower (-2%). Accordingly, BIOMASS declined by 2% from the fifteen-year average. VCIx (0.83) was just average, and CALF was elevated by 1%. Even though most of the agroclimatic indicators show favorable conditions, the overall conditions were below average in this region based on the NDVI profile, as it stayed below the 5YA. However, conditions were more favorable in the northern part of this region.

For the first three months, crop conditions were below the five-year average, but improved in July in the Central and Eastern Steppe region. This region also received above-average rainfall (RAIN, +88%). Temperatures (TEMP -0.1°C) and radiation (RADPAR -7%) were below average. CALF increased by 2%, and regional VCIx was 0.90. Estimated BIOMSS decreased by 8%. The Central and Eastern Steppe region has only a small fraction of cropland. Most of it experienced slightly unfavorable conditions between April and June, but the situation improved in July.

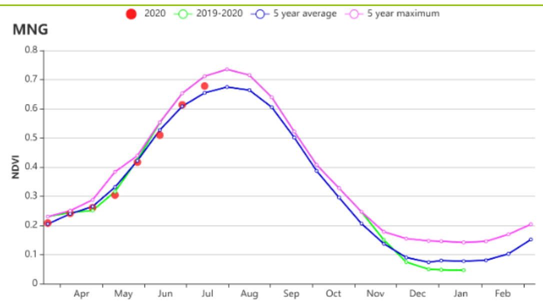
**Figure 3.31 Mongolia's crop condition, April - July 2020**

| | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Wheat | | | | | | | | | | | | |

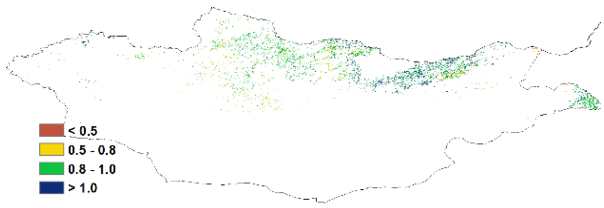
Sowing Growing Harvesting

Maize Wheat Soybean Rice

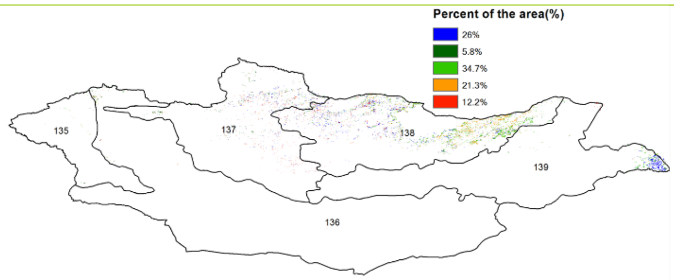
(a). Phenology of major crops

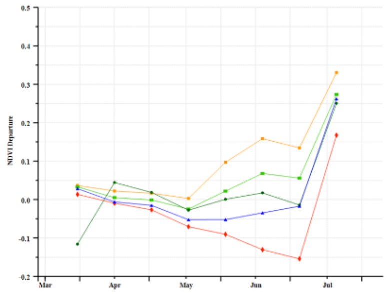



(b) Crop condition development graph based on NDVI



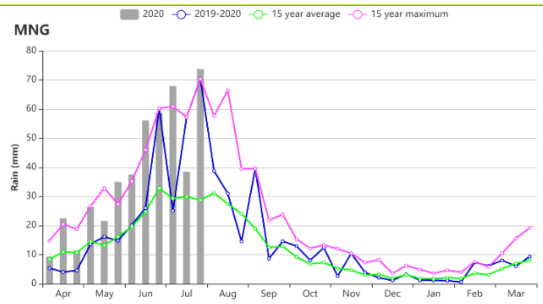

(c) Maximum VCI

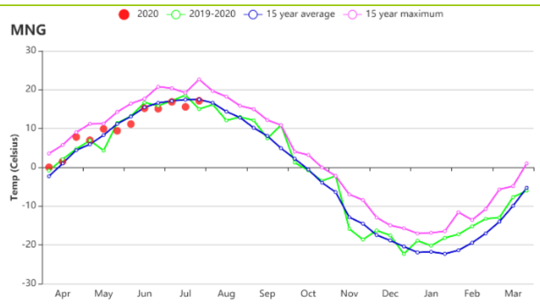



(d) Spatial NDVI patterns compared to 5YA

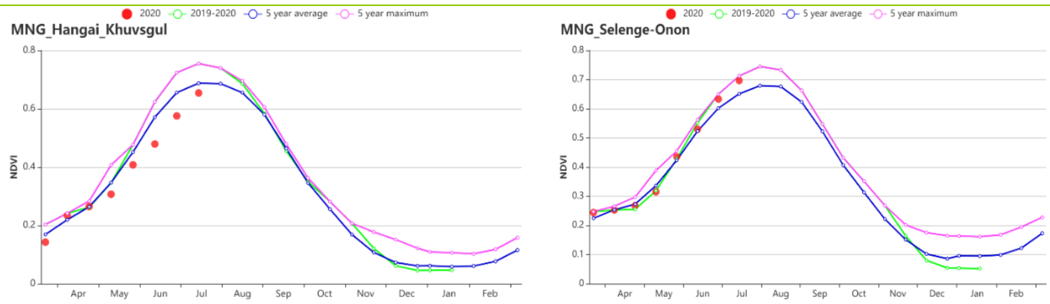
(e) NDVI profiles



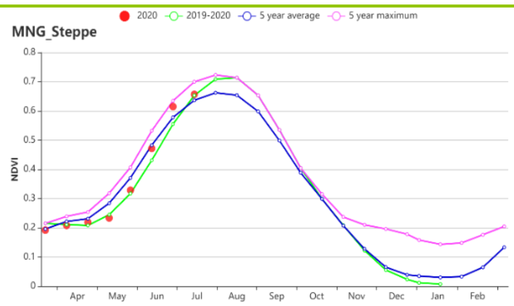




(f) Rainfall profiles

(g) Temperature profiles




(h) Crop condition development graph based on NDVI (Hangai Khuvsgul Region (left) and Selenge-Onon Region (right))




(i) Crop condition development graph based on NDVI (Central and Eastern Steppe)

**Table 3.53 Mongolia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2020**

| Region | RAIN | | TEMP | | RADPAR | | BIOMSS | |
|---|---|---|---|---|---|---|---|---|
| | Current (mm) | Departure (%) | Current (°C) | Departure (°C) | Current (MJ/m²) | Departure (%) | Current (gDM/m²) | Departure (%) |
| Hangai Khuvsgul Region | 457 | 72 | 8.4 | 0.4 | 1365 | -2 | 369 | |
| Selenge-Onon Region | 483 | 107 | 11.1 | -0.1 | 1293 | -6 | 418 | |
| Central and Eastern Steppe | 370 | 88 | 13.5 | -0.1 | 1265 | -7 | 488 | |

**Table 3.54 Mongolia's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2020**

| Region | Cropped arable land fraction | | Maximum VCI |
|---|---|---|---|
| | Current (%) | Departure (%) | Current |
| Hangai Khuvsgul Region | 99 | 1 | 0.83 |
| Selenge-Onon Region | 100 | 4 | 0.94 |
| Central and Eastern Steppe | 98 | 2 | 0.9 |

AFG AGO ARG AUS BGD BLR BRA CAN DEU EGY ETH FRA GBR HUN IDN IND IRN ITA KAZ KEN KGZ KHM LKA MAR MEX MMR MNG **MOZ** NGA PAK PHL POL ROU RUS THA TUR UKR USA UZB VNM ZAF ZMB

# [MOZ] Mozambique

The April-July 2020 reporting period covers the late grainfilling phases of maize and rice in the northern region. Harvest took place in April and May. It also covers the main growing season for wheat, which was harvested by July. The effect of below-average soil moisture combined with below-average rainfall and the early cessation of rains in the southern and central regions could negatively impact the ongoing second season, which is mainly used for vegetable production.

At the national level, rainfall was 24% below average (99 mm). The recorded temperature was 19.9°C (0.1°C below the 15YA). Radiation decreased by about 3%. Altogether (rainfall, temperature and radiation) contributed to the decrease in biomass by about 2%. CALF was near average. Based on the NDVI graph, crop conditions were below average during the entire period. The NDVI clustering reveals that crop conditions in 6.2% of the area in Mozambique were above the five-year average, especially along the Limpopo and Zambezi riverbanks where VCIx was close to 1.

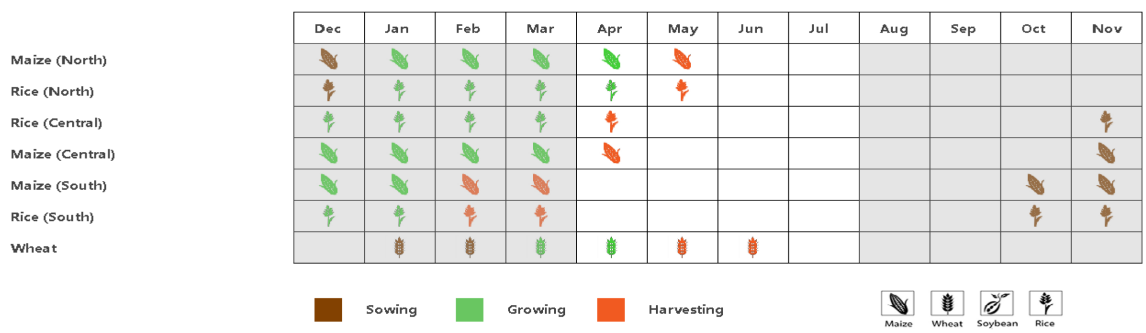
The favorable VCIx conditions observed in these regions correspond to the ongoing second season which is mainly used for vegetables and irrigated rice. Meanwhile, 14.3% of the country recorded far below average crop conditions, mostly in the Tete, Zambézia, and Nampula provinces. The national average maximum VCIx was recorded at 0.81. Mixed crop conditions were observed throughout the country with the overall conditions being below the 5-year average.

**Regional analysis**

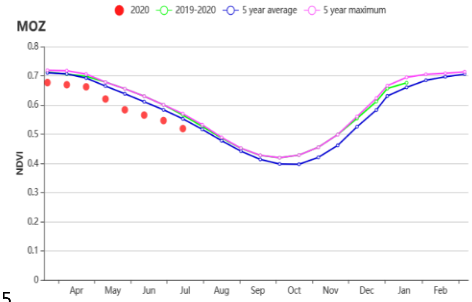
According to the cropping system, topography and climate, CropWatch has subdivided Mozambique into five agro-ecological zones (AEZ): (1) Buzi Basin, (2) Northern High-altitude Areas, (3) Low Zambezi River Basin, (4) Northern Coast, and (5) Southern Region.

During the reporting period, all the agro-ecological regions recorded significant decreases in rainfall when compared to the past fifteen years-average. The Northern high-altitude areas and the Northern coast zone recorded the highest reductions by about 44% and 30%, respectively. The temperature was below average in the Buzi basin (-0.4°C), Northern high-altitude areas (-0.3°C) and Southern region (-0.2°C). With the exception for Northern high-altitude areas, radiation and biomass were also lower in the remaining zones. About average CALF was verified in the Buzi basin, Northern high-altitude areas, and Northern coast, while in the Low Zambezi river basin CALF decreased by 2%. With maximum VCIx varying from 0.79 to 0.89, the crop development graph based on NDVI indicates below-average crop conditions during the entire monitoring period in all agro-ecological zones.

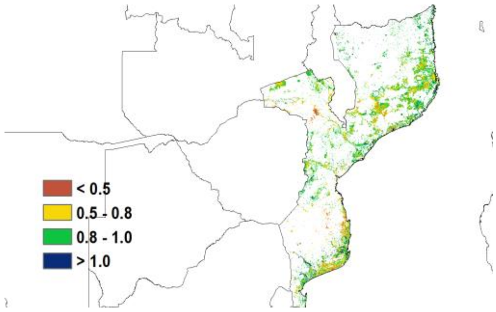
**Figure 3.32 Mozambique's crop condition, April-July 2020**



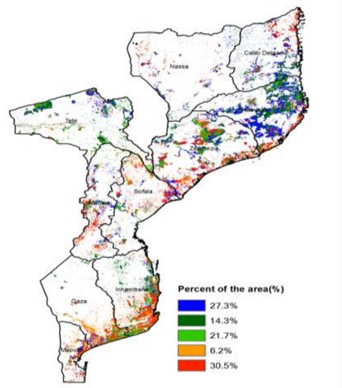

(a) Phenology of major crops

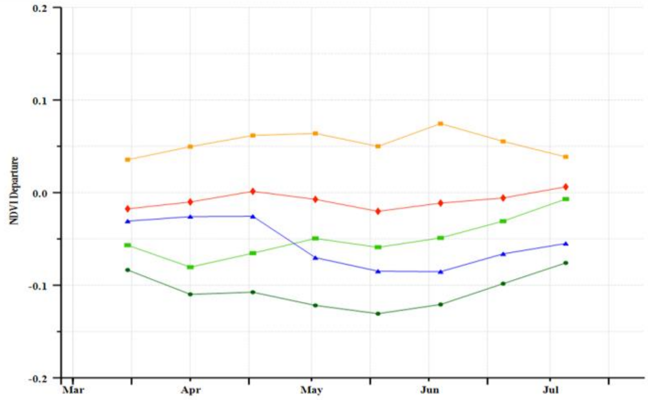



Nh5

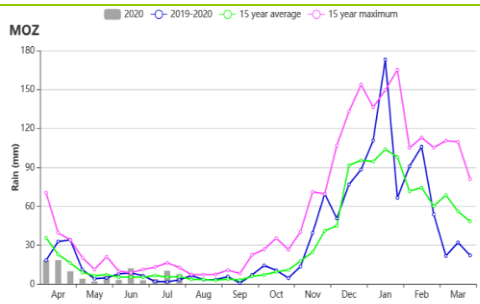


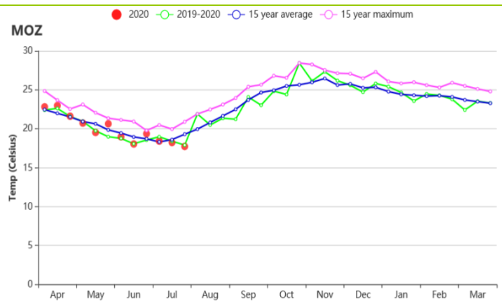

(b) Crop condition development graph based on NDVI (c) Maximum VCI



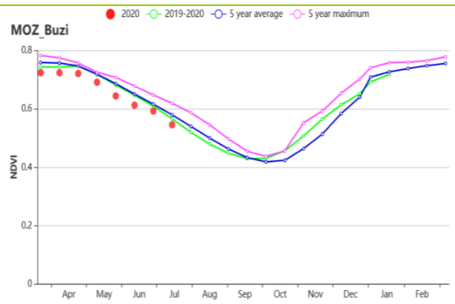



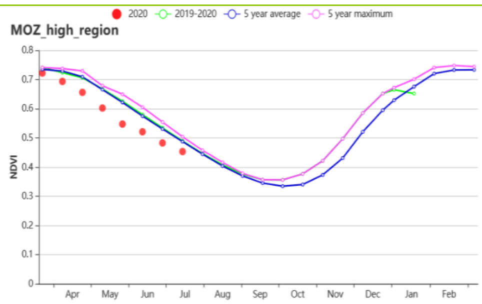

(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



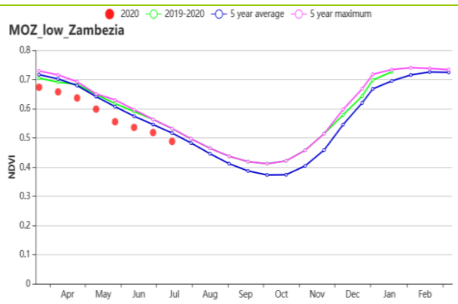



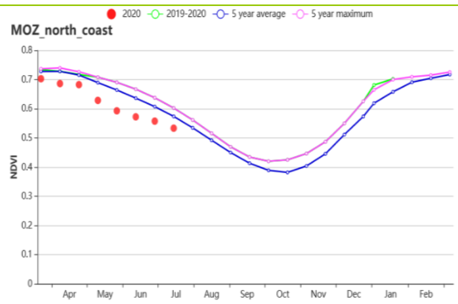

(f) Southen region time-series rainfall profiles (g) National time-series temperature profiles



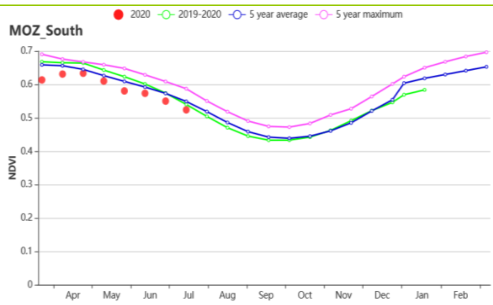




(h) Crop condition development graph based on NDVI-Buzi basin (left), and Northern high-altitude areas (right)




(i) Crop condition development graph based on NDVI-Lower Zambezi River basin (left), and Northern coast region (right)




(j) Crop condition development graph based on NDVI- Southern region

**Table 3.55 Mozambique's agro-climatic indicators by sub-national regions, current season's values and departure from 15YA, April-July 2020**

| Region | RAIN | | TEMP | | RADPAR | | BIOMSS | |
|---|---|---|---|---|---|---|---|---|
| | Current (mm) | Departure (%) | Current (°C) | Departure (°C) | Current (MJ/m²) | Departure (%) | Current (gDM/m²) | Departure (%) |
| Buzi basin | 89 | -16 | 17.0 | -0.4 | 961 | -4 | 417 | -2 |
| Northern high-altitude areas | 66 | -44 | 19.2 | 0.0 | 996 | 0 | 503 | 0 |
| Low Zambezi River basin | 110 | -9 | 19.4 | -0.3 | 924 | -4 | 463 | -2 |
| Northern coast | 119 | -30 | 21.0 | 0.0 | 964 | -2 | 553 | -1 |
| Southern region | 91 | -10 | 20.3 | -0.2 | 861 | -4 | 454 | -2 |

**Table 3.56 Mozambique's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April-July 2020**

| Region | CALF | | Maximum VCI |
|---|---|---|---|
| | Current (%) | Departure (%) | Current |
| Buzi basin | 100 | 0 | 0.85 |
| Northern high-altitude areas | 100 | 0 | 0.89 |
| Low Zambezia River basin | 96 | -2 | 0.80 |
| Northern coast | 100 | 0 | 0.82 |
| Southern region | 99 | 1 | 0.79 |

AFG AGO ARG AUS BGD BLR BRA CAN DEU EGY ETH FRA GBR HUN IDN IND IRN ITA KAZ KEN KGZ KHM LKA MAR MEX MMR MNG MOZ **NGA** PAK PHL POL ROU RUS THA TUR UKR USA UZB VNM ZAF ZMB

# [NGA] Nigeria

The current period from April to the end of July was marked by the start of the rainy season in April. In the South, the harvest of maize took place, as well as the planting of rainfed and irrigated rice. In the north, the sowing of cereals like millet, sorghum and maize started in May. Security, hampering crop production, is still a challenge for the northern part of the country.

At the national level, precipitation was 24% below the 15YA. Average temperatures were 0.5°C above the 5YA and radiation was also 2% higher. As a result, biomass production potential was slightly higher (+1%). Cropped land was reduced by 4%, and the vegetation condition was at 0.83. NDVI fell below the 5YA starting in June. Crop conditions are unfavorable.

**Regional analysis**

The analysis covers the four main agro-ecological zones; zone sudano-sahel in the north which is the driest zone, Guinea savanna and derived savanna zone in the center and the humid forest zone in the south.

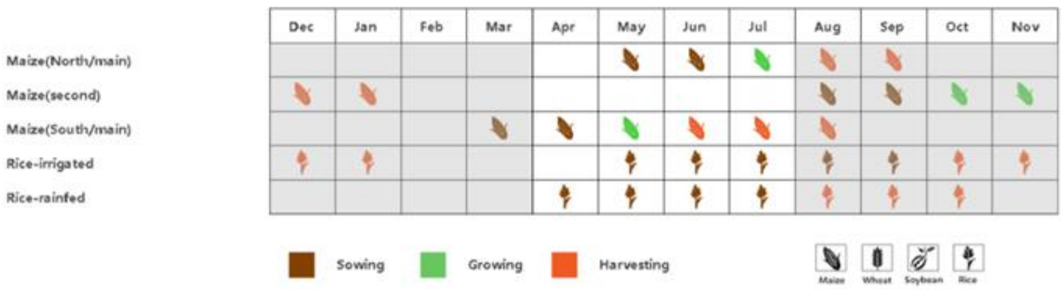
In the north, The Sudano-Sahelian zone recorded a reduction of 54% in rainfall, with a 0.7°C increase in temperature and average radiation as compared to the 15YA. These conditions bring the biomass to 643 gDM/m$^2$ (-1% of departure from 15YA). Cropped land amounted to 50%, a 9% decrease while the VCIx was at 75. The NDVI graph shows that the NDVI values were slightly above the average till mid-May when they dropped to below-average levels. By the end of July, they were back to the 5YA.

For the Guinean savanna, precipitation dropped by 40% from the 15 YA, temperature increased by 0.6°C and radiation up by 2%. Consequently, the biomass was 767 gDM/m$^2$ (+ 2%). In this period the cropped land was reduced by -4% from 15YA. Vegetation condition index was at 0.85. On the NDVI development graph, the values were close to average until late May, when they started to drop to below average levels, indicating unfavorable conditions.

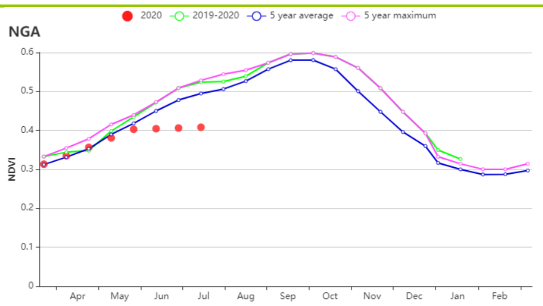
For the Derived savanna, rain was reduced by 29%, temperature increased by 0.5°C and the radiation was also higher (+3%) as compared to the 15 YA. These agro-climatic conditions resulted in an increase of potential biomass by 3%. The cropped land area was reduced by 2%, and the vegetation condition index was at 0.90. Vegetation conditions were relatively good till May when the NDVI profile graph started to sharply drop.

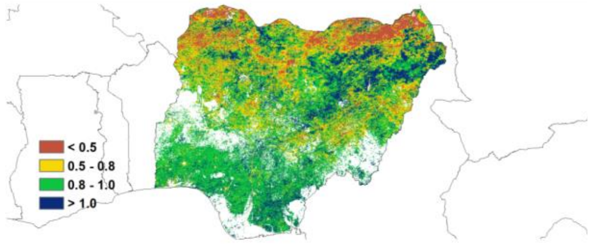
In the south, humid forest zone rainfall was 4% below the 15YA. Temperature was 0.2°C warmer and the radiation was 2% above the 15YA. These indicators increased the biomass by 2% and the cropped land fraction (CALF) was 99% with zero departure from 5YA. The vegetation condition index (VCIx) was at 0.95. As in the other regions, the NDVI profile started to drop to below-average levels in May.

**Figure 3.33 Nigeria's crop condition, April 2020 - July 2020**

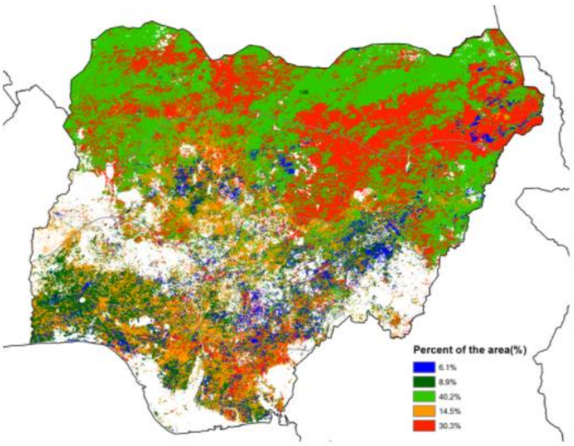


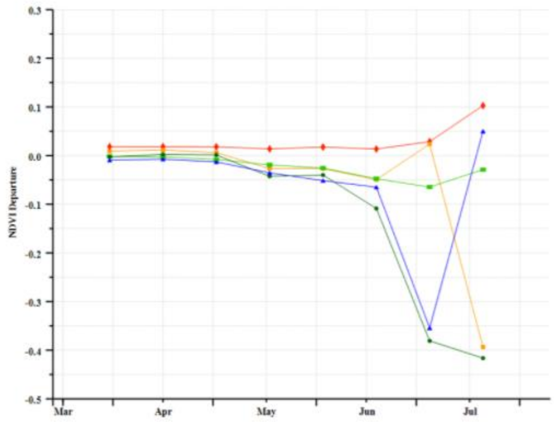

(a). Phenology of major crops



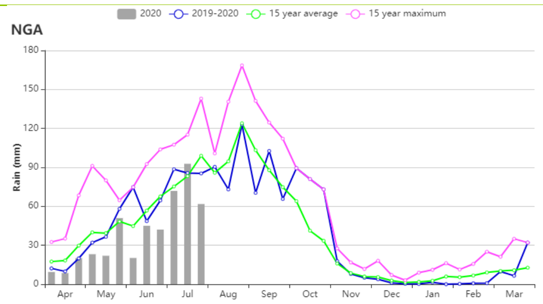



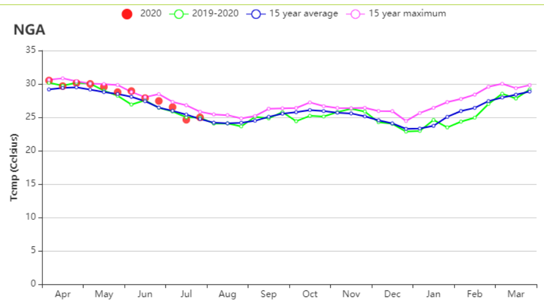

(b) Crop condition development graph based on NDVI (c) Maximum VCI



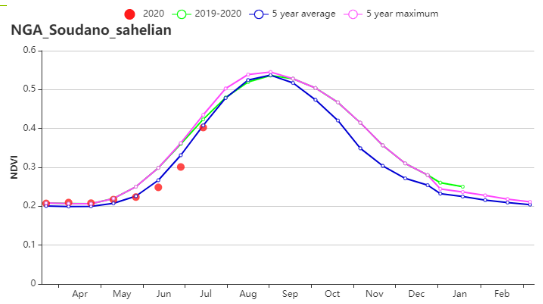



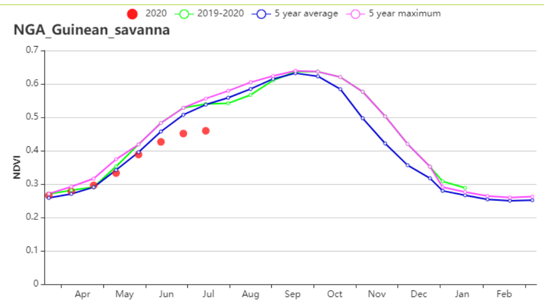

(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



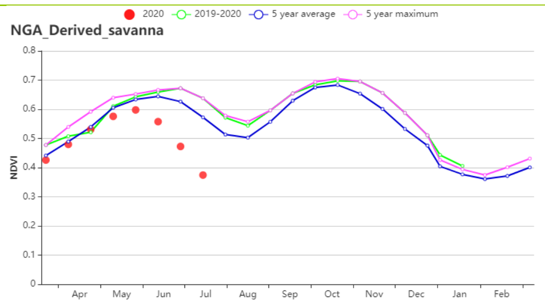



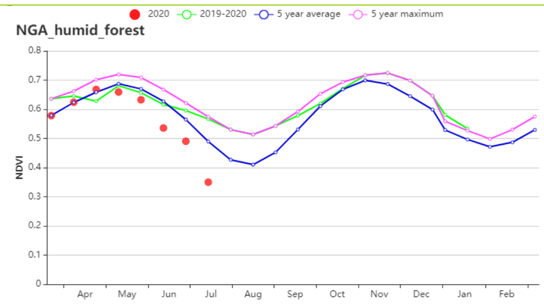

(f) Rainfall profiles (g) Temperature profiles




(h) Crop condition development graph based on NDVI (Soudano-Sahelian region (left) and Guinean savanna (right))




(i) Crop condition development graph based on NDVI (derived Savanna (left) and Humid forest zone (right)

**Table 3.57 Nigeria's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April 2020 - July 2020**

| Region | RAIN | | TEMP | | RADPAR | | BIOMSS | |
|---|---|---|---|---|---|---|---|---|
| | Current (mm) | Departure (%) | Current (°C) | Departure (°C) | Current (MJ/m²) | Departure (%) | Current (gDM/m²) | Departure (%) |
| Derived_savanna | 506 | -29 | 27.0 | 0.5 | 1194 | 3 | 787 | 3 |
| Guinean_savanna | 265 | -40 | 28.6 | 0.6 | 1267 | 2 | 767 | 2 |
| Humid_forest | 1136 | -4 | 25.8 | 0.2 | 1092 | 2 | 738 | 2 |
| Soudano_sahelian | 88 | -54 | 31.7 | 0.7 | 1330 | 0 | 643 | -1 |

**Table 3.58 Nigeria's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April 2020 - July 2020**

| Region | Cropped arable land fraction | | Maximum VCI |
|---|---|---|---|
| | Current (%) | Departure (%) | Current |
| Derived_savanna | 97 | -2 | 0.90 |
| Guinean_savanna | 88 | -4 | 0.85 |
| Humid_forest | 99 | 0 | 0.95 |
| Soudano_sahelian | 50 | -9 | 0.75 |

# [PAK] Pakistan

This reporting period covers the harvest of winter wheat and the planting of summer maize and rice. Crop conditions were generally favorable.

At the country level, RAIN was 8% above average, while TEMP (-1.2°C) and RADPAR (-3%) were below. The combination of all the agro-climatic indicators resulted in BIOMSS exceeding the 15YA by 18%. Precipitation varied greatly in time and space. Local heavy rainfall caused floods and unfavorable conditions during the harvest period of wheat, for instance in Karachi and Pakhtunkhwa. About 20% of the crop areas experienced drought caused by insufficient rainfall in July, as shown in the VHIn graph. So far, summer maize and rice have benefited from the generally favorable weather conditions, and the fraction of cropped arable land (CALF) increased significantly by 9% compared with 5YA, which may have a postive effect on the summer crop production.

At the national level, the NDVI development graphs indicated favorable conditions during the previous reporting period, which continued in this period until the end of June, when they started to drop to below average levels, presumably due to a rainfall deficit starting in June. The spatial NDVI patterns and profiles show that 69% of the cropped areas were average or above average, whereas only 7% were consistently below average during the monitoring period. The below average areas were scattered throughout the country and not concentrated in any particular region. However, the trends showed a general decrease in July for 46% of the crop areas. The sowing of maize benefitted from favorable conditions in Punjab. The Indus river basin (the rice producing areas) has reached average or above average NDVI after transplanting in June. Though below-average crop conditions were observed in the three main agricultural areas in July, above-average rainfall in the Northern Highland (+22%) and Punjab (+30%) regions, together with irrigation of lower Indus river basin might help sustain favorable crop conditions for the remainder of the growing season.

**Regional analysis**

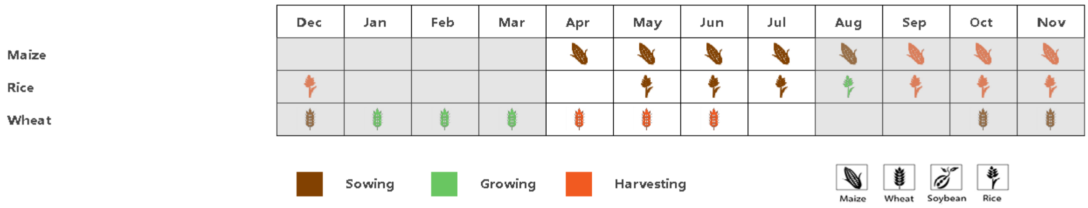
For a more detailed spatial analysis, CropWatch subdivides Pakistan into three agro-ecological regions based essentially on geography and agro-climatic conditions: the Northern highlands, Northern Punjab region and the Lower Indus river basin in South Punjab and Sind.

The NDVI development graph of **Northern highlands** shows above average crop condition from April to early July. RAIN was 22% above average. RADPAR and TEMP were below average (-4% and -1.9°C respectively) between April and July. The resulting BIOMSS exceeded the fifteen-year average by 2%. The region achieved a rather low CALF of 63%, but it is a large increase by 14% over the 5YA and VCIx is 1.04. Wheat conditions were satisfactory but the harvest may have suffered from heavy rainfall or storms; weather was generally favorable for the establishment of maize.

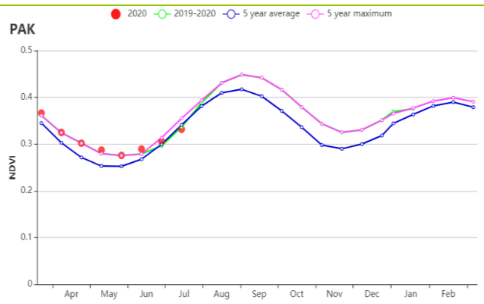
The **Northern Punjab**, the main agricultural region in Pakistan recorded abundant RAIN (30% above average). TEMP was below average by 1.9°C, and the RADPAR departure was -2%. The estimated BIOMSS departure of +14% as compared to the fifteen-year average is probably not so relevant, since this period covers the harvest of wheat and the establishment of maize and rice crops. Wheat had above average NDVI values during the entire growth period, which resulted in high yields. Together with the large VCIx (0.89) and high CALF (79% with an increase of 13%), crop conditions are favorable.

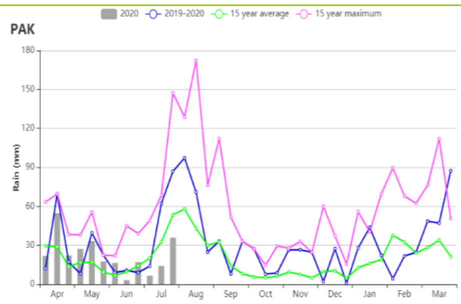
In the **Lower Indus river basin** in south Punjab and Sind, RAIN was above average by 13%, while RADPAR and TEMP were below average by -2% and 0.4°C respectively. Estimated BIOMSS was 35% higher than the last fifteen-year average. The VCIx was at 0.88, which is normal for this period between the harvest of wheat and the establishment of the new crops. Considering that the vast majority of land in this region is irrigated, prospects for the newly established crops are promising. CALF was rather low (43%), but still 5% higher than 5YA, which indicates an increase in production due to a larger area planted.

**Figure 3.34 Pakistan's crop condition, April-July, 2020**

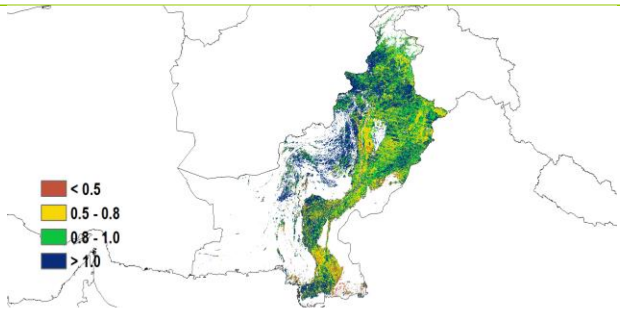



(a). Phenology of major crops

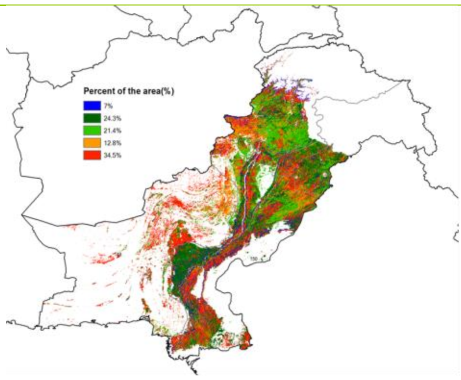


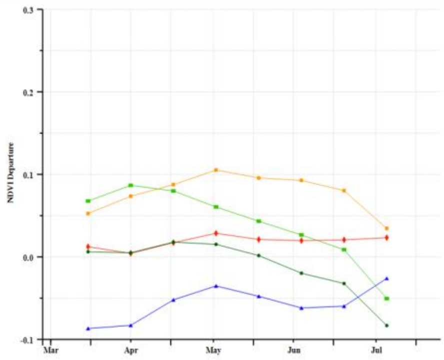




(b) Crop condition development graph based on NDVI (c) Time series precipitation profile

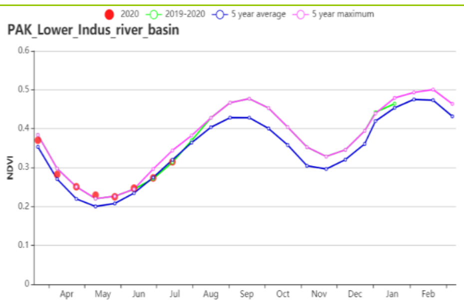


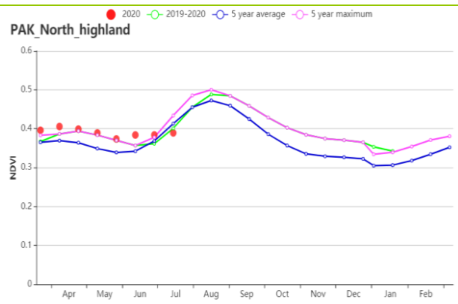

(d) Maximum VCI



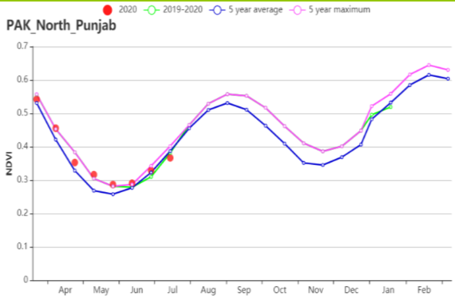




(e) Spatial NDVI patterns compared to 5YA (f) NDVI profiles

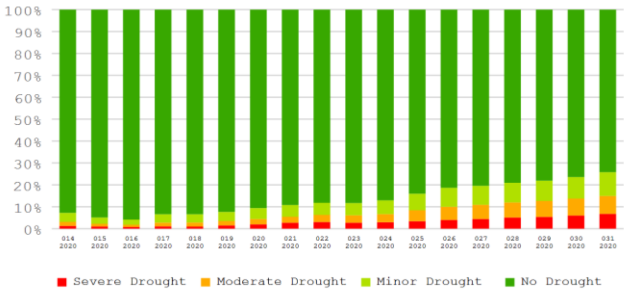



(g) Crop condition development graph based on NDVI in Lower Indus river basin in south Punjab and Sind (left) and Northern Highlands (right)




(h) Crop condition development graph based on NDVI in Northern Punjab




(i) Proporation of VHIn categories compared with 5YA

**Table 3.59 Pakistan's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April-July 2020**

| Region | RAIN | | TEMP | | RADPAR | | BIOMSS | |
|---|---|---|---|---|---|---|---|---|
| | Current (mm) | Departure (%) | Current (°C) | Departure (°C) | Current (MJ/m²) | Departure (%) | Current (gDM/m²) | Departure (%) |
| Lower Indus river basin in south Punjab and Sind | 76 | 13 | 34.4 | -0.4 | 1532 | -2 | 842 | 35 |
| Northern highlands | 422 | 22 | 19.6 | -1.9 | 1492 | -4 | 691 | 2 |
| Northern Punjab | 250 | 30 | 31.1 | -1.9 | 1481 | -2 | 996 | 14 |

**Table 3.60 Pakistan's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April-July 2020**

| Region | Cropped arable land fraction | | Maximum VCI |
|---|---|---|---|
| | Current (%) | Departure (%) | Current |
| Lower Indus river basin in south Punjab and Sind | 43 | 5 | 0.88 |
| Northern highlands | 63 | 14 | 1.04 |
| Northern Punjab | 79 | 13 | 0.89 |

AFG AGO ARG AUS BGD BLR BRA CAN DEU EGY ETH FRA GBR HUN IDN IND IRN ITA KAZ KEN KGZ KHM LKA MAR MEX MMR MNG MOZ NGA PAK **PHL** POL ROU RUS THA TUR UKR USA UZB VNM ZAF ZMB

# [PHL] Philippines

The reporting period covers the sowing to early harvesting stage of main maize and the sowing to early growth stage of main rice. The harvest for the second maize was concluded by the end of May and for the second rice by the end of April. The NDVI for the country was below average until late June and close to average in July. The maximum departure for NDVI from average was in the middle of May. Generally, crop conditions in the Philippines were close to or below average compared to the previous five years.

Compared to the average values of the past 15 years, the precipitation (RAIN, -16%) for the country was lower and the temperatures (TEMP, +0.5°C) were slightly warmer. However, the radiation (RADPAR, +6%) was higher than the average of the previous 15 years. The variation of values for agro-climatic indicators mentioned above resulted in an above-average potential biomass production (BIOMASS, +6%). At the same time, the cropped arable land fraction (CALF) for the country was almost 100% and the maximum VCI value was at 0.96.

According to spatial patterns of NDVI profiles, about 47.3% of the crop land, mainly located in the area of the west of Luzon island, the south of Mindoro and the north of Naga, had a stable NDVI, which was close to average conditions. For around 30.4% of the crop land, NDVI decreased before May and increased gradually after that time. This was mainly in the middle of Luzon island and the middle of Mindanao island. The NDVI there was lower than average before the end of June and it was higher than average in July. An anomaly for the NDVI was observed in some scattered areas, about 8.8% of the crop land, which dropped dramatically up to 0.4 NDVI units in early May but recovered before June. This drop was due to cloud cover as shown in the satellite images. From the maximum VCI graph, most parts of the country had a high maximum VCI value (VCIX > 0.8), however, about 52.7% of the crop land experienced a sub-average NDVI for most of the time. So the prospected production of maize and second rice is close to or below average.

**Regional analysis**

Based on the cropping systems, climatic zones and topographic conditions, three main agro-ecological regions can be distinguished for the Philippines. They are the Lowlands region (northern islands), the Hilly region (Island of Bohol, Sebu and Negros), and the Forest region (mostly southern and western islands). All the regions had a stable (almost 100%) cropped arable land fraction and a high maximum VCI value (VCIx>0.94).

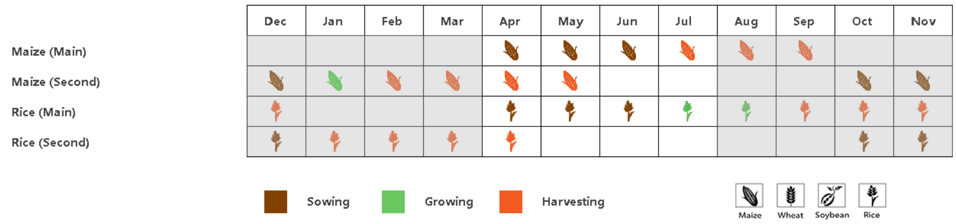
The **Lowlands region** experienced above-average temperature (TEMP +0.5°C), radiation (RADPAR, +7%) and potential biomass production (BIOMASS, +6%). However, the rainfall (RAIN, -22%) for the region was below average. As the NDVI profile shows, the NDVI was lower than average before the end of May and it was close to average in June. The above-average NDVI values in July indicate that the main rice experienced favorable conditions.

Compared to the previous 15 years, the **Negros and central Visayas Islands region** experienced less precipitation (RAIN, -9%), relatively higher temperatures (TEMP, +0.6°C) and above-average radiation (RADPAR, +5%). The potential biomass production (BIOMASS, +5%) for the region was higher than the 15YA. The regional maximum VCI value (VCIx) was at 0.99. According to the NDVI profile, the NDVI for the region was close to average before the middle of April and then it was below average for most of the time except for the early July when NDVI was close to average as well. Considering the regional NDVI, the prospected production of main maize and the crop condition of main rice are below average.

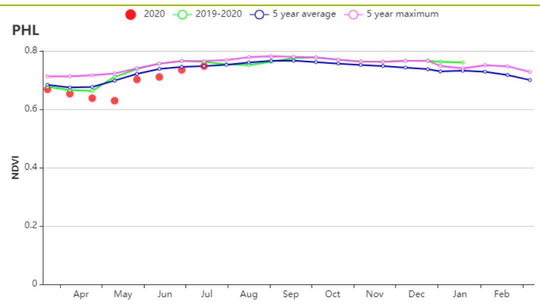
The **Forest region** had an above-average temperature (TEMP, +0.4°C) and above-average radiation (RADPAR, +5%). The potential biomass production (BIOMASS) for the region was above average by 5% and the rainfall (RAIN, -11%) was lower than average. The NDVI profiles for the region show that it was close to average before the middle of April and it was below average after that time. The maximum departure of NDVI from average condition appeared in the middle of May and it was close to 0 during

July, which means the production of second maize in this region was below average and the crop conditions of the main maize and the main rice were stable and close to average.

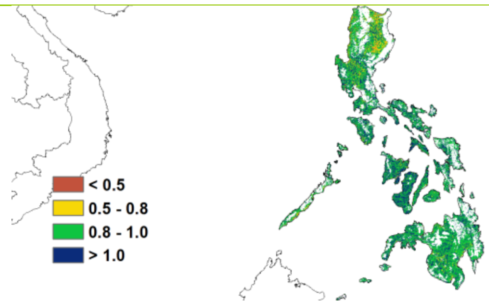
**Figure 3.35 Philippines' crop condition, April - July 2020**



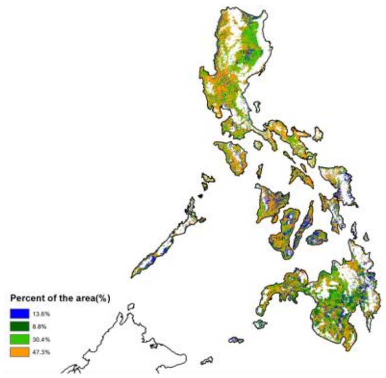

(a). Phenology of major crops



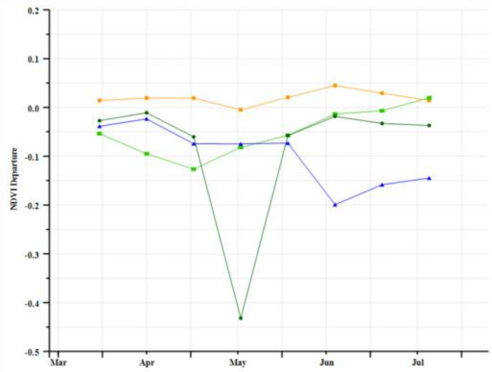

(b) Crop condition development graph based on NDVI



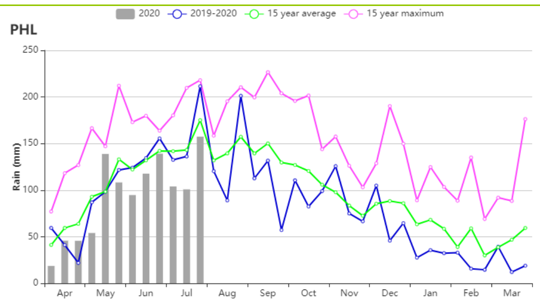

(c) Maximum VCI



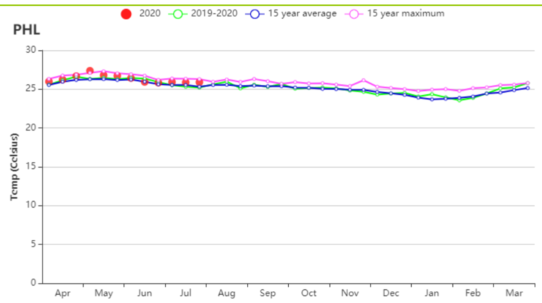

(d) Spatial NDVI patterns compared to 5YA



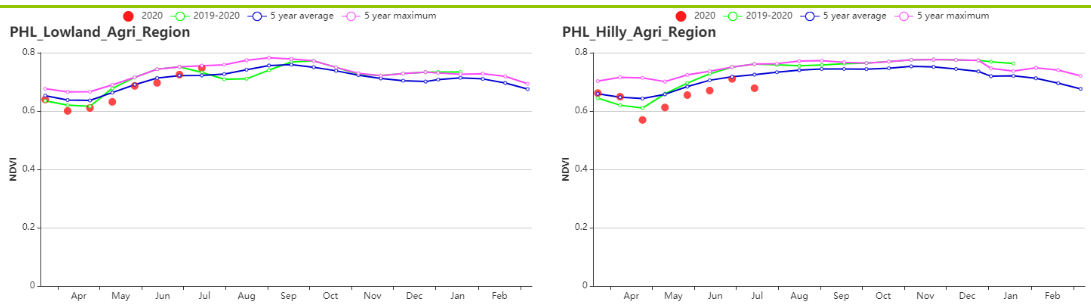

(e) NDVI profiles



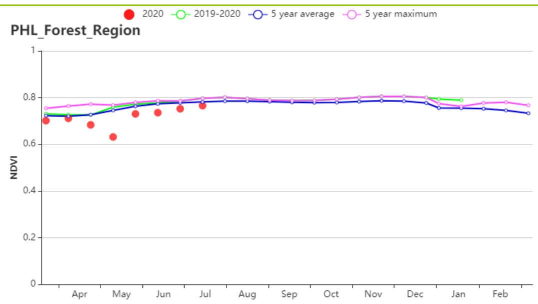

(f) Rainfall profiles




(g) Temperature profiles




(h) Crop condition development graph based on NDVI (Lowlands region (left) and Hills region (right))




(i) Crop condition development graph based on NDVI (Forest Region)

**Table 3.61 Philippines' agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2020**

| Region | RAIN | | TEMP | | RADPAR | | BIOMSS | |
|---|---|---|---|---|---|---|---|---|
| | Current (mm) | Departure (%) | Current (°C) | Departure (°C) | Current (MJ/m²) | Departure (%) | Current (gDM/m²) | Departure (%) |
| **Forest region** | 1155 | -11 | 25.8 | 0.4 | 1314 | 5 | 887 | 5 |
| **Hilly region** | 1154 | -9 | 27.8 | 0.6 | 1391 | 5 | 951 | 5 |
| **Lowland region** | 1083 | -22 | 26.6 | 0.5 | 1394 | 7 | 934 | 6 |

**Table 3.62 Philippines' agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2020**

| Region | Cropped arable land fraction | | Maximum VCI |
|---|---|---|---|
| | Current (%) | Departure (%) | Current |
| **Forest region** | 100 | 0 | 0.96 |
| **Hilly region** | 100 | 0 | 0.99 |
| **Lowlands region** | 100 | 0 | 0.94 |

# [POL] Poland

This monitoring period covers the planting of spring wheat and maize, which was concluded in May. Winter wheat started to reach maturity in late July.

Compared to the average of the last 15 years, precipitation increased by 13%, average temperatures were 1.0°C lower and RADPAR was near average during this monitoring period. Potential biomass levels were 7% lower due to low temperatures. In terms of agricultural conditions, the percentage of cultivated land was close to 100%, which is comparable to the average of the last 5 years, and the VCIx reached 0.96.

As shown in the development graphs, the NDVI levels were below average until June, which was presumably due to cooler temperatures in May. NDVI recovered to average values in June and reached maximum values in July, but then started to drop to the 5-year average in late July. This indicates that the spring crops benefitted from the favorable moisture conditions in June and early July. However, rainfall was generally low in the second half of July, which may have caused the drop in NDVI. The dry conditions in late July may have benefitted wheat harvest.

Due to the ongoing drought in the northwest, the 11.4% of the country's arable land area where NDVI was consistently below average during the monitoring period was mainly located in that part of the country. However, by the end of the current monitoring period, NDVI rose to above-average levels. VCIx for almost the entire country was above 0.8.

In general, agronomic conditions were generally favorable for the growth and harvest of winter wheat, as well as for the other crops.

**Regional analysis**

The country was divided into four zones according to agro-ecological characteristics, including: (a) the Northern oats and potatoes areas covering the northern half of West Pomerania, eastern Pomerania and Warmia-Masuria, (b) the Northern-central wheat and sugar-beet area (Kuyavia-Pomerania to the Baltic sea), (c) the Central rye and potatoes area (Lubusz to South Podlaskie and northern Lublin), and (d) the Southern wheat and sugar-beet area (Southern Lower Silesia to southern Lublin and Sub-Carpathian along the Czech and Slovak borders).

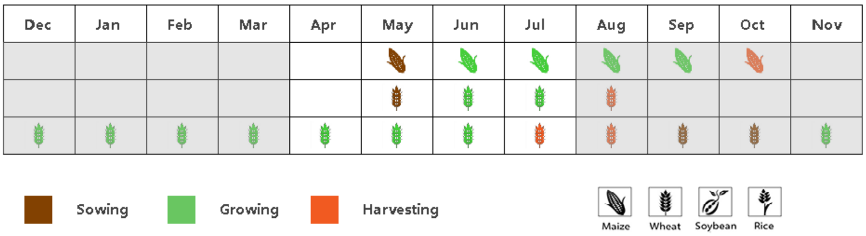
Precipitation, average temperature, and radiation were all below the 15-year average (RAIN, -3%; TEMP, -0.9°C; RADPAR, -1%) in **Northern oats and potatoes areas**, resulting in a potential biomass decrease by 6%.

In **Northern-central wheat and sugar-beet area** and **Central rye and potatoes area** similar trends were observed: Precipitation was both above average by 5%, temperatures were below (1.0°C and 0.9°C respectively), and RADPAR was close to average. BIOMSS was below average by 6% in both regions.

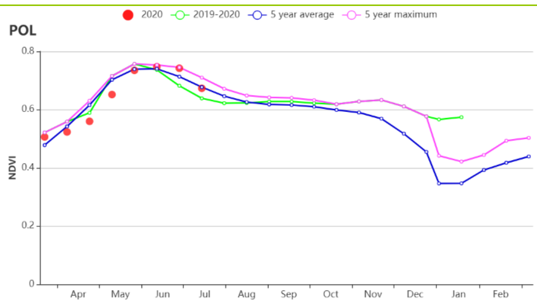
Precipitation in the **Southern wheat and sugar-beet area** was significantly above average, with an increase by 31%. Temperature was 1.1°C below average and radiation near-average. Although precipitation was abundant, potential biomass was 10% lower due to lower temperatures.

In all the four subregions, NDVI was below average until June due lower temperatures and drought in the early spring. After precipitation in May returned to normal, and temperature rose in June, NDVI was higher than average from early June, and by the end of July, NDVI dropped to average again. CALF in all four zones was about 100%, and VCIx in four zones reached 0.95 and more.

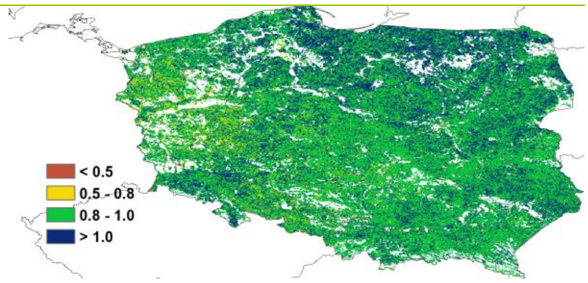
**Figure 3.36 Poland's crop condition, April - July 2020**



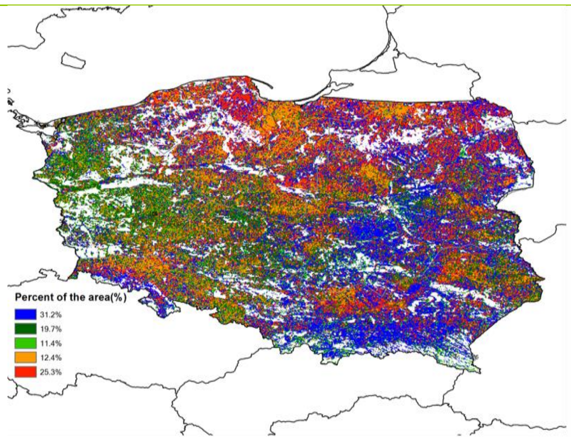

(a). Phenology of major crops



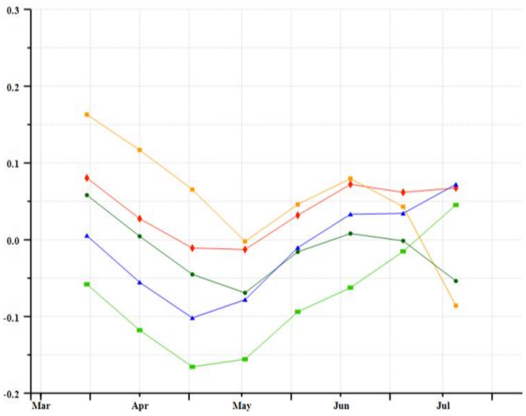

(b) Crop condition development graph based on NDVI



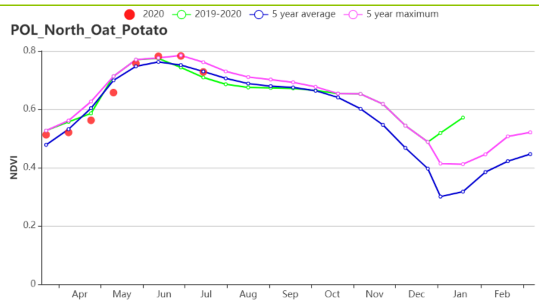

(c) Maximum VCI

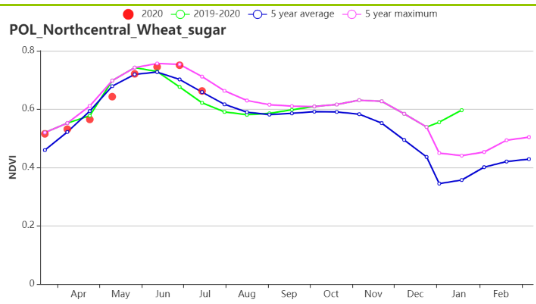



(d) Spatial NDVI patterns compared to 5YA

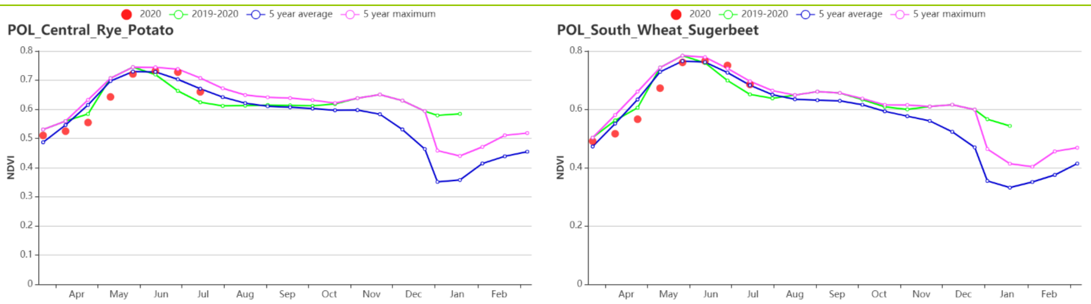



(e) NDVI profiles

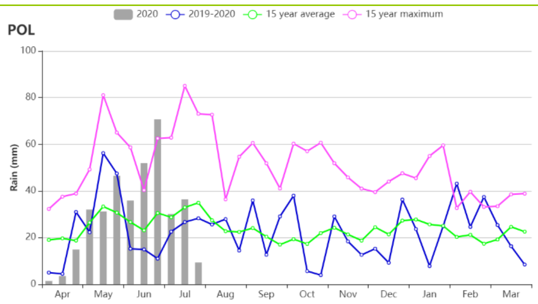


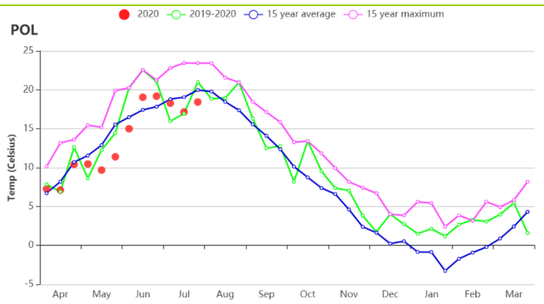

(f) Crop condition development graph based on NDVI, Northern oats and potatoes area (left) and Northern-central wheat and sugar beet area (right).




(g) Crop condition development graph based on NDVI, Central rye and potatoes area (left) and Southern wheat and sugar beet area (right).




(h) Rainfall index




(i) Temperature Index

**Table 3.63 Poland's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April-July 2020**

| Region | RAIN | | TEMP | | RADPAR | | BIOMSS | |
|---|---|---|---|---|---|---|---|---|
| | Current (mm) | Departure (%) | Current (°C) | Departure (°C) | Current (MJ/m²) | Departure (%) | Current (gDM/m²) | Departure (%) |
| Northern oats and potatoes areas | 317 | -3 | 13.0 | -0.9 | 1133 | -1 | 414 | -6 |
| Northern-central wheat and sugarbeet area | 310 | 5 | 13.4 | -1.0 | 1154 | 0 | 428 | -6 |
| Central rye and potatoes area | 319 | 5 | 14.1 | -0.9 | 1163 | 1 | 448 | -6 |
| Southern wheat and sugarbeet area | 460 | 31 | 13.4 | -1.1 | 1177 | 0 | 429 | -10 |

**Table 3.64 Poland's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April-July 2020**

| Region | Cropped arable land fraction | | Maximum VCI |
|---|---|---|---|
| | Current | Departure (%) | Current |
| Northern oats and potatoes areas | 100 | 0 | 1.00 |
| Northern-central wheat and sugarbeet area | 100 | 0 | 0.98 |
| Central rye and potatoes area | 100 | 0 | 0.95 |
| Southern wheat and sugarbeet area | 100 | 0 | 0.96 |

AFG AGO ARG AUS BGD BLR BRA CAN DEU EGY ETH FRA GBR HUN IDN IND IRN ITA KAZ KEN KGZ KHM LKA MAR MEX MMR MNG MOZ NGA PAK PHL POL **ROU** RUS THA TUR UKR USA UZB VNM ZAF ZMB

# [ROU] Romania

During this reporting period, maize and spring wheat were sown, while winter wheat was harvested in July. At the national level, rainfall was 6% above average, average temperature was 0.9°C lower and radiation was slightly below average (-1%). With lower temperature and radiation, biomass decreased by 9%. The CALF of Romania remained unchanged (100%) and current maximum VCI is at 0.88, which is fair for production. The rainfall time series shows that it was far below average in April, close to average in May and far above average in June, while temperature was around average. The VHI map shows that at the beginning of the reporting period, drought conditions were observed in April and May, until heavy rainfall occurred in June. According to the NDVI development curve, crop conditions were below average during April to June and reached close to average levels in July. Crop conditions are assessed as generally unfavorable.

**Regional analyses**

More details are provided below for three main agro-ecological zones: the **Central mixed farming and pasture Carpathian hills** (160), the **Eastern and southern maize, wheat and sugar beet plains** (161) and the **Western and central maize, wheat and sugar beet plateau** (162).

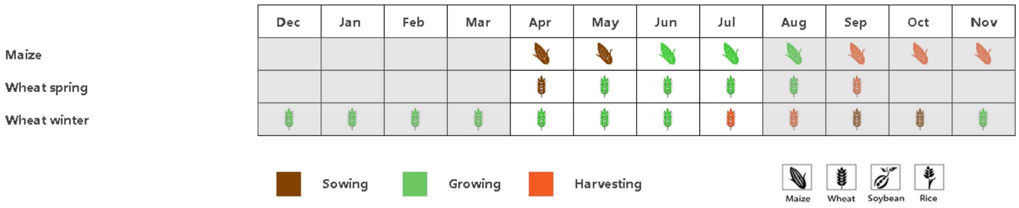
For the Central mixed farming and pasture Carpathian hills, compared to the 15YA, rainfall increased by 6%, while temperature and radiation were both down (TEMP -1.0°C, RADPAR -3%) and BIOMSS decreased by 12%. According to the NDVI development, crop conditions were below the average from April to June but improved and were above average in July. The regional average VCI maximum was 0.97. The NDVI spatial distribution shows that the NDVI was decreasing in April to May and increased since June. As this region occupies only a small part of cropland in Romania, the low biomass is not significant for Romania's crop production.

For the Eastern and Southern maize, wheat and sugar beet plains all weather-related parameters decreased: Rainfall (-1%), temperature (-0.6°C), radiation (-1%). This resulted in a reduced estimate of biomass (-4%). The NDVI development graph shows that crop conditions dropped to below average starting in April. The VCI max value of this region was 0.84, much lower than the other two sub regions. According to the distribution map, the light green NDVI profile line region in the southeast (counties of Tulcea and Constanta) droped largely in April to May and increased in June and July, meanwhile the VCI maximum values in this area were very low, some even below 0.5. Spatial NDVI patterns show that the NDVI values in most areas of the Eastern and Southern maize, wheat and sugar beet plains were decreasing since April (red line), which indicates unfavorable crop conditions.

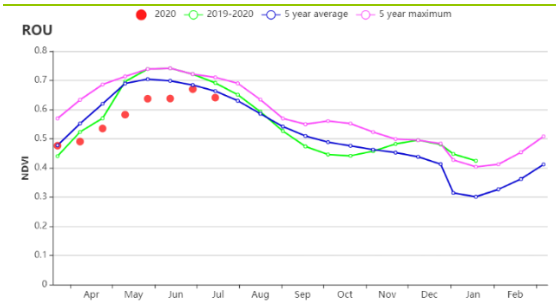
For the Western and central maize, wheat and sugar beet plateau, rainfall was higher than average by 16%, temperature lower than average by 1.3°C, radiation was a bit lower (RADPAR -3%) and biomass decreased by 15%. Maximum VCI of this region was 0.94 and the spatial distribution was between 0.5 and 1.0, a bit better than the Eastern and Southern maize, wheat and sugar beet plains. Spatial NDVI pattern shows that NDVI slightly increased during May to July (yellow and blue line), which indicates that crop conditions were improving for this region.

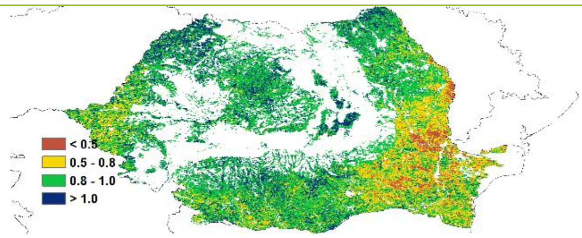
Overall, crop conditions were not satisfactory in Romania during this reporting period, as indicated by the low biomass and VCI. Currently, the outlook is unfavorable for the 2020 winter wheat, but rather promising for the maize crops.

**Figure 3.37 Romania's crop condition, April - July 2020**



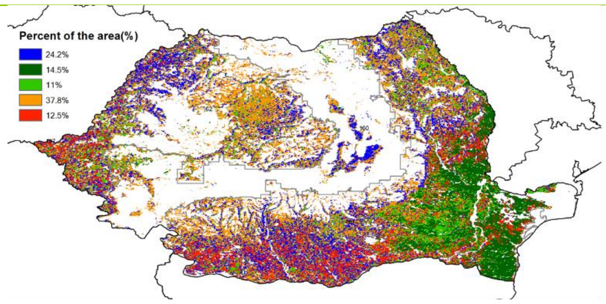

(a). Phenology of major crops

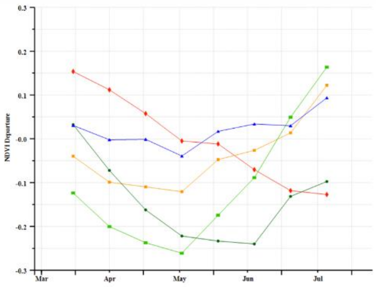



(b) Crop condition development graph based on NDVI

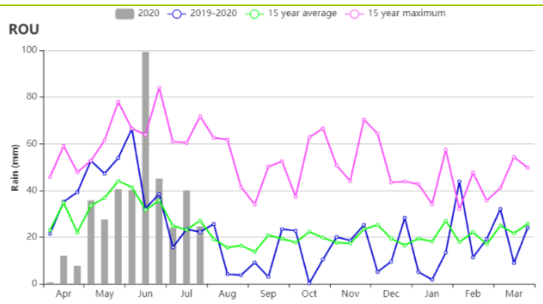
(c) Maximum VCI

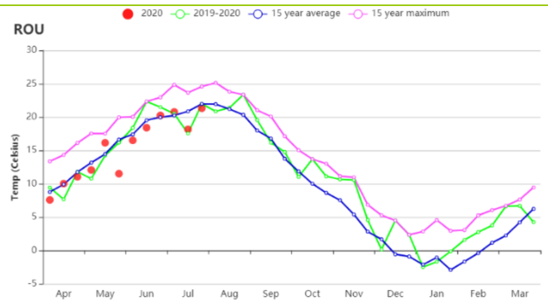



(d) Spatial NDVI patterns compared to 5YA

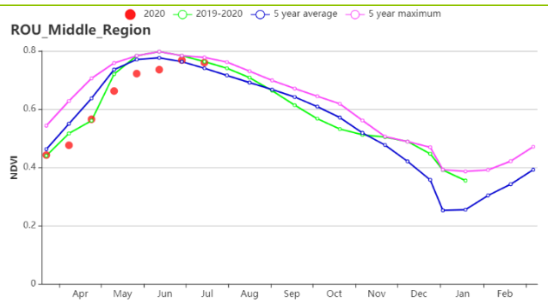
(e) NDVI profiles

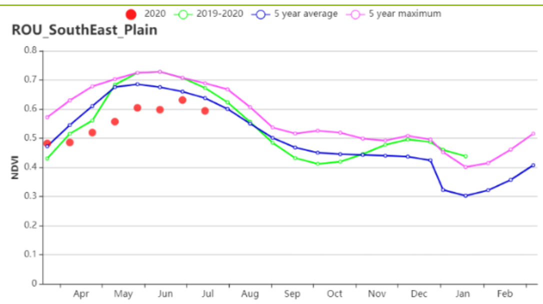


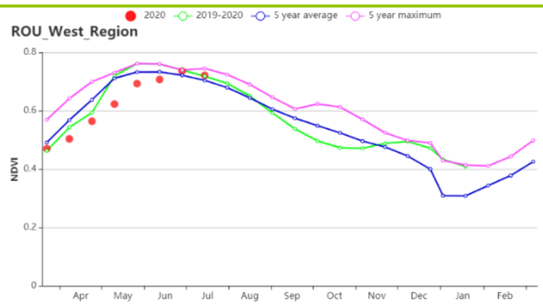

(f) Rainfall profiles

(g) Temperature profiles

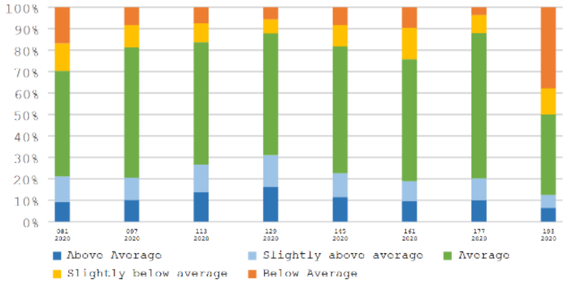


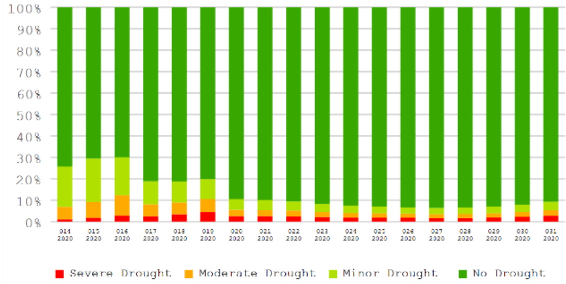




(h) Crop condition development graph based on NDVI (Central mixed farming and pasture Carpathian hills (left) and Eastern and southern maize, wheat and sugar beet plains (right))




(i) Crop condition development graph based on NDVI (Western and central maize, wheat and sugar beet plateau)




(j) Proportion of NDVI anomaly categories compared with 5YA (k) Proportion of VHIn categories compared with 5YA

**Table 3.65 Romania's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2020**

| Region | RAIN | | TEMP | | RADPAR | | BIOMSS | |
|---|---|---|---|---|---|---|---|---|
| | Current (mm) | Departure (%) | Current (°C) | Departure (°C) | Current (MJ/m²) | Departure (%) | Current (gDM/m²) | Departure (%) |
| Central mixed farming and pasture Carpathian hills | 473 | 6 | 13.1 | -1 | 1255 | -3 | 443 | |
| Eastern and southern maize wheat and sugarbeet plains | 337 | -1 | 16.6 | -0.6 | 1325 | 1 | 591 | |
| Western and central maize wheat and sugarbeet plateau | 440 | 16 | 14.5 | -1.3 | 1282 | -3 | 486 | |

**Table 3.66 Romania's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2020**

| Region | Cropped arable land fraction | | Maximum VCI |
|---|---|---|---|
| | Current (%) | Departure (%) | Current |
| Central mixed farming and pasture Carpathian hills | 100 | 0 | 0.97 |
| Eastern and southern maize wheat and sugarbeet plains | 99 | 0 | 0.84 |
| Western and central maize wheat and sugarbeet plateau | 100 | 0 | 0.94 |

# [RUS] Russia

In Russia, the period from April to July is the time of active crop growth. At the end of July, winter crops are harvested in many regions, while spring crops reach the peak of their growth.

NDVI was equal to its 5-year average until mid-May. From mid-May and mid-June, it was at the level of the 5-year maximum, but by mid-July, it had dropped below the level of the previous year and the 5-year average.

During the period from April to June, rainfall was mainly above the 15-year average. From April to the beginning of June, rainfall exceeded the 15-year maximum. From mid-June to mid-July, the amount of precipitation was close to the 15-year average and mainly below the level of the previous year. By the end of July, rainfall exceeded the 15-year average and reached the level of the previous year.

From April to mid-June the temperature in Russia was close to the level of the previous year and the 15-year average. At the end of June, it fell below both these levels. At the beginning of July, temperature increased and reached the 15-year maximum. However, it dropped to the level of the previous year by the end of the month.

Main regions of winter crop production showed different NDVI departures and VCIx. South and North Caucasus showed mainly negative NDVI departure with VCIx varying from <0.5 to 0.8-1. Central and Central Black Soils region as well as Middle Volga showed mainly positive NDVI departure with VCIx from 0.8-1 to >1.

In the regions with positive NDVI departures the yield of winter crops is expected to be at the level of the previous year or above. While in the regions with negative NDVI departure, the yield of winter crops is likely to be below the level of the previous year. Overall, crop conditions are favorable.

**Regional analysis**

In **South Caucasus region,** rainfall was 2% below the 15-year average. Temperature decreased by 0.2°C compared to the 15-year average. RADPAR was above the 15-year average by 1% and BIOMASS increased by 1%. VCIx was 0.96. CALF was at the level of the 5-year average (100%). During this period, NDVI was mainly below the level of the previous year and the 5-year average. The yield of winter crops is likely to be lower than in the previous year in this region.

In the **North Caucasus**, rainfall was below the 15-year average by 2%. The temperature was also below the 15-year average (-0.7°C). RADPAR decreased by 1%. Unfavorable agroclimatic conditions resulted in a decrease in BIOMASS value by 3%. VCIx was 0.84 - the lowest value for Russia. CALF was 4% below the 5-year average. NDVI in the period from April to May was below the 5-year average and the value of the previous year. In early June, NDVI reached the 5-year average, but then dropped below the level of the previous year and the 5-year average. The yield of winter crops is likely to be lower than in the previous year in this region.

In **Central Russia**, rainfall was above the 15-year average by 31%. The temperature decreased by 1.3°C compared to the 15-year average. RADPAR decreased by 9% relative to the 15-year average. BIOMASS dropped by 14%. VCIx value was 0.98. CALF was at the level of the 5-year average (100%). In April and May, NDVI was mainly below the 5-year average and the level of the previous year. In June, NDVI reached the 5-year average. The yield of winter crops is expected to be close to or slightly above the level of the previous year.

**Central Black Soils** region experienced the highest rainfall, which was 36% above the 15-year average. The temperature decreased by 1.3°C. RADPAR decreased by 6% relative to the 15-year average. BIOMASS decreased by 10% relative to the 5-year average. VCIx was 0.99. CALF was equal to the 5-year average (100%). In April and May, NDVI was equal to the level of the previous year and 5-year average. In June it increased and reached a 5-year maximum. In mid-July NDVI dropped below the 5-year average to the level of the previous year. The yield of winter crops is likely to be slightly higher than in the previous year.

In **Middle Volga region** rainfall exceeded the 15-year average by 28%. Temperature was 0.8°C below the 15-year average. RADPAR decreased by 3% compared to the 15-year average. BIOMASS decreased by 5%. VCIx was 0.93. CALF was at the level of the 5-year average (98%). From mid-April to the end of May, NDVI stayed at the level of the previous year and the 5-year average. In June, it increased to the 5-year maximum. Then it dropped below the 5-year average. The yield of winter crops is likely to be slightly higher than in the previous year.

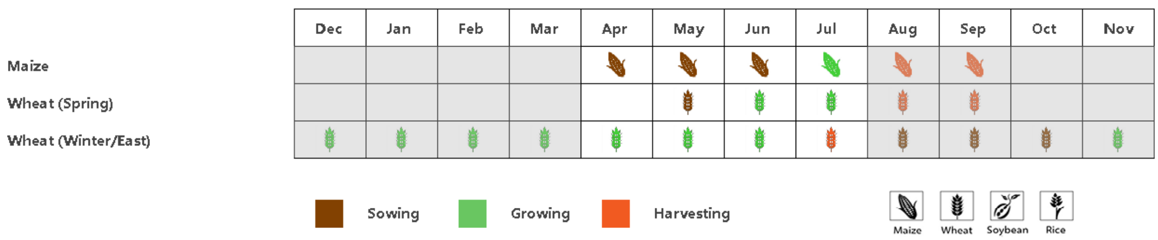
In **Ural and Western Volga region** rainfall was above the 15-year average by 3%. Temperature exceeded the 15-year average by 0.4°C. RADPAR was below the 15-year average by 1%. BIOMASS increased by 3%. VCIx was 0.87. CALF was at the level of the 5-year average (99%). From April till mid-May NDVI was at the level of previous year and 5-year average. By the end of May it increased up to the 5-year maximum, which indicated that the vegetation progressed faster than in the previous year. At the beginning of June NDVI came back to the level of the previous year and the 5-year average. Then it dropped below these levels. The winter crops yield is expected to be lower than in the previous season.

In **Western Siberia** rainfall exceeded the 15-year average by 25%. Temperature was above the 15-year average by 1.2°C. RADPAR was by 4% below the 15-year average. BIOMASS increased by 3%. VCIx was 0.87. CALF was at the level of the 5-year average (99%). From April till the end of May, NDVI was at the level of the 5-year maximum. Then it dropped to the level of the previous year and the 5-year average. In June and July, it stayed below the level of the previous year and the 5-year average. The spring and summer crops status is likely to be worse than in the previous year.

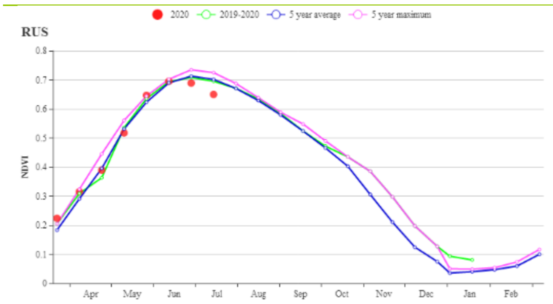
In **Middle Siberia**, rainfall increased by 33% relative to the 15-year average. Temperature increased by 0.7°C compared to the 15-year average. RADPAR was below 15-year average by 4%. BIOMASS decreased by 2%. VCIx was 0.92 and CALF increased by 4% relative to the 5-year average. NDVI between April and May was equal to the 5-year average and the value of the previous year. It subsequently reached a 5-year maximum in July. The status of spring and summer crops is close to the long-term average.

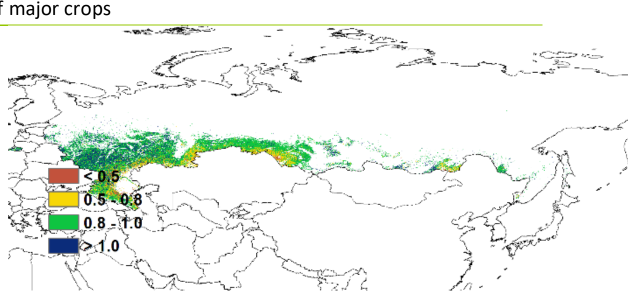
In **Eastern Siberia**, rainfall decreased by 9% relative to the 15-year average. Temperature was below the 5-year average by 0.4°C. RADPAR decreased by 4% relative to the 15-year average. BIOMASS decreased by 8%. CALF was equal to 100%. VCIx was 0.98. From April to May, NDVI value was below the level of the previous year, but equal to the 5-year average. In June and July, there were some fluctuations. NDVI stayed mainly below the 5-year average and the level of the previous year. The spring and summer crops status is likely to be slightly below average.

**Figure 3.38 Russia's crop condition, April - July 2020**



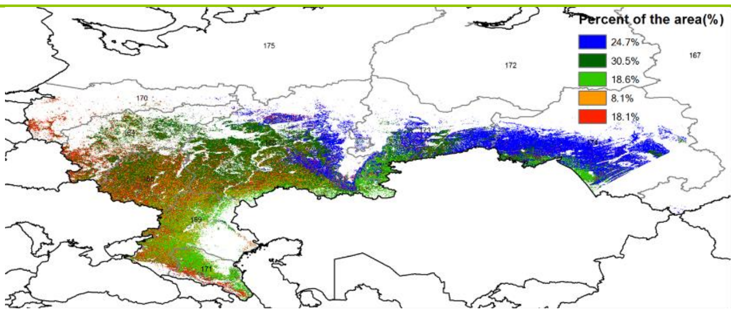

(a) Phenology of major crops

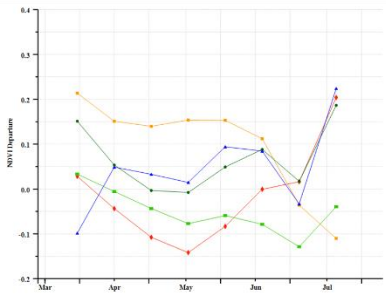


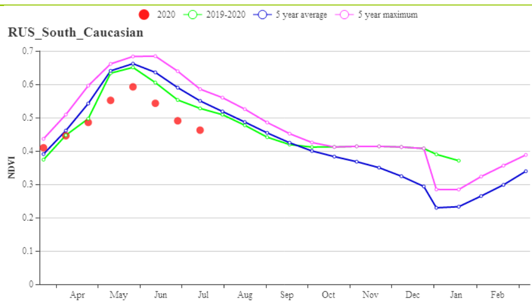

(b) Crop condition development graph based on NDVI

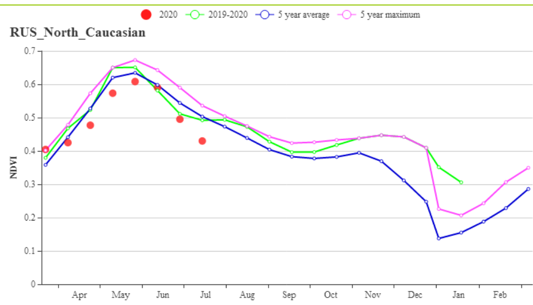
(c) Maximum VCI



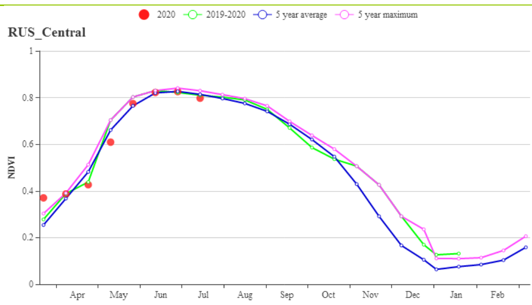



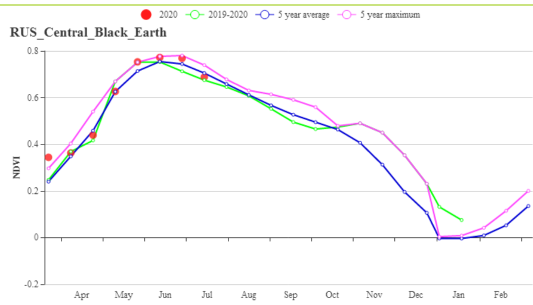

(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



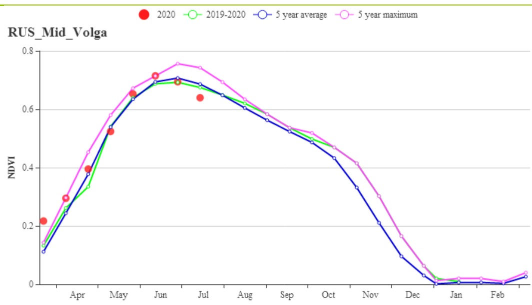



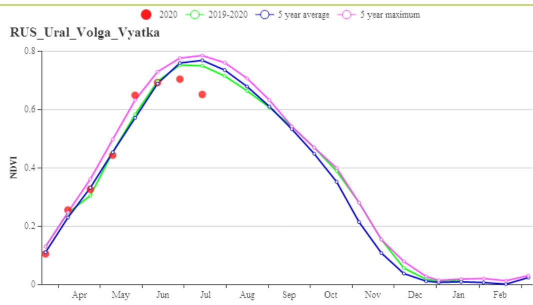

(f) Crop condition development graph based on NDVI (Southern Caucasus (left) and Northern Caucasus (right))



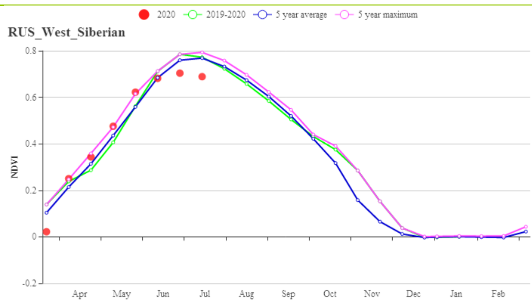



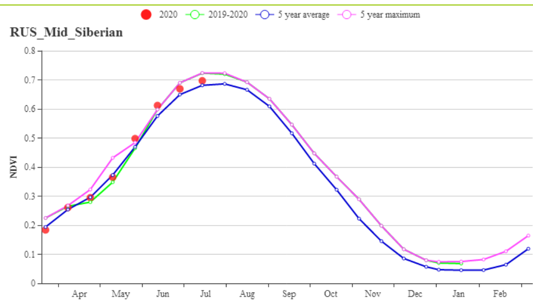

(g) Crop condition development graph based on NDVI (Central Russia (left) and Central black soils area (right))



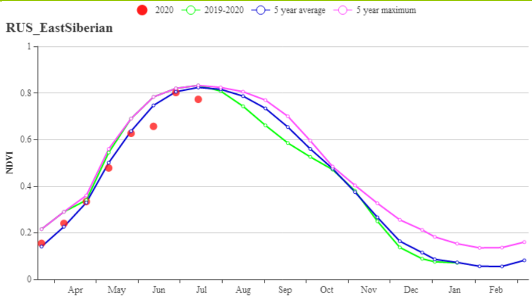




(h) Crop condition development graph based on NDVI (Middle Volga (left) and Ural and western Volga region (right))

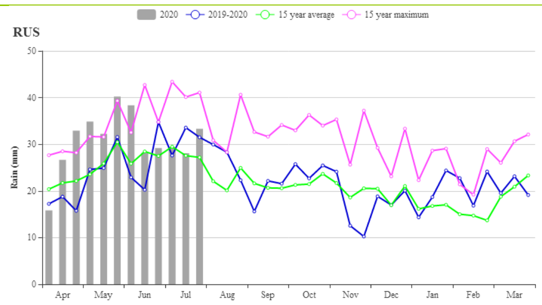


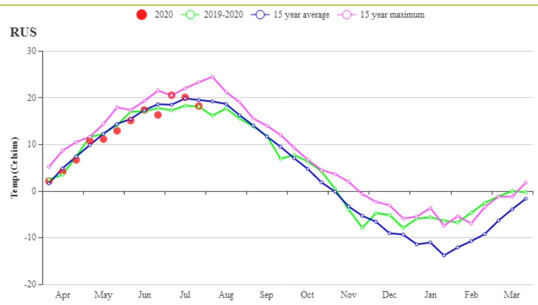

(i) Crop condition development graph based on NDVI in the Western Siberia (left) and the Middle Siberia (right)




(j) Crop condition development graph based on NDVI (Eastern Siberia)




(k) Rainfall index




(l) Temperature index

**Table 3.67 Russia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2020**

| Region | RAIN | | TEMP | | RADPAR | | BIOMSS | |
|---|---|---|---|---|---|---|---|---|
| | Current (mm) | Departure (%) | Current (°C) | Departure (°C) | Current (MJ/m$^2$) | Departure (%) | Current (gDM/m$^2$) | Departure (%) |
| **Amur and Primorsky Krai** | 370 | 6 | 13.0 | -0.4 | 1194 | -1 | 455 | -3 |
| **Central Russia** | 435 | 31 | 11.6 | -1.3 | 994 | -9 | 359 | -14 |
| **Central black soils area** | 406 | 36 | 13.4 | -1.3 | 1111 | -6 | 447 | -10 |
| **Eastern Siberia** | 403 | -9 | 11.1 | -0.4 | 1093 | -4 | 370 | -8 |
| **Middle Siberia** | 366 | 33 | 11.1 | 0.7 | 1212 | -4 | 402 | -2 |
| **Middle Volga** | 379 | 28 | 12.7 | -0.8 | 1107 | -3 | 443 | -5 |
| **Northwest Region including Novgorod** | 329 | 6 | 11.1 | -1.1 | 1039 | -3 | 360 | -7 |
| **Northern Caucasus** | 285 | -2 | 17.0 | -0.7 | 1303 | -1 | 617 | -3 |
| **Southern Caucasus** | 495 | -2 | 14.9 | -0.2 | 1311 | 1 | 559 | 2 |
| **Ural and western Volga region** | 296 | 4 | 12.9 | 0.4 | 1088 | -1 | 430 | 3 |
| **Western Siberia** | 355 | 25 | 13.8 | 1.2 | 1100 | -4 | 446 | 3 |
| **West subarctic region** | 366 | 21 | 9.3 | -1.1 | 930 | -5 | 299 | -10 |

**Table 3.68 Russia's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2020**

| Region | Cropped arable land fraction | | Maximum VCI |
|---|---|---|---|
| | Current (%) | Departure (%) | Current |
| Amur and Primorsky Krai | 100 | 0 | 0.96 |
| Central Russia | 100 | 0 | 0.98 |
| Central black soils area | 100 | 0 | 0.99 |
| Eastern Siberia | 100 | 0 | 0.98 |
| Middle Siberia | 98 | 4 | 0.92 |
| Middle Volga | 98 | 0 | 0.93 |
| Northwest Region including Novgorod | 100 | 0 | 0.99 |
| Northern Caucasus | 95 | 0 | 0.84 |
| Southern Caucasus | 94 | -4 | 0.79 |
| Ural and western Volga region | 99 | 0 | 0.87 |
| Western Siberia | 99 | 0 | 0.87 |
| West subarctic region | 100 | 0 | 0.98 |

AFG AGO ARG AUS BGD BLR BRA CAN DEU EGY ETH FRA GBR HUN IDN IND IRN ITA KAZ KEN KGZ KHM LKA MAR MEX MMR MNG MOZ NGA PAK PHL POL ROU RUS **THA** TUR UKR USA UZB VNM ZAF ZMB

# [THA] Thailand

This report covers the harvest of Second Season Rice in June. Planting of Main Season Rice started in May, while maize sowing started a bit earlier, in April. Crop conditions during this reporting period were generally below the 5-year average (5YA) in April-June mainly due to the rainfall shortage in April and May. However, by July, the crop conditions improved to close to the 5-year maximum, as indicated by the graph of NDVI development at the national level.

The drier-than-normal weather Thailand has been experiencing gradually improved to close-to-average conditions. Rainfall from April to July was recovering to just 7% below the 15YA (compared to -40% in the previous January - April period in 2020, or -23% for the same April-July period in 2019). Although the rainfall in May was significantly below last year's and the 15YA, it improved to close to the 15YA in July. According to provincial rainfall conditions, the deficit was more pronounced in some northern and central region provinces (Chiang Rai, Phayao, Nan, Prae, Uttaradit, Phitsanulok, Kamphaeng Phet, Phichit, Nakorn Sawan, Uthai Thani, Chai Nat, Supanburi and Ang Thong), where the deficit exceeded 30% as compared to the 15YA. Also, the temperature (+0.7°C) and radiation (+4%) were above average, which led to an increase in biomass production potential (BIOMSS) by 5%.

The spatial NDVI pattern (figure 1.5) shows that some patches in central and mostly north-eastern provinces, i.e., Ratchaburi, Kamphaeng Phet, Sakon Nakorn, Bueng Kan, Khon Kaen, Kalasin, Amnat Charoen, Ubon Ratchathani, Nakon Ratchasima, Surin, and Sri Sa Ket, have above-5YA crop conditions, covering 31.7% of total arable land. The crop conditions in the remaining areas stayed below average until early June. The areas in the north-eastern provinces having above-average crop conditions were also confirmed by the VCIx map.

Overall, considering the favorable national VCIx of 0.93, most provinces VCIx were higher than 0.8. Lowest values were observed for Sing Buri (0.67) and Ang Thong (0.64). Combined with a CALF of 99% which was 1% above average, the crops in the country recovered to mostly satisfactory conditions.

The agricultural information is corroborated with several techniques such as a list frame survey, crop cutting experiments, forecasting and Geo-informatics. We compare the CropWatch indicators with the reports from regional offices and forecasting divisions and focus on rice only.

In 2020, the harvested area is forecasted to be up by 2.4% at the country level over the last year. The increase of rice harvested area and production is consistent with the increase in precipitation when compared with last year. In addition, the rice selling price is rather high, which is an incentive for farmers to plant more rice. Rice yields are forecasted to increase from last year but are still below average levels. The main constraints are the dry spells that occurred during the rice growing season. When looking at the regional scale, the rice cultivated area in the north is estimated to increase when compared to the previous year. The Thai Meteorological Department forecasted that the total precipitation would be less; however, so far, the rainfall has been higher than last year. In the northeast, the rice area is expected to increase because farmers in some provinces switched to rice instead of growing sugarcane (e.g. Surin, Burirum, Mahasarakham, Roiet, Kalasin, Khon Khan, Chaiyaphum, and Nakhon Ratchasima). Similarly, as in the north, rice yield in the northeast is estimated to increase from 2019, but will be below the 15YA due to dry spells during the growing season. In some areas of the central region, which is the main rice cultivation region and mostly irrigated, it is possible to plant a second rice crop during the wet season. If the average rainfall conditions and high prices persist over the remainder of the rainy season, farmers will take advantage of planting a second rice crop. Good yields can be expected from the current crop and the increase in area may result in an increased rice production in the central region as compared to the previous year.

Yields of Dry Season Rice in 2020 had decreased because water supply for the crops was not adequate. There was a severe water shortage for these dams and reservoirs: Mae Mok (Lampang province), Ubonrat (Khon Khan province), Chulaphon (Chaiyaphum province), Lam Pra Pleng, Upper Moon dam and

Lam Sang (Nakhon Ratchasima province). Government had to restrict outflow, which in turn led to drought conditions and yield reductions for dry season rice, especially in the northeast region. Due to the lack of water, poor grain quality of rice resulted and some paddies were unable to survive until the reproductive stage. Pests and diseases were an issue as well. These are the main causes for the reduction of dry season rice yield for Thailand in 2020.

**Sub-National Analysis**

There are four agro-ecological zones (AEZ) defined within Thailand based on its cropping systems, climatic zones and topographic conditions. These are the central double and triple-cropped rice lowlands; single cropped rice north-eastern; western and southern hill; and south-eastern horticulture.

In terms of NDVI, all zones except the western and southern hill areas produced below-15-year-average NDVI until June. Afterwards, NDVI levels recovered to average levels in July, with the north-eastern region improving to significantly above-average NDVI levels.

**Central double and triple-cropped rice lowlands**

The change in rainfall patterns from deficit to excess has been especially extreme for the central double and triple-cropped rice lowlands (figure 2.4a). The nation-wide drought experienced since the start of the year continued in central areas for almost a month longer than in the other AEZs. When the recovery came, it was also extreme in the other direction. At the end of April, rainfall levels suddenly rebounded back to 50-100 mm per dekad. These levels were above the 15YA. Apart from a brief drop in mid-May, which occurred for all Thai regions, rainfall continued to exceed the 15YA into July. On the other hand, temperature and radiation received by central lowlands terms remained normal. The temperature closely followed its yearly pattern of gradual decrease from +30°C down to 25°C except for a small uptick in mid-May, when a nation-wide drop in rainfall was observed. Meanwhile, photosynthetically active radiation (PAR) fluctuated between 90 to 120 W/m2 which is at or slightly above the 15YA.

Overall, the carry-over effect of the water-shortage in the previous months impacted rice cultivation during the April-June period. This was likely reflected in the delay of the annual NDVI upturn normally associated with the beginning of the wet-season. As seen in figure 2.3a, the upturn that should have happened rapidly in May according to the 15YA had instead become a gradual rise that reached normal levels in July only. Quarterly values of CALF and VCIx also painted a similar picture of drought and recovery. For the past ten years, central areas have always had around 98% CALF regardless of season, but it dropped to 63% in the second quarter of this year (figure 2.5a). This was likely the result of the government issuing a request earlier in the year for farmers to refrain from planting second-season rice. As for VCIx, its value of 0.84 shown in table 2.2 indicates that the plants are recovering in the central areas, but not to as good conditions as in the other areas of Thailand. The Central areas can expect substantially reduced yield from second-season rice and slightly reduced yield from the main-season rice.

**South-eastern horticulture area**

The South-eastern horticulture area has seen its rainfall index decrease by 15% from the 15YA, temperature increased by 0.5°C and PAR increased by 4% (table 2.1). Despite a considerable reduction in rainfall, the region received 907 mm rainfall which may still have been sufficient for the early growth of main-season rice. Thanks to the 4% increase of PAR, the BIOMASS index was estimated to have increased by 5% (table 2.1). As for the crop conditions, the low NDVI (figure 2.3b) in late May to early June was possibly due to the lower rainfall (figure 2.4b) observed during that period as compared to the 15YA. Since mid-June, the region received 80 - 100 mm rainfall every ten days which accelerated the rice development. Crop conditions recovered to average level by the end of July. Overall, the lowered rainfall in the early period of this bulletin does not appear to have significantly affected the crop conditions as reflected by a relatively high VCIx value ranging from 0.8 to over 1.0 (South-eastern horticulture area in figure 1.6). The CALF value in the area was 99% which was 1% above the 5YA (table 2.2).

**Western and southern hill areas**

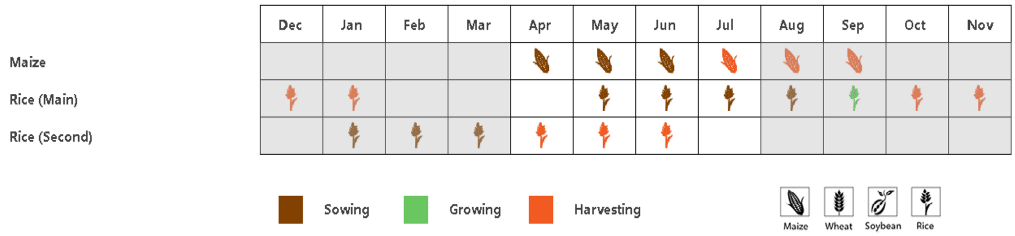
Most indicators of the western and southern hill areas stayed close to their 15YA, with the notable exception of NDVI which dropped below its 5YA until it recovered to just about average in July (figure 2.3c). The NDVI pattern is consistent with rainfall levels which also showed a delayed start of the rainy season in mid-April followed by a recovery to above 15YA in July (figure 2.4c). Major crops of this area are Pará rubber, palm, coconut, and longan. All of these crops can be harvested all year round except longan which can only be harvested during July and August. Since the cumulative rainfall during April-July was just about average (table 2.1), the dry condition early in the year likely didn't leave a lasting impact on these crops. This is reflected in VCIx and CALF which are measured to be 0.94 and 99% respectively during the second quarter of 2020, representing good vegetation conditions.

**Single-cropped rice north-eastern region**

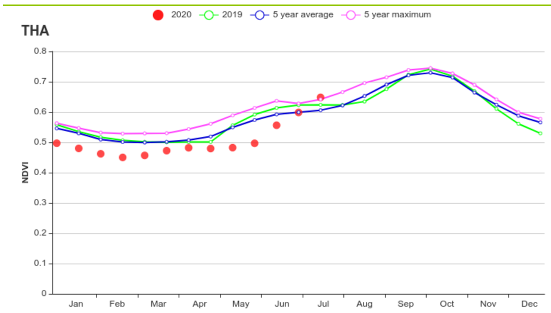
For the north-east, dominated by Single-rice cultivation, rainfall (-22%) was below and PAR (+7%) above the 15YA as listed in table 2.1. More specifically, precipitation was below average throughout the period except for a few, isolated peaks in late May and early July (figure 2.4d). Meanwhile, PAR was mostly average until mid-June and then increased to distinctly above average from June onwards. In total, while rainfall dramatically declined compared with 15YA, the above average radiation benefitted biomass accumulation as potential biomass was measured to be 8% higher than 15YA (table 2.1).

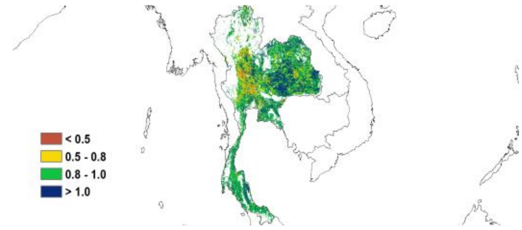
For agronomic indicators, overall NDVI stayed below average except for July when the NDVI rose above the 5YA average (figure 2.3d). The significantly below average NDVI from April to June was mainly due to the rainfall shortage during that period. The rise of NDVI in July could have been a result of higher rainfall in the wet-season which helped mitigate the drought observed earlier in the year. Moreover, VCIx across north-eastern Thailand was 0.97, which represents good vegetation conditions. The CALF value was back to 100% (table 2.2) which indicated that farmers are cultivating all of their land.

**Figure 3.39 Thailand's crop condition, April-July 2020**

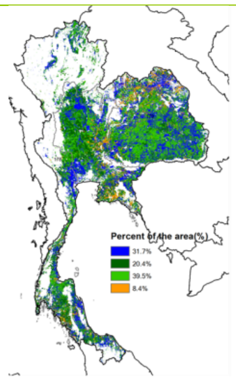


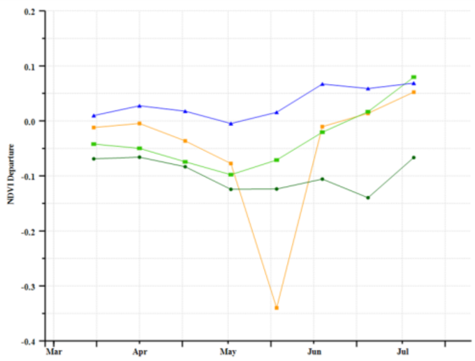

(a). Phenology of major crops



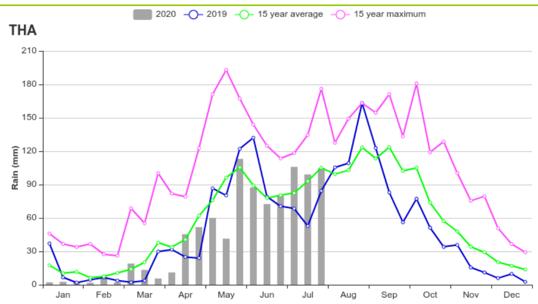



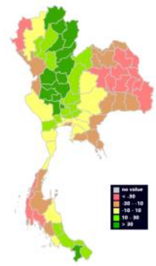

(b) Crop condition development graph based on NDVI (c) Maximum VCI



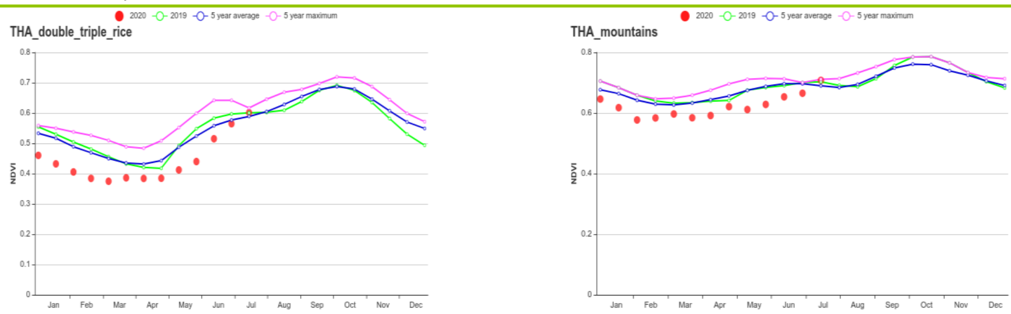




(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles

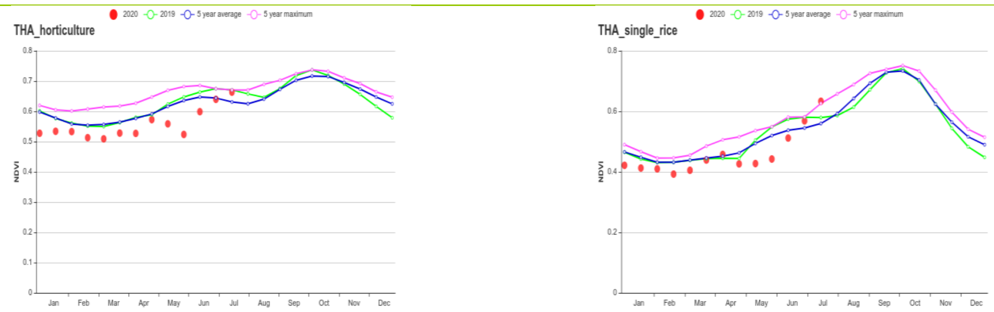


(f) Rainfall profiles (g) Rainfall Departure from 15YA (%)




(h) Crop condition development graph based on NDVI (Central double and triple-cropped rice lowlands(left) South-eastern horticulture area Western and southern hill areas(right))




(i) Crop condition development graph based on NDVI (South-eastern horticulture area Western and southern hill areas(letf) Single-cropped rice north-eastern region(right))

**Table 3.69 Thailand's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2020**

| Region | RAIN | | TEMP | | RADPAR | | BIOMSS | |
|---|---|---|---|---|---|---|---|---|
| | Current (mm) | Departure (%) | Current (°C) | Departure (°C) | Current (MJ/m²) | Departure (%) | Current (gDM/m²) | Departure (%) |
| Central double and triple-cropped rice lowlands | 919 | 28 | 28 | 0.5 | 1208 | 4 | 808 | 4 |
| South-eastern horticulture area | 907 | -15 | 28 | 0.5 | 1279 | 4 | 879 | 5 |
| Western and southern hill areas | 932 | 2 | 26 | 0.5 | 1226 | 2 | 802 | 3 |
| Single-cropped rice north-eastern region | 790 | -22 | 29 | 1 | 1214 | 7 | 827 | 8 |

**Table 3.70 Thailand's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2020**

| Region | Cropped arable land fraction | | Maximum VCI |
|---|---|---|---|
| | Current (%) | Departure (%) | Current |
| Central double and triple-cropped rice lowlands | 98 | 1 | 0.84 |
| South-eastern horticulture area | 99 | 1 | 0.95 |
| Western and southern hill areas | 99 | 0 | 0.94 |
| Single-cropped rice north-eastern region | 100 | 2 | 0.97 |

# [TUR] Turkey

This monitoring period covers the sowing and growth of maize and rice, while the harvest of wheat was almost concluded by the end of July. Nationwide, RAIN was close to average (+1%), and both TEMP (-0.4°C) and RADPAR (-1%) were slightly below the 15YA. BIOMSS was 5% below the average. High temperatures in mid-May accelerated the maturity of winter crops and may have affected yield formation.

The NDVI-based crop condition development graph indicates slightly below-average crop conditions during the whole monitoring period. The national average VCIx was 0.85. The southeastern, southern, and western provinces, such as Sanliurfa, Mardin, and Adana, experienced very promising VCIx values above 1.0, indicating that crops in those regions outperformed the best recent conditions. Low VCIx (< 0.5), which indicates below average crop conditions, was mainly observed for the central provinces such as Ankara, Yozgat, and Kayseri.

In terms of the NDVI spatial departure clustering map, the results confirmed the spatial pattern described above. Regarding the proportion of NDVI anomaly categories compared with the 5-year average, the first seven 16-day phases shared almost the same pattern. However, the last phase had slightly below to below average anomalies in around 50% of the cropped areas. This might have been due to heavy rainfall and the impact of local floods on the crops. As shown by the VHIn graph, some areas went through dry conditions in early April. Overall, most areas experienced favorable conditions throughout this monitoring period. Crop production is generally expected to be close to normal.

**Regional analysis**

The regional analysis includes four agro-ecological zones (AEZ): **the Black Sea area**, **Central Anatolia**, **Eastern Anatolia** and **Marmara Aegean Mediterranean lowland zone**.

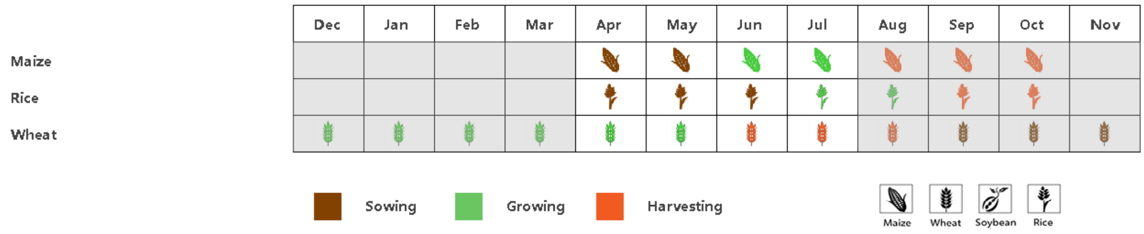
In the **Black Sea zone**, crop conditions were generally below but close to average. The rainfall was slightly above average (RAIN, +3%), while the temperature (TEMP) decreased by 0.4°C. The cropped arable land fraction was 98%, 1% below average. The average value of VCIx was high at 0.9, the highest among all four AEZs of Turkey. The crop conditions are assessed to be close to normal.

During this monitoring period, the crop conditions were also close to average in the **Central Anatolian plateau**. This AEZ is the only one which experienced below-average rainfall (RAIN, -13%） during this monitoring period. TEMP (-0.3°C) and RADPAR (-1%) were both below the 15YA, resulting in a slight decrease of the BIOMSS index (-1%). The average VCIx for this region was 0.8. The cropped land area slightly decreased (CALF -2%). Crop conditions are assessed as slightly below average.

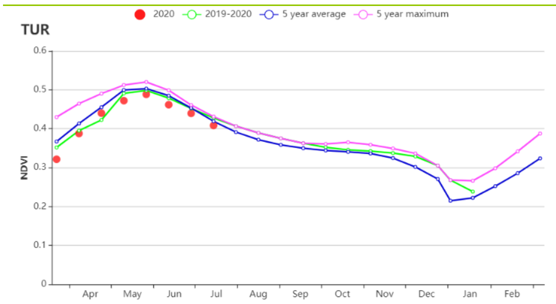
In **Eastern Anatolia**, crop conditions were generally below average until late July. TEMP and RADPAR were 0.4°C and 3% below the average, respectively, while the rainfall was above average (RAIN +10%). The relatively abundant rainfall led to the increase of biomass by 11%. The CALF increased slightly (+1%) compared to the average. With VCIx at 0.88, crop output is assessed to be average.

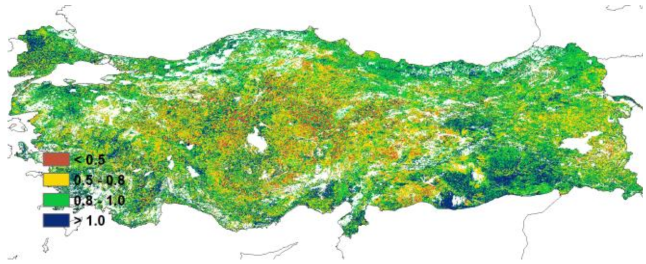
As indicated by the NDVI profile, in the **Marmara Aegean Mediterranean lowland zone**, the crop conditions were better than the 5YA during April, then slid to below average. RAIN was 3% above the average. The temperature was slightly below average (TEMP -0.5°C). VCIx was 0.89, and CALF is up 4%, which is the largest increase among the four AEZs. Production in this region is expected to be near average.

**Figure 3.40 Turkey's crop condition, April-July 2020**



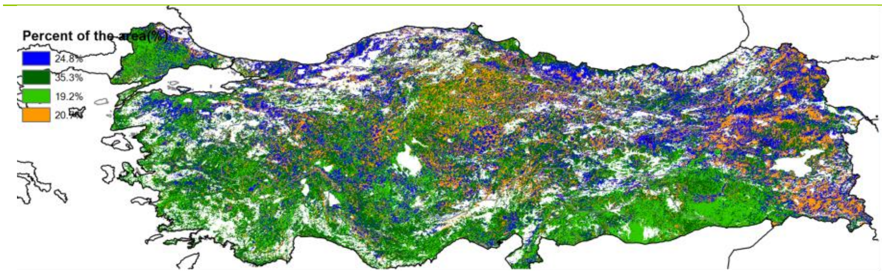

(a). Phenology of major crops

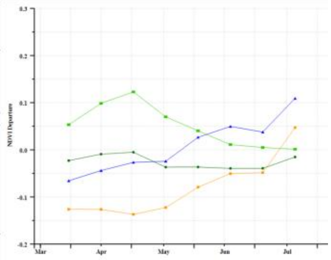



(b) Crop condition development graph based on NDVI

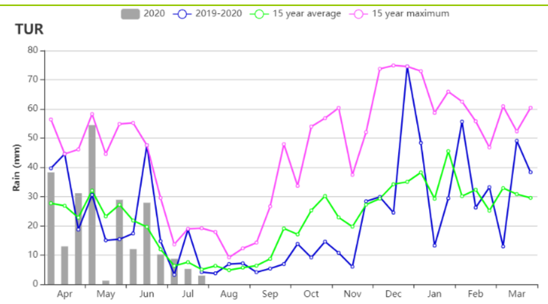
(c) Maximum VCI

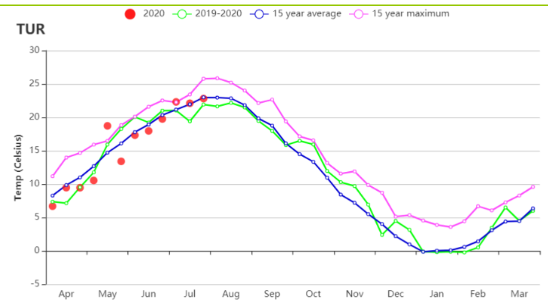


(d) Spatial NDVI patterns compared to 5YA

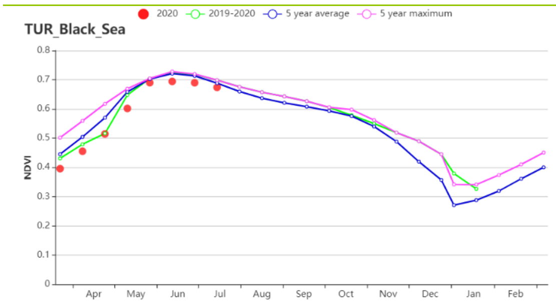
(e) NDVI profiles

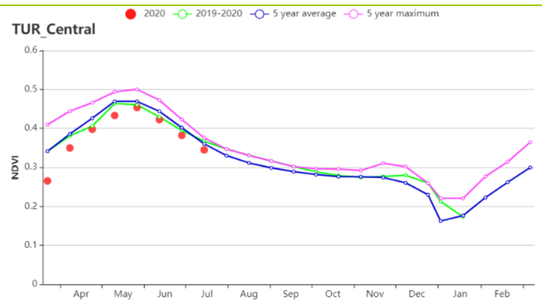


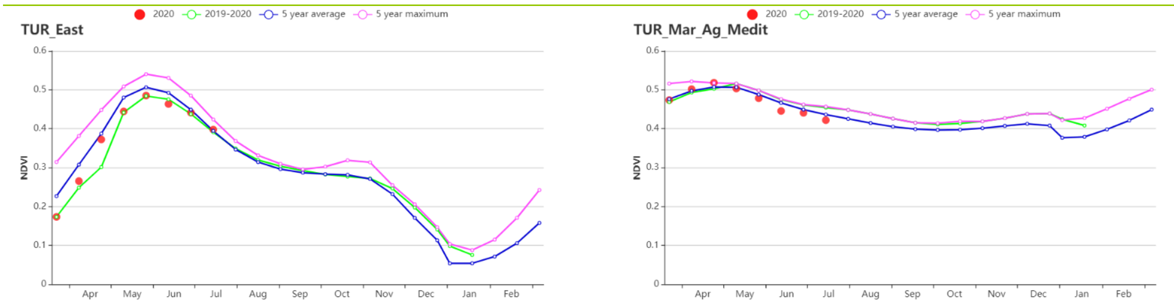

(f) Time series rainfall profile

(g) Time series temperature profile

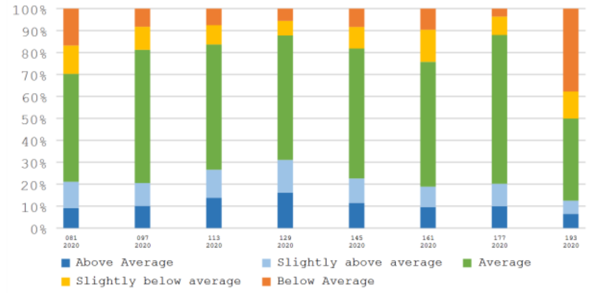


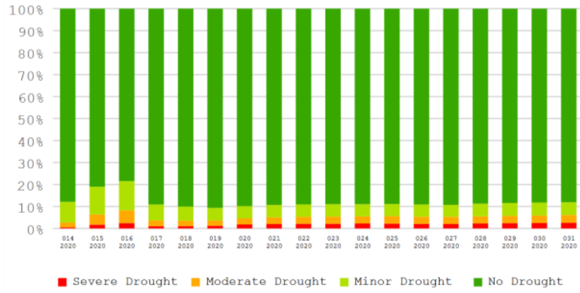




(h) Crop condition development graph based on NDVI (Black Sea region (left) and Central Anatolia region (right))




(i) Crop condition development graph based on NDVI (Eastern Anatolia region (left) and Marmara_Agean_Mediterranean lowland region (right))




(j) Proportion of NDVI anomaly categories compared with 5YA (k) Proportion of VHIn categories compared with 5YA

**Table 3.71 Turkey's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April-July 2020**

| Region | RAIN | | TEMP | | RADPAR | | BIOMSS | |
|---|---|---|---|---|---|---|---|---|
| | Current (mm) | Departure (%) | Current (°C) | Departure (°C) | Current (MJ/m²) | Departure (%) | Current (gDM/m²) | Departure (%) |
| **Black Sea region** | 380 | 3 | 12.6 | -0.4 | 1316 | -1 | 475 | -4 |
| **Central Anatolia region** | 187 | -13 | 15.1 | -0.3 | 1470 | -1 | 524 | -7 |
| **Eastern Anatolia region** | 332 | 10 | 13.9 | -0.4 | 1472 | -3 | 516 | 11 |
| **Marmara Agean Mediterranean lowland region** | 181 | 3 | 18.4 | -0.5 | 1519 | -1 | 521 | -12 |

**Table 3.72 Turkey's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April-July 2020**

| Region | Cropped arable land fraction | | Maximum VCI |
|---|---|---|---|
| | Current | Departure (%) | Current |
| **Black Sea region** | 98 | -1 | 0.90 |
| **Central Anatolia region** | 65 | -2 | 0.80 |
| **Eastern Anatolia region** | 83 | 1 | 0.88 |
| **Marmara Agean Mediterranean lowland region** | 82 | 4 | 0.89 |

# [UKR] Ukraine

In Ukraine, maize, winter wheat and canola were the major crops in the field during this monitoring period. Maize was planted in May and winter wheat harvest began in July.

After drier-than-normal conditions in late winter, rainfall was abundant starting in May. In the course of this monitoring period, it reached 356 mm (+19%). Temperatures were colder than average (TEMP, 15°C, -1°C) with normal RADPAR (1225 MJ/m², -1%). Based on the agroclimatic conditions, CropWatch predicts that the potential biomass is 6% below the 5YA, mainly due to the dry conditions observed during April and the cold weather conditions in May, when temperatures were more than 6°C below the 15YA. Almost all cropland was cultivated (CALF, 99%) and the maximum vegetation condition index (VCIx) reached 0.90, which was favorable.

At the national level, NDVI was below the 5-year-average until late June. NDVI on 23.6% of the cropland, concentrated in southern areas, especially in Odessa and Crimea experienced a significant depression before July, consistent with the low VCIx (mainly between 0.5 and 0.8 with some below 0.5 ), indicating crop conditions were not favorable in this area. This was due to drought conditions observed during the previous monitoring period from which winter wheat could not fully recover. Crop development in other areas was generally good and VCIx (above 0.8) indicates favorable prospects for the summer crops.

In summary, drought conditions during the early spring had a negative impact on winter wheat, which explains the below average development of NDVI from April to June. The maize crop was off to a better start and reached maximum levels in July. Hence, conditions were sub-optimal for wheat, but favorable for maize.

**Regional analysis**

Regional analyses are provided for four agro-ecological zones (AEZ) defined by their cropping systems, climatic zones and topographic conditions. They are referred to as **Central wheat area** with the Poltava, Cherkasy, Dnipropetrovsk and Kirovohrad Oblasts; **Northern wheat area** with Rivne; **Eastern Carpathian hills** with Lviv, Zakarpattia and Ivano-Frankivsk Oblasts and **Southern wheat and maize area** with Mykolaiv, Kherson and Zaporizhia Oblasts.

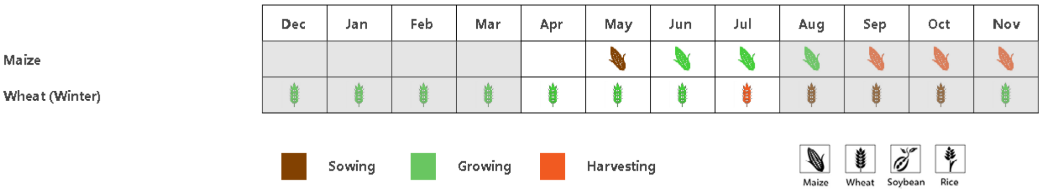
The **Central wheat area** had sufficient rainfall (324 mm, +20%) while temperature (-1.1°C) and radiation (-1%) were below the 15YA. The BIOMASS (525g DM/m²) is estimated to be 7% lower than the 5YA. The agronomic indicators show a very good CALF (100%) and VCIx (0.95). The NDVI development profile also confirmed unfavorable conditions until June, when they started to surpass the 5YA. Conditions for the summer crops are favorable.

The **Northern wheat area** received 370 mm of rainfall (+14%) and TEMP (14.1°C, -1.2°C) and RADPAR (1159 MJ/m², -2%) were lower than the 15YA. Because of cooler temperatures and less sunshine, the BIOMASS indicator reached 464g DM/m$^2$, 9% below average. The CALF was 100% and maximum VCIx was 0.96. NDVI was above the 5YA starting in July, overall crop conditions were unfavorable until June and greatly improved in July.

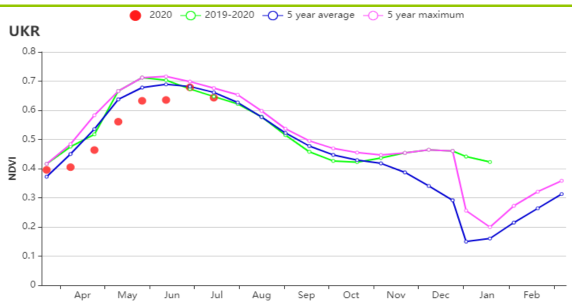
The conditions in the **Eastern Carpathian hills** showed a similar pattern as the other regions: abundant rainfall (538 mm, +26%), cooler temperatures (13.2°C, -1.3°C) and low RADPAR (1182 MJ/m², -3%) resulted in decreased potential BIOMSS (422 g DM/m², -14%). High CALF (100%) and VCIx at 0.97, as well as NDVI, indicate favorable conditions for the summer crops.

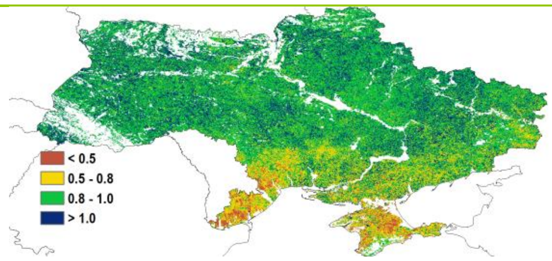
The **Southern wheat and maize** area also received more rainfall (+24%) and experienced cooler temperatures (-1°C) and sightly higher radiation (+1%). CALF (99%) was high, but VCI (0.85) was fair. Accordingly, NDVI stayed below the 5YA throughout this monitoring period. Crop conditions were below average.

**Figure 3.41 Ukraine's crop condition, April- July 2020**



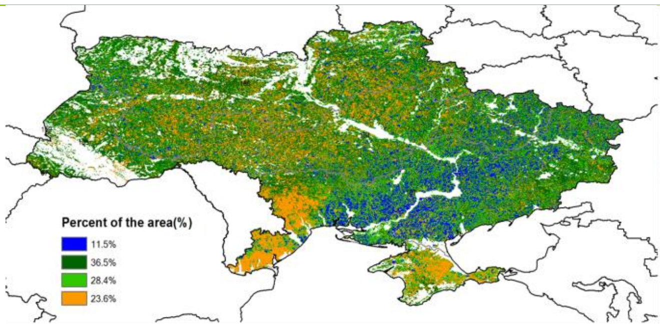

(a). Phenology of major crops

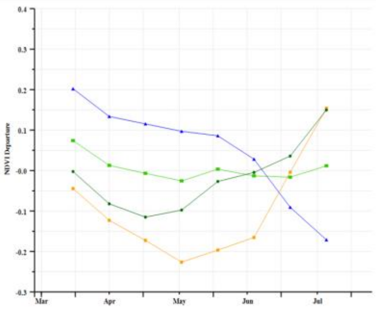



(b) Crop condition development graph based on NDVI

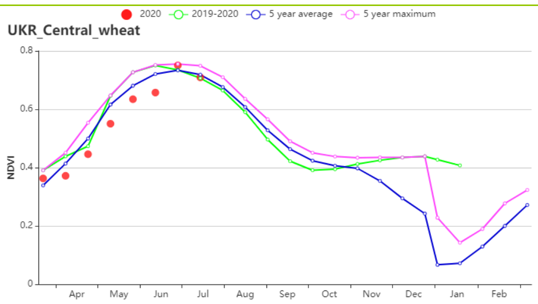
(c) Maximum VCI

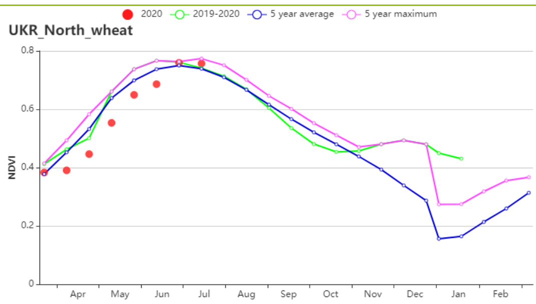


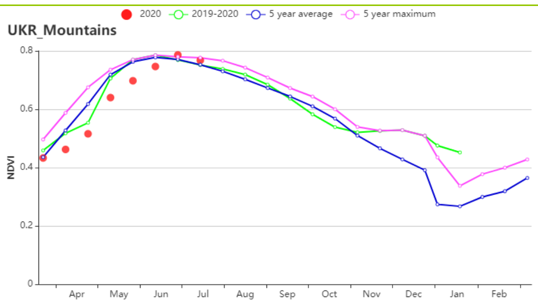
(d) Spatial NDVI patterns compared to 5YA

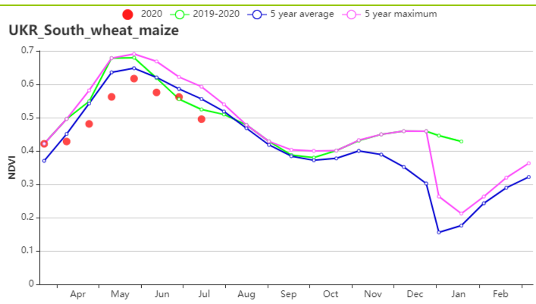
(e) NDVI profiles



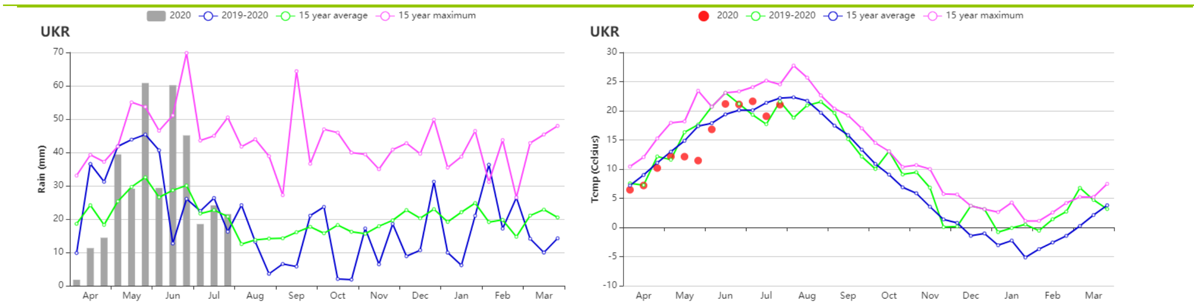




(e) Crop condition development graph based on NDVI (Central wheat area (left) Northern wheat area (right))




(f) Crop condition development graph based on NDVI (Eastern Carpathian hills (left) Southern wheat and maize area (right))




(g) Rainfall profile (left) and temperature profile (right)

**Table 3.73 Ukraine's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2020**

| Region | RAIN | | TEMP | | RADPAR | | BIOMSS | |
|---|---|---|---|---|---|---|---|---|
| | Current (mm) | Departure (%) | Current (°C) | Departure (°C) | Current (MJ/m²) | Departure (%) | Current (gDM/m²) | Departure (%) |
| Central wheat area | 344 | 20 | 15.1 | -1.1 | 1231 | -1 | 525 | -7 |
| Eastern Carpathian hills | 538 | 26 | 13.2 | -1.3 | 1182 | -3 | 442 | -14 |
| Northern wheat area | 370 | 15 | 14.1 | -1.2 | 1159 | -2 | 464 | -9 |
| Southern wheat and maize area | 302 | 25 | 16.5 | -1.0 | 1294 | 1 | 596 | -3 |

**Table 3.74 Ukraine's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2020**

| Region | Cropped arable land fraction | | Maximum VCI |
|---|---|---|---|
| | Current (%) | Departure (%) | Current |
| Central wheat area | 100 | 0 | 0.95 |
| Eastern Carpathian hills | 100 | 0 | 0.97 |
| Northern wheat area | 100 | 0 | 0.96 |
| Southern wheat and maize area | 99 | 0 | 0.85 |

# [USA] United States

This report covers the period from April to July 2020. Winter wheat had reached maturity in June and July. Maize and soybean planting started in April and finished in May. Maize reached the silking stage and soybean was in the bloom and pod setting stage by late July. In general, the crop conditions were generally favorable nationwide.

Slightly more humid and cooler weather was observed in this monitoring period with rainfall 6% above average, temperatures 0.5°C below average and PAR 2% lower as compared to the 15YA. At the national scale, biomass was estimated to be 2% below the 5YA, due to lower PAR. Significantly above average rainfall occurred in Illinois (12%), Iowa (14%), Missouri (15%), Alabama (7%), Georgia (7%), Florida (18%), Washington (10%), and South Carolina (19%). On the contrary, the northeastern region of the United States and the eastern part of the Corn Belt suffered from a light precipitation deficit. This includes Pennsylvania (-11%), Vermont (-13%), Indiana (-15%), Ohio (-4%), Michigan (-5%). The rainfall time series show that it fluctuated around the long-term average, and no prolonged dry spell was observed. Temperatures in the eastern United States and northern Great Plains were 0.5-1.5°C lower than average. In mid-April, a cold wave had swept across the central and southern United States, causing significantly below-average temperatures and delaying the planting of maize. With the exception of some states located in the Northeast and North Plains, most areas of the United States experienced lower PAR than usual, such as Illinois (-5%), Iowa (-4%) and Missouri (-5%).

The USA encompasses a wide range of agro-climates. Nationwide, VCIx was at 0.88, indicating generally favorable conditions, but there were some differences in crop conditions in major food producing areas of the United States. In the southern Great Plains, VCIx was below 0.5, whereas it was higher than 1 in the western Corn Belt. Using the spatial clustering method, our analysis divides the mainland of the United States into five categories based on the NDVI anomaly dataset. In the Southern Great Plains, drier than normal conditions prevailed over most of the monitoring period, causing a negative departure of NDVI. But the crop conditions improved significantly in July. From April to the end of May 2020, the crop conditions in the corn belt suffered from wet and cold conditions, which caused some delays in planting and early crop development. As in the south, the conditions improved greatly in July. From April to July 2020, crop conditions in the southeastern United States remained at a relatively favorable level, and the NDVI anomalies remained positive. At the end of July, 90% of arable land was cropped, which was 1% below the 5YA.

In short, with the exception of some areas in the Southern Great Plains, crop conditions in most major crop producing areas in the United States were favorable. In the next monitoring period, all spring and summer crops will enter the grain filling stage and reach maturity.

**Regional analysis**

**Corn Belt**

This is the most important corn and soybean producing area in the United States. It includes Illinois, Iowa, Minnesota, Wisconsin, Ohio and Michigan. Compared with the 15YA, the agro-climatic conditions in the area during the monitoring period were slightly more humid and cooler. Precipitation was 5% higher, while temperature and PAR were 1°C and 2% below average. The crops developed more slowly than usual, which explains the slightly below-average NDVI values in May and June. However, the crops recovered to average levels by July. The VCIx value of 0.93 also indicates favorable crop growth in the region and the outlook for the soybean and maize crops is favorable.

**Lower Mississippi**

This is the most important rice producing area and an important soybean producing area in the United States. It includes Arkansas, Louisiana, Mississippi and Missouri. Rice reached the heading stage in July.

The agro-climatic conditions in the lower Mississippi were close to the average with average rainfall (+ 3%) and temperature (-0.7°C), while the average PAR was 3% lower than 15YA. In early May and June, the deficit in precipitation in the area resulted in below average crop conditions. By July, the crop conditions returned to close to average. The VCIx value reached 0.91, which also indicates favorable crop growth conditions in this region.

**NorthWest**

This is an important winter wheat producing area in the United States, including Washington and Idaho. Winter wheat reached maturity and was mostly harvested by the end of July. Compared with the 15 YA, rainfall was 9% above average, temperature was 0.4°C below average, and PAR was 4% below average. The precipitation time series show that the rainfall in the northwestern region was lower than average in early and mid-April, and subsequently gradually recovered to above-average levels. The NDVI development profile indicates that the crop conditions were below average in April and May, but subsequently returned to average levels. The below average conditions in the early part of this reporting period can be attributed to below average rainfall in April, which also impacted CALF (-4%). By the end of July, crop conditions were generally favorable

**Northern Plains**

This is the most important spring wheat and sunflower producing area in the United States and the second most important corn and soybean producing area. It includes North Dakota, South Dakota, Nebraska and Montana. This monitoring period covers the planting, germination, silking and dough stages of corn; the sowing, emergence, heading and grain filling stages of spring wheat; the sowing, emergence, flowering and pod-setting stages of soybean. Compared with the 15 YA, the northern plain had experienced nearly average weather conditions, with rainfall 4% higher and temperature (-0.7°C) and PAR (-1%) lower than the 15YA. After sowing and emergence, the spring and summer crops in July all entered silk (corn), flowering (soybean) and heading (spring wheat) stages. Cooler and wetter conditions in North and South Dakota delayed the timely planting of the spring crops. However, by the end of July the crops had caught up and their NDVI reached slightly higher than average levels, especially in South Dakota and Montana. A VCIx value as high as 0.95 also indicates favorable crop growth in this region

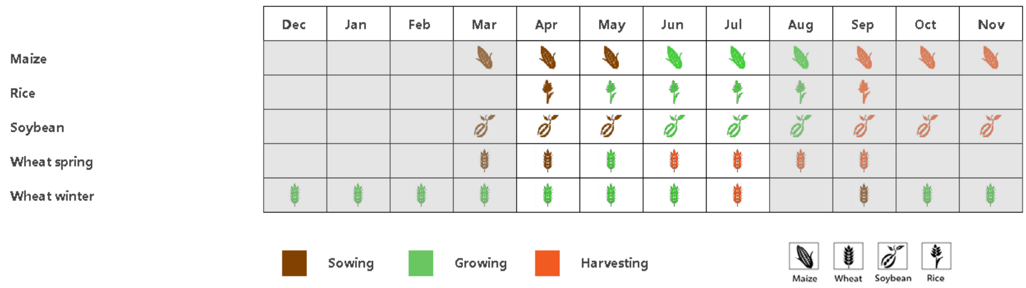
**Southeast**

This is an important cotton production area in the United States, including Georgia, Alabama and North Carolina. During the monitoring period, the agro-climatic conditions in this region were favorable. Compared with the 15 YA, rainfall was 16% higher, temperature 0.6°C lower and PAR 3% below average. Abundant rainfall helped sustain vigorous crop growth, although rainfall in July was far below average. The VCIx value, which reached 0.93, also indicates favorable crop growth in the region

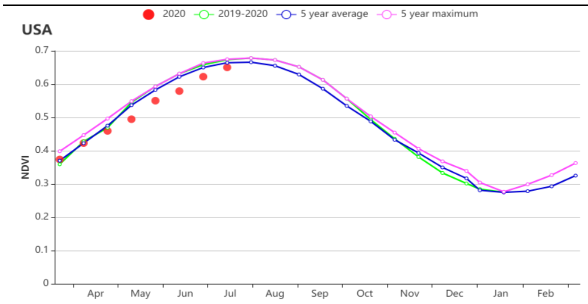
**Southern Plains**

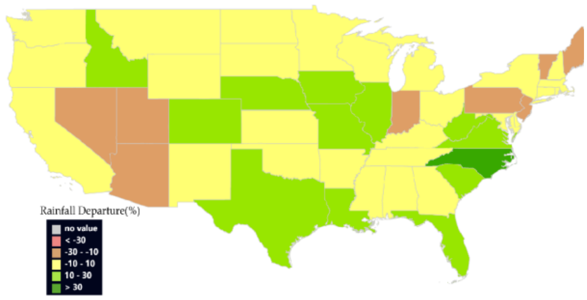
This is the most important winter wheat, sorghum and cotton producing area in the United States. It includes Kansas, Oklahoma, Texas, and eastern Colorado. Texas is the largest cotton producing state and Kansas the largest winter wheat producing state in the United States. During this monitoring period, the southern plain experienced a slightly wetter season than normal: Compared to the 15YA, rainfall was 9% higher, temperatures 0.3°C below average and PAR 2% below average. The monitoring period covers the grain filling and harvesting stages of winter wheat and the planting, square and boll fixing stages of cotton. The development profile of NDVI shows that the crop conditions were significantly below average in May and June, however, they improved in July. At the same time, the proportion of cultivated land has dropped by 4% compared to the 5YA. All in all, crop conditions were slightly below average by the end of this monitoring period

**Figure 3.42 United States' crop condition, April - July 2020**



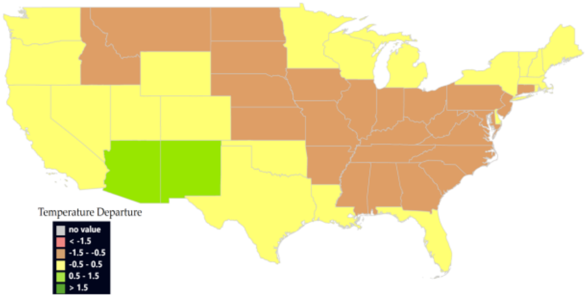

(a). Phenology of major crops

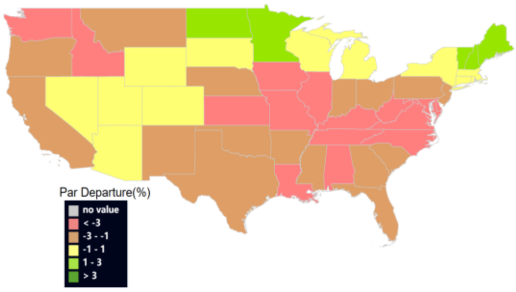



(b) Crop condition development graph based on NDVI_USA

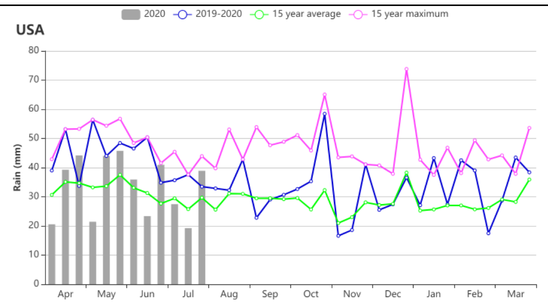
(c) Rainfall departure at state's level

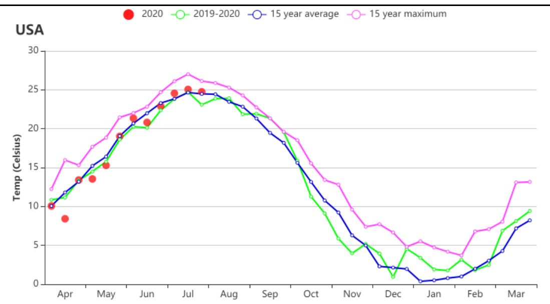



(d) Temperature departure at state's level

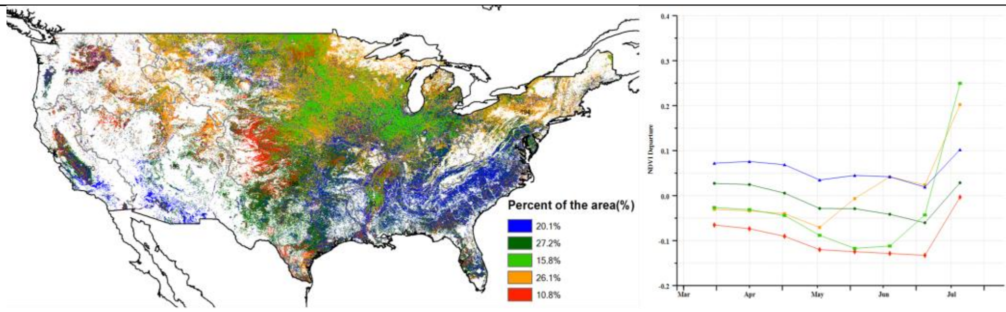
(e)PAR departure at state's level



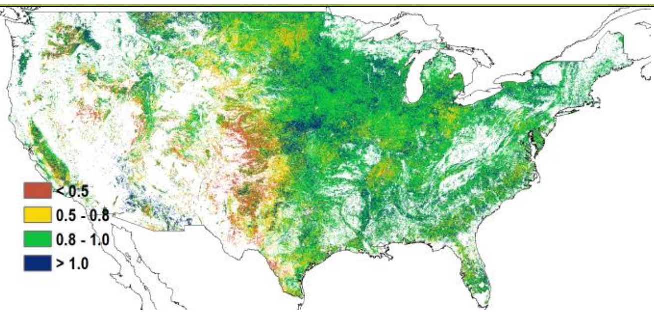




(f) Rainfall time series from April to July

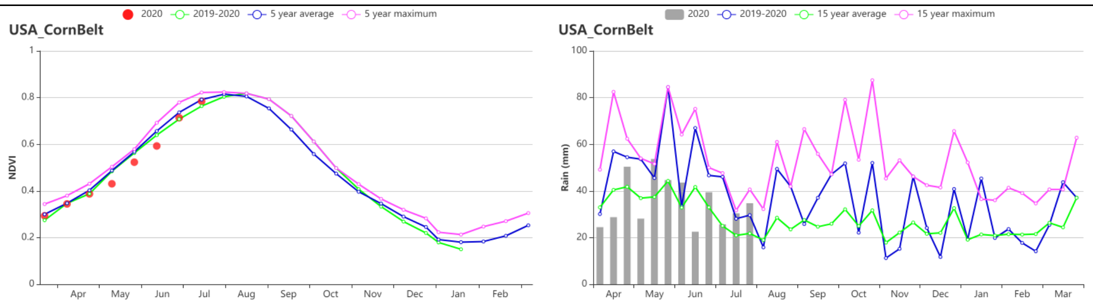
(g) Temperature time series from April to July



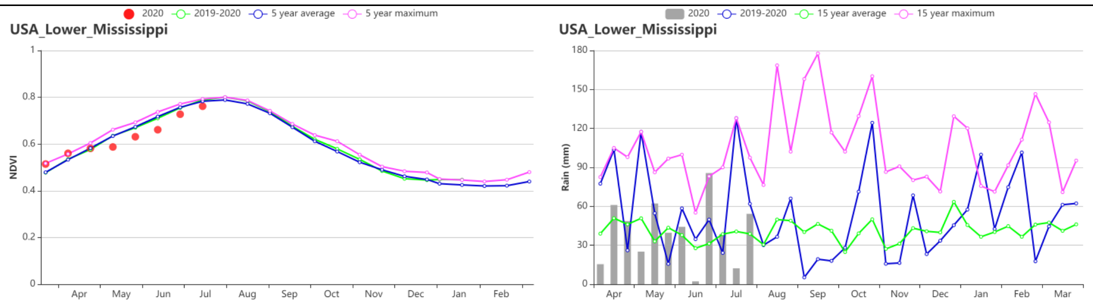

(h) NDVI departure clustering and its development profile



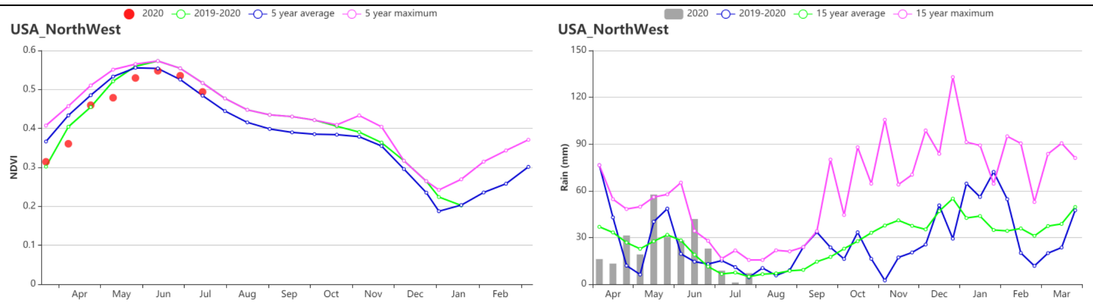

(i) Maximum VCI



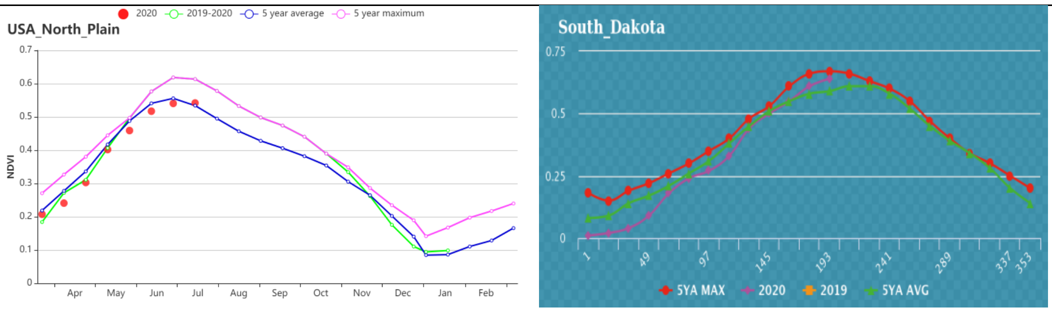

(j) Crop condition development graph based on NDVI (Corn Belt) and Rainfall time series



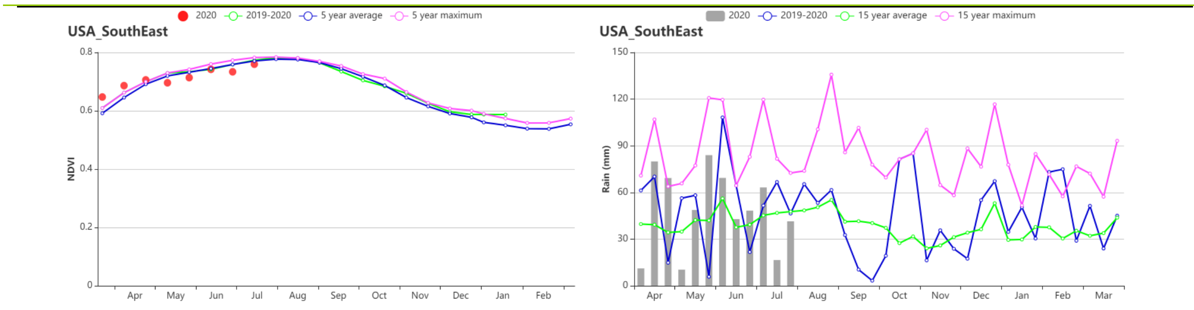

(k) Crop condition development graph based on NDVI (Lower Mississippi) and Rainfall time series



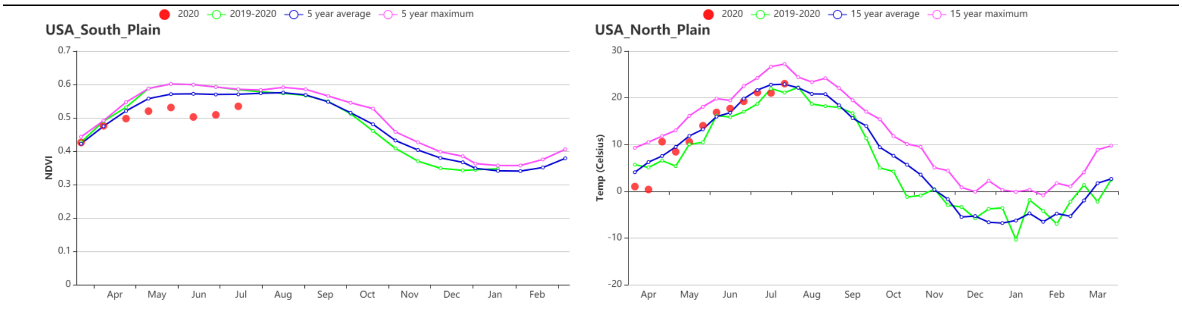

(l) Crop condition development graph based on NDVI (NorthWest) and Rainfall time series




(l) Crop condition development graph based on NDVI (North Plain(left) and South Dakota(right))




(m) Crop condition development graph based on NDVI (SouthEast) and Rainfall time series




(n) Crop condition development graph based on NDVI (South Plain) and temperature time series

**Table 3.75 United States' agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2020**

| Region | RAIN | | TEMP | | RADPAR | | BIOMSS | |
|---|---|---|---|---|---|---|---|---|
| | Current (mm) | Departure (%) | Current (°C) | Departure (°C) | Current (MJ/m²) | Departure (%) | Current (gDM/m²) | Departure (%) |
| **California** | 100 | -10 | 17.4 | 0.3 | 1599 | -1 | 419 | -13 |
| **Corn Belt** | 426 | 5 | 16.3 | -0.7 | 1268 | -2 | 603 | -1 |
| **Lower Mississippi** | 489 | 3 | 22.9 | -0.7 | 1350 | -3 | 788 | -5 |
| **North-eastern areas** | 425 | -2 | 15.5 | -0.7 | 1226 | -2 | 548 | -1 |
| **Northwest** | 278 | 9 | 11.8 | -0.4 | 1346 | -4 | 439 | -10 |
| **Northern Plains** | 350 | 4 | 13.7 | -0.7 | 1376 | -1 | 561 | -3 |
| **Southeast** | 585 | 16 | 22.5 | -0.6 | 1361 | -3 | 793 | -4 |
| **Southwest** | 175 | -6 | 18.4 | 0.5 | 1588 | 0 | 634 | 6 |
| **Southern Plains** | 370 | 9 | 22.6 | -0.3 | 1401 | -2 | 806 | 0 |
| **Blue Grass region** | 457 | 4 | 18.9 | -1.1 | 1311 | -4 | 676 | -7 |

**Table 3.76 United States' agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2020**

| Region | Cropped arable land fraction | | Maximum VCI |
|---|---|---|---|
| | Current (%) | Departure (%) | Current |
| California | 81 | 9 | 0.86 |
| Corn Belt | 100 | 0 | 0.93 |
| Lower Mississippi | 100 | 0 | 0.91 |
| North-eastern areas | 100 | 0 | 0.95 |
| Northwest | 82 | -4 | 0.87 |
| Northern Plains | 91 | 5 | 0.86 |
| Southeast | 100 | 0 | 0.93 |
| Southwest | 40 | -6 | 0.79 |
| Southern Plains | 83 | -5 | 0.8 |
| Blue Grass region | 100 | 0 | 0.93 |

# [UZB] Uzbekistan

This report covers the cultivation and harvest of wheat and the sowing and early growth period of maize in Uzbekistan.

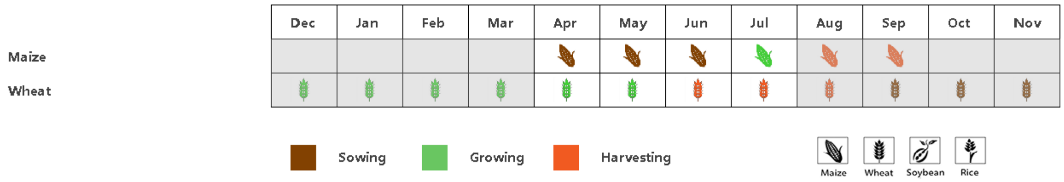
The crop conditions for the whole country were generally favorable. The national average VCIx was 0.88, and the cropped arable land fraction increased by 30%. Among the CropWatch agroclimatic indicators, TEMP and RADPAR were slightly below average (-0.5°C and -4%), while RAIN increased by 62%. Especially April and May were wetter than normal. This resulted in an increased BIOMSS (+5%) compared to the recent fifteen-year average. As shown by the NDVI development graph, crop conditions were above or near average in the whole period except for June. The NDVI cluster graphs and profiles showed that most areas across Uzbekistan experienced favorable crop conditions during this monitoring period. About 35% of the cropland had above average conditions from April to July, covering most provinces of Samarkand, Kashkadarya, Surkhadarya, Jizzakh, and some small parts of Nawoiy, Sirdaryo, Tashkent, Namangan, Ferghana and Andijon provinces.  In contrast, about 15% of the arable land was below the five-year-average NDVI, mainly in the Karakalpakstan, Khorezm, and Bukhoro provinces. Overall, the crop conditions are estimated to be favorable.

**Regional analysis**

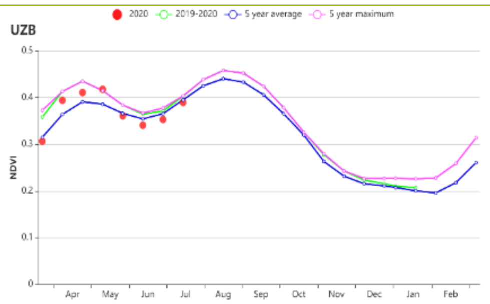
In the rainfed Eastern hilly cereals zone, NDVI was above average from April to mid May and near average from the end of May to the end of July. RAIN was above average (+63%), and RADPAR and TEMP were below average (-4% and -0.6°C). The combination of the factors resulted in a BIOMSS increase (+12%) compared to the five-year average. The maximum VCI index was 0.95, while the cropped area increased by 19% compared to the five-year average. Overall, crop prospects in this region are good.

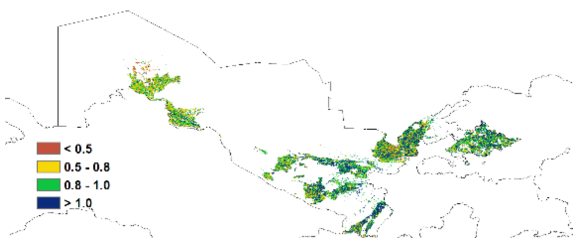
In the irrigated Aral Sea cotton zone, the crop conditions, after a favorable start in April, dropped to below the 5YA starting in late May. Accumulated rainfall (RAIN -29%) was below the 15YA, RADPAR (-1%) was slightly below and temperatures were higher (TEMP +0.5°C) than average. The BIOMSS index decreased by 17% compared to the fifteen-year average. The maximum VCI index was 0.81, while the cropped arable land decreased by 3%. Overall crop prospects are slightly unfavorable.

**Figure 3.43 Uzbekistan's crop condition, April - July 2020**

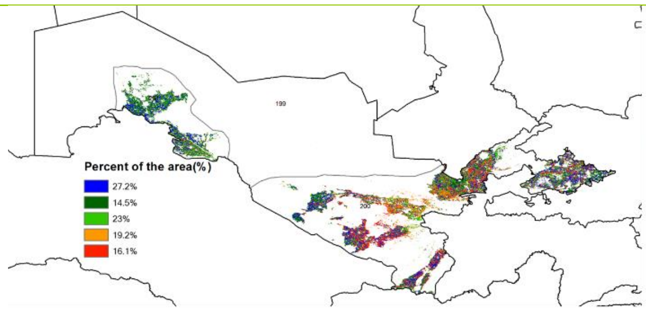


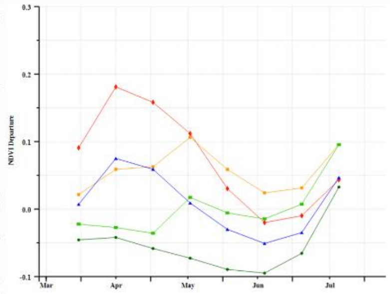

(a). Phenology of major crops



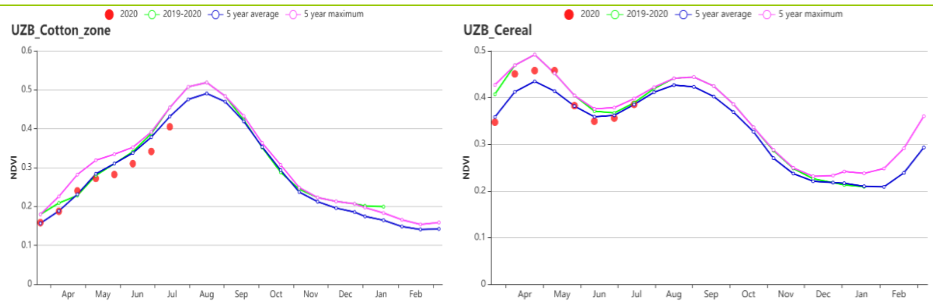




(b) Crop condition development graph based on NDVI (c) Maximum VCI

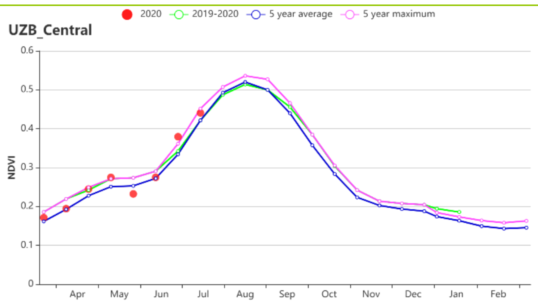



(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles




(f) Crop condition development graph based on NDVI Aral Sea cotton region (left) Eastern hilly cereals region (right)




(g) Crop condition development graph based on NDVI Central region with sparse crops

**Table 3.77 Uzbekistan's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April – July 2020**

| Region | RAIN | | TEMP | | RADPAR | | BIOMSS | |
|---|---|---|---|---|---|---|---|---|
| | Current (mm) | Departure (%) | Current (°C) | Departure (°C) | Current (MJ/m²) | Departure (%) | Current (gDM/m²) | Departure (%) |
| Aral Sea cotton zone | 19 | -29 | 25.5 | 0.5 | 1517 | -1 | 523 | -17 |
| Eastern hilly cereals zone | 224 | 63 | 21.4 | -0.6 | 1500 | -4 | 617 | 12 |
| Central region with sparse crops | 71 | 72 | 25.1 | 0.1 | 1519 | -2 | 536 | -8 |

**Table 3.78 Uzbekistan's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April – July 2020**

| Region | Cropped arable land fraction | | Maximum VCI |
|---|---|---|---|
| | Current (%) | Departure (%) | Current |
| Aral Sea cotton zone | 65 | -3 | 0.81 |
| Eastern hilly cereals zone | 84 | 19 | 0.95 |
| Central region with sparse crops | 75 | 14 | 0.87 |

AFG AGO ARG AUS BGD BLR BRA CAN DEU EGY ETH FRA GBR HUN IDN IND IRN ITA KAZ KEN KGZ KHM LKA MAR MEX MMR MNG MOZ NGA PAK PHL POL ROU RUS THA TUR UKR USA UZB **VNM** ZAF ZMB

# [VNM] Vietnam

This report summarizes the rice production conditions over Vietnam and in its main agro-ecological zones including North Central Coast, North East, Red River Delta, South East, South Central Coast, North West, Central highlands and Mekong River Delta from April to July, 2020. This monitoring period fully covers the duration from sowing to harvesting of summer rice in the Central Part, while the north and the south were in the last stages of their winter-spring rice and summer-autumn crops, respectively. Spring-winter rice production in the Mekong Delta and Southest region started in July.

Precipitation over the nation decreased nearly 21% as compared to the 15-year average. Shortages of rainfall occurred in May, early June, early and late July. The North Central Coast (-39%) and Red River Delta (-37%) are the two regions encountering the highest lack of precipitation. Apart from precipitation, temperature (+0.3°C) and radiation (+5%) were slightly above average. The moderate climate conditions led to a 4% gain in biomass at the national scale.

Crop condition development based on NDVI was significantly lower than the 5YA. The NDVI trend in the northern part of Vietnam tended to be below average levels, while the region from central to southern Vietnam (nearly 57% area) had a similar pattern of NDVI, which was close to the average. When it comes to VCIx, most parts of Vietnam had a value over 0.8, except for South Central Coast and the coastal provinces of the Mekong Delta where VCIx was very low. According to prior knowledge of our research team, these two zones suffered from drought and salinity intrusion. This considerably affected the health of the crops. The CALF was stable as compared to the recent five-year average.

Overall, the output of rice production from April to July is estimated as poor, due to unfavorable weather conditions.

**Regional analysis**

Based on cropping systems, climatic zones and topographic conditions, several agro-ecological zones (AEZ) can be distinguished for Vietnam: North Central Coast (202), North East (203), Red River Delta (204), South East (205), South Central Coast (206), North West (207), Central highlands (208), Mekong River Delta (209).

During this reporting period, the summer-autumn rice crop cultivation in the North Central Coast passed through 3 phases: sowing, growing and harvesting. The average rainfall was about 571 mm, 39% below average, while the temperature was 25.3°C, an increase by 0.5°C as compared to the 15YA. RADPAR was above average (+7%). Despite the substantial reduction in rainfall, BIOMASS was above average (+ 6%). The crop conditions were below average from April to July. Overall, VCIx was 0.95 and CALF was close to average, indicating moderate conditions in this region. The output of summer and autumn rice in this region is estimated to be slightly lower than in 2019.

The period from April to May is the last stage of rainy season rice in the North West. In this region, the average rainfall was 4% above average while temperatures dropped 0.2°C compared to the 15YA. Radiation was also slightly higher than average (+6%). In general, the climate condition pattern had a small departure from the 15-year baseline. The potential biomass was above average (+ 2%) and the VCIx was in the range of 0.8 -1. The NDVI profiles in the region showed spatial variations, and the values of this indicator decreased between June and July. The CALF reached 100% and was stable compared to 5-year average. Generally, the output of the rainy season crop in the North West would be average thanks to good weather conditions.

In the Red river Delta, the average rainfall was 674 mm and it was 37% lower than the 15YA. The temperature was up by 0.1°C and the VCIx was 0.95. RADPAR (1%) and BIOMSS (0%) did not change significantly from the 15-year average. The crop condition development graph based on NDVI fluctuated greatly from 0.3 to 0.7. CALF increased by 1%. Overall, this region has moderate prospects for summer-autumn rice.

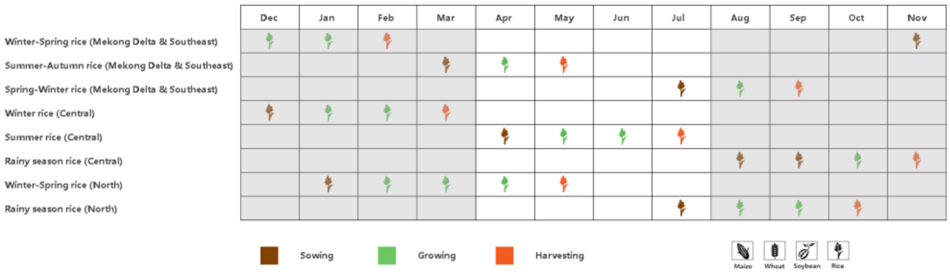
During this reporting period, the summer-autumn rice crop in the South East entered the growing and harvesting phases. It was followed by the planting of the spring-winter rice crop in July. Total rainfall in this reporting period was about 902 mm, 24% below 15YA. Temperature was 27.2°C, up by 0.7°C as compared to the 15YA. RADPAR was higher than average (+5%). BIOMASS was above average (+3%). The crop condition graph based on NDVI presented below-average values. Rainfall deficit might be the reason for negative NDVI departure. Overall, VCIx (0.9) and CALF (94.11%) indicated moderate conditions in this region. The outputs of summer-autumn rice and spring-winter rice crop can be expected to be slightly lower than in 2019.

During this reporting period, the summer-autumn rice crop in the South Central Coast passed through 3 phases: sowing, growing and harvesting. The average rainfall was about 721 mm, 24% below average while TEMP was 24.6°C, up by 0.3°C over the 15YA. RADPAR was above average (+7%). Despite the big reduction in rainfall, BIOMASS was above average (+2%). The crop condition was below average from April to July. VCIx (0.86) and CALF (+1%), in combination with the other CropWatch indicators, presented a generally unfavorable yield prospect for summer-autumn rice.

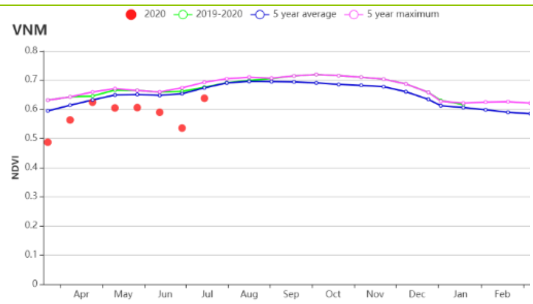
The summer-autumn rice crop in the Central Highlands passed through all 3 phases: sowing, growing and harvesting. The average rainfall in the Central Highlands was about 884 mm and it was 26% below average, while TEMP was 24.4°C, an increase by 0.6°C, as compared to the 15YA. RADPAR was above average (+12%). Despite the big reduction in rainfall, BIOMASS was above average (+10%). The crop conditions were below average from April 1 to early July, and then above average in late July. Overall, high VCIx (0.94) and stable CALF indicated moderate conditions in this region. The output of summer-autumn rice is estimated to be poor.

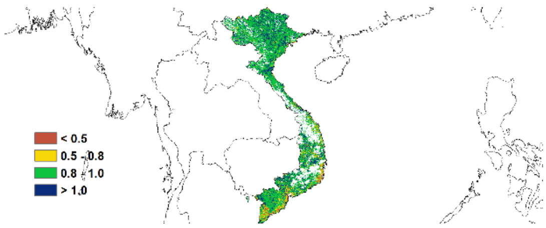
During this reporting period, the summer-autumn rice crop in Mekong River Delta had completed the growing and harvesting phases. Spring-winter rice planting started in July. Total rainfall in this reporting period was about 944 mm, and it was 11% below the 15YA. Average temperature was 28.5°C, 0.6°C higher than the 15YA. PAR (RADPAR) was slightly higher than average (1%). BIOMASS was above average (+2%). The crop condition graph based on NDVI presented below-average values over the entire monitoring period. Rainfall deficit as well as record-low flow levels of the Mekong river are the likely causes for the negative NDVI departure. VCIx (0.87) and CALF (83%) indicated moderate conditions in this region. The outputs of summer-autumn rice and spring-winter rice crop are forecasted to be lower than in 2019.

**Figure 3.44 Vietnam's crop condition, April-July 2020**



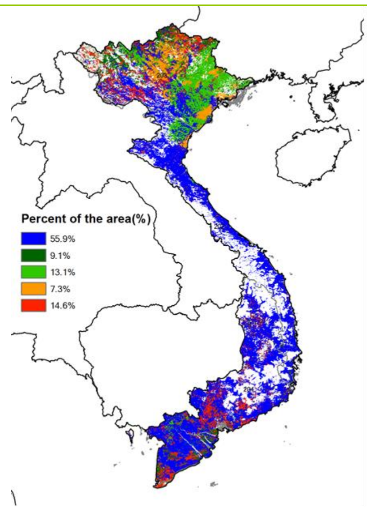

(a). Phenology of major crops

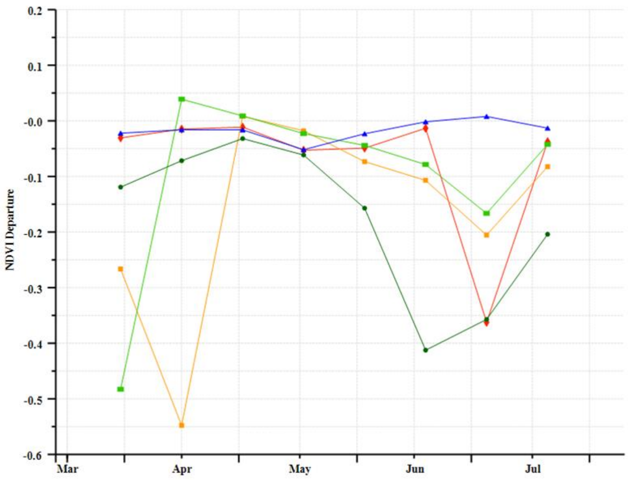



(b) Crop condition development graph based on NDVI

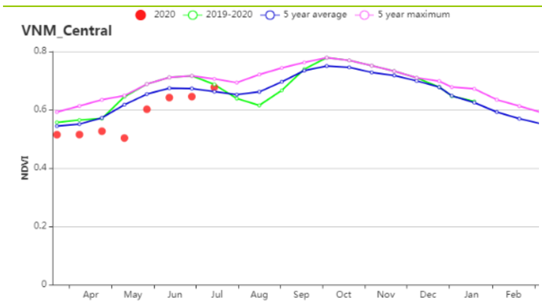
(c) Maximum VCI

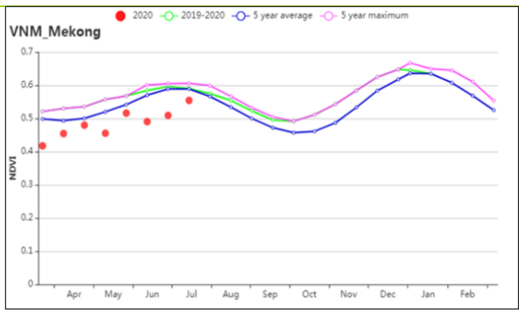


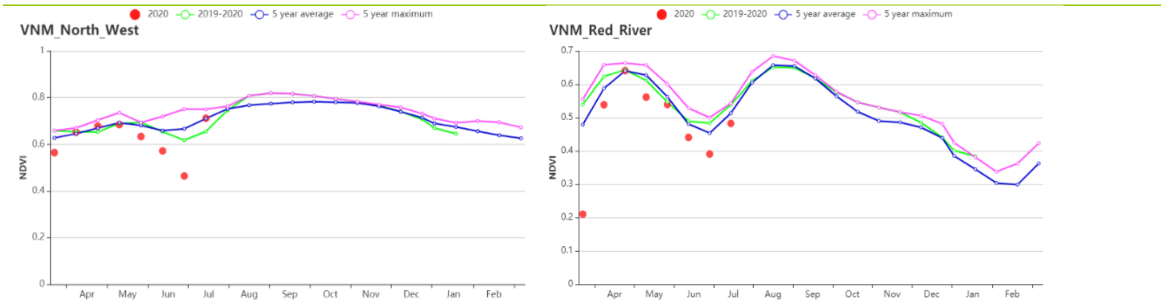

(d) Spatial NDVI patterns compared to 5YA

(e) NDVI profiles

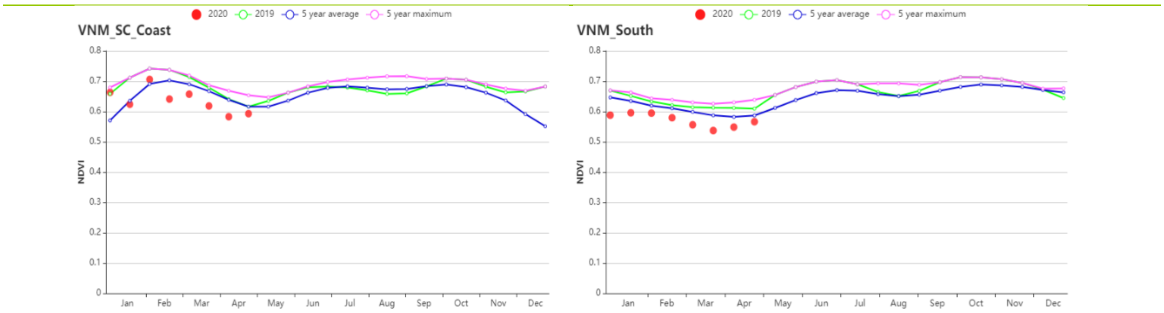


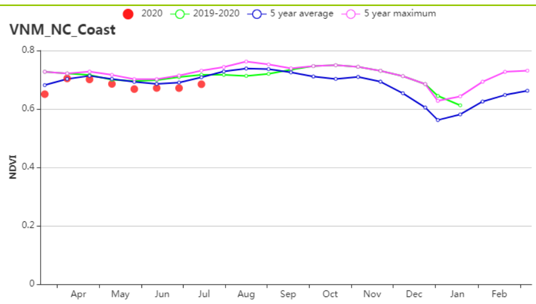

(f) Crop condition development graph based on NDVI Central Highlands Vietnam (left), and Mekong River Delta (right).




(g) Crop condition development graph based on NDVI North West Vietnam (left), and Red River Delta (right).




(h) Crop condition development graph based on NDVI South Central Coast Vietnam (left), and South East Vietnam (right).




(i) Crop condition development graph based on NDVI North Central Coast Vietna

**Table 3.79Vietnam's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April-July 2020**

| Region | RAIN | | TEMP | | RADPAR | | BIOMSS | |
|---|---|---|---|---|---|---|---|---|
| | Current (mm) | Departure (%) | Current (°C) | Departure (°C) | Current (gDM/m²) | Departure (%) | Current (MJ/m²) | Departure (%) |
| Central Highlands | 884 | -26 | 24.4 | 0.6 | 1260 | 12 | 782 | 10 |
| Mekong River Delta | 944 | -11 | 28.6 | 0.6 | 1270 | 1 | 877 | 2 |
| North Central Coast | 571 | -39 | 25.3 | 0.5 | 1262 | 7 | 808 | 6 |
| North East | 1223 | -14 | 23.8 | -0.1 | 1192 | 3 | 755 | 3 |
| North West | 1167 | 4 | 22.8 | -0.2 | 1246 | 6 | 760 | 6 |
| Red River Delta | 674 | -37 | 27 | 0.1 | 1195 | 1 | 806 | 0 |
| South Central Coast | 721 | -24 | 24.6 | 0.3 | 1270 | 7 | 770 | 2 |
| South East | 902 | -23 | 27.2 | 0.7 | 1271 | 5 | 834 | 3 |

**Table 3.80 Vietnam's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April-July 2020**

| Region | Cropped arable land fraction | | Maximum VCI |
|---|---|---|---|
| | Current | Departure (%) | Current |
| Central Highlands | 98 | 1 | 0.77 |
| Mekong River Delta | 84 | -2 | 0.83 |
| North Central Coast | 99 | 0 | 0.94 |
| North East | 83 | -1 | 0.87 |
| North West | 99 | 0 | 0.95 |
| Red River Delta | 100 | 0 | 0.96 |
| South Central Coast | 100 | 0 | 0.95 |
| South East | 98 | 1 | 0.95 |

# [ZAF] South Africa

Most crops, such as maize, sorghum, soybeans, rice and groundnuts reached maturity in May or June. Wheat planting started in May.

As compared to the 15-year average, the precipitation decreased by 23%, the temperature was 0.7°C below average and RADPAR was 2% higher. The decrease in precipitation and temperature affected the potential biomass which was reduced by 17% as compared to the 15YA. The fraction of cropped land increased by 9% compared to the 5YA.

Based on the NDVI profile, it was noticed that from April to July, the crop conditions were fair: NDVI values remained close to the 5-year average for the whole period. According to the map depicting spatial NDVI patterns, 6.1% of the area, mostly in Western Cape, had a rising NDVI departure beginning in mid-May, because wheat had started to emerge at around that time. The graph also shows that 42% of the area (in Eastern State, KwaZulu Natal, Free State, Mpumalanga, and North West) had positive NDVI departures until the end of June. 51% of the area in these provinces had negative NDVI departures which can be explained by the harvesting period. The maximum VCIx was at 0.89.

**Regional analysis**

CropWatch considers three main crop production zones in South Africa, namely The Mediterranean zone, Humid Cape Fold Mountains and Dry Highveld and Bushveld maize areas.

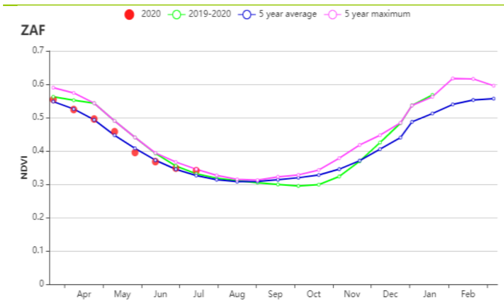
In the Mediterranean zone, the precipitation decreased by 3% (from the 15YA), temperature remained close to average (+0.1°C), while the radiation increased by 6% as compared to the 15YA. In this zone which is known for its wheat cultivation, the slight reduction in rainfall did not affect the potential biomass, as a 2% increase over the 15YA was estimated. The cropped land increased by 3% over the 5YA and the vegetation condition index was at 0.86. According to the NDVI graph the crop conditions were above the 5YA average starting in June and reached a maximum in July. Conditions for wheat are promising in this region.

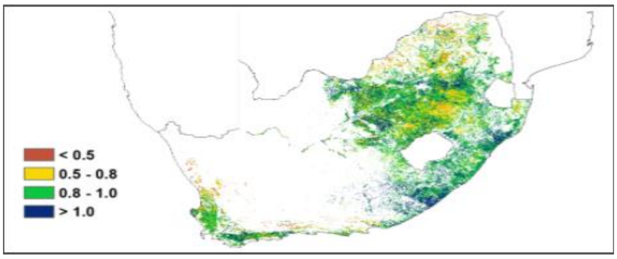
In the Humid Cape Fold Mountains, the precipitation dropped by 31% compared to the 15YA, and the region was cooler by 0.4°C while the radiation increased by 3% from 15YA. Hence, the current biomass estimate was reduced by 6%. CALF increased 2% as compared to the 5YA. The NDVI values closely followed the 5-year trend. Maximum vegetation condition index was at 93. The crop conditions were average for this region.

In the Dry Highveld and Bushveld maize areas, the rainfall departed by -26% from the average, temperatures were also below average (-0.9°C) and radiation was 2% higher as compared to 15YA. In this main production zone, estimated biomass was reduced by 24% compared to 15YA. Regarding the cropped area land fraction (CALF), it had increased by 11% above the 5YA and VCIx was at 0.89. From April up to July, the NDVI profile for this semi-arid region was close to average. Crop conditions were average for this region.

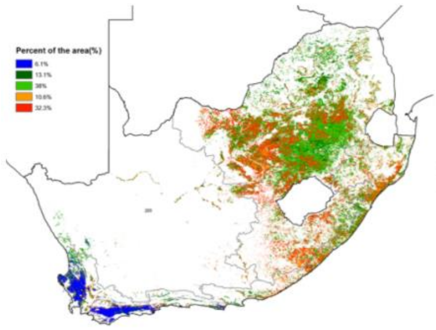
**Figure 3.45 South Africa's crop condition, April - July 2020**

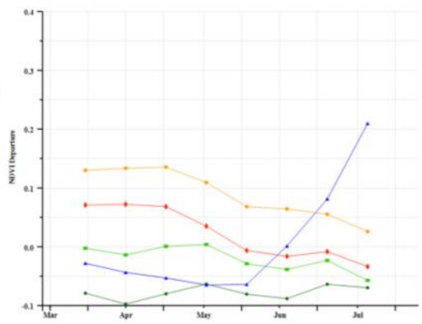

(a). Phenology of major crops



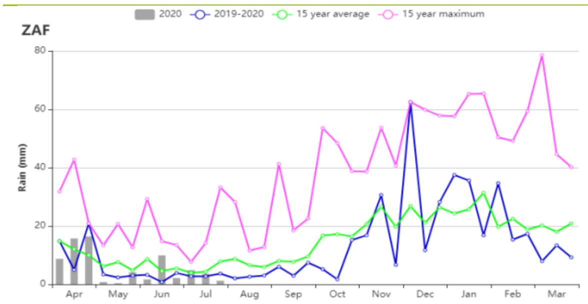



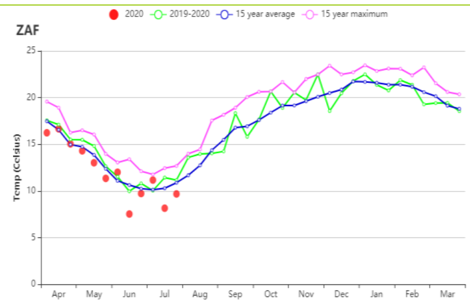

(b) Crop condition development graph based on NDVI (c) Maximum VCI



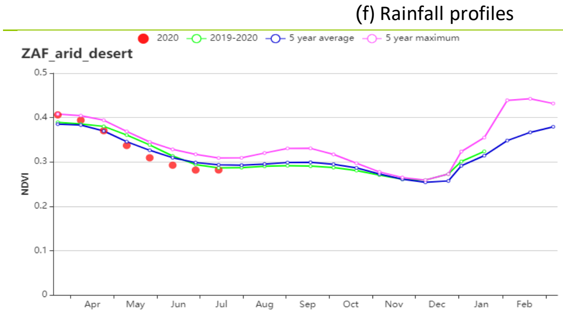


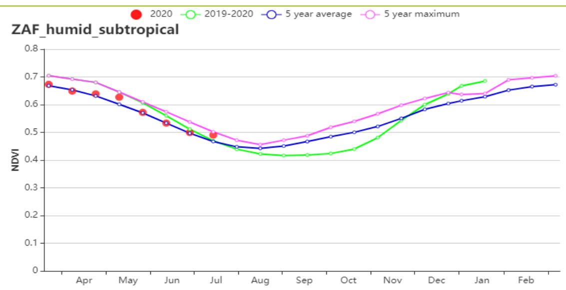
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



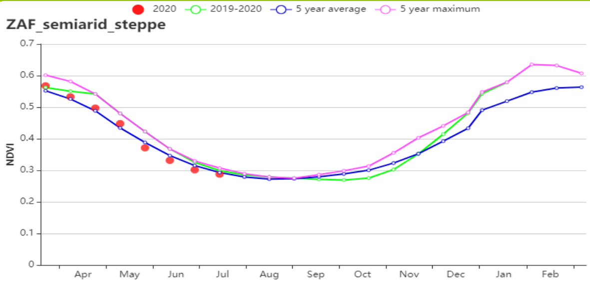



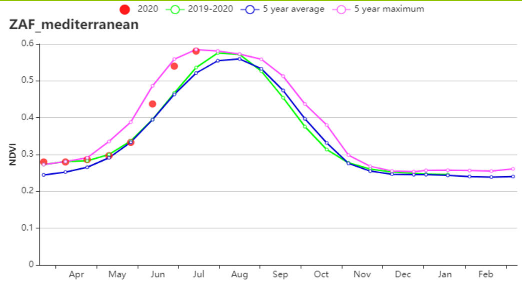

(f) Rainfall profiles (g) Temperature profiles




(h) Crop condition development graph based on NDVI Arid desert (left) and Humid sub-tropical (right)




(i) Crop condition development graph based on NDVI semi-arid steppe (left) and Mediterranean (right)

**Table 3.81 South Africa's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2020**

| Region | RAIN | | TEMP | | RADPAR | | BIOMSS | |
|---|---|---|---|---|---|---|---|---|
| | Current (mm) | Departure (%) | Current (°C) | Departure (°C) | Current (MJ/m²) | Departure (%) | Current (gDM/m²) | Departure (%) |
| Humid Cape Fold Mountains | 95 | -31 | 14.3 | -0.4 | 812 | 3 | 278 | -6 |
| Mediterranean Zone | 245 | -3 | 13.5 | 0.1 | 721 | 6 | 257 | 2 |
| Dry Highveld and Bushveld | 51 | -26 | 11.5 | -0.9 | 933 | 2 | 190 | -24 |

**Table 3.82 South Africa's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2020**

| Region | Cropped arable land fraction | | Maximum VCI |
|---|---|---|---|
| | Current (%) | Departure (%) | Current |
| Humid Cape Fold Mountains | 97 | 2 | 0.93 |
| Mediterranean Zone | 85 | 3 | 0.86 |
| Dry Highveld and Bushveld | 88 | 11 | 0.89 |

AFG AGO ARG AUS BGD BLR BRA CAN DEU EGY ETH FRA GBR HUN IDN IND IRN ITA KAZ KEN KGZ KHM LKA MAR MEX MMR MNG MOZ NGA PAK PHL POL ROU RUS THA TUR UKR USA UZB VNM ZAF **ZMB**

# [ZMB] Zambia

This reporting period covers the end of the harvest period for the rainfed crops and the onset of the irrigated season mainly for winter wheat and horticultural crops. The harvest of the 2020 cereal crops started in April and concluded in July. A delay in the start of the seasonal rains had affected crop establishment, however precipitation stabilized and was generally conducive to normal crop growth.

During this period the average rainfall received was 43 mm with the highest in the Northern High Rainfall zone (86 mm, 15Yr Dep. -16%) and lowest in Western Semi arid zone (10 mm, 15Yr Dep. -74%). Generally, the CALF was above 98% in all the zones and VCIx above 0.82. BIOMSS production varied from 155 to 380 gDM/m$^2$ during this reporting period, which was below average due to low rainfall. Drier-than-normal conditions also negatively affected NDVI, which was below the 5-year average, but slightly better than years conditions.

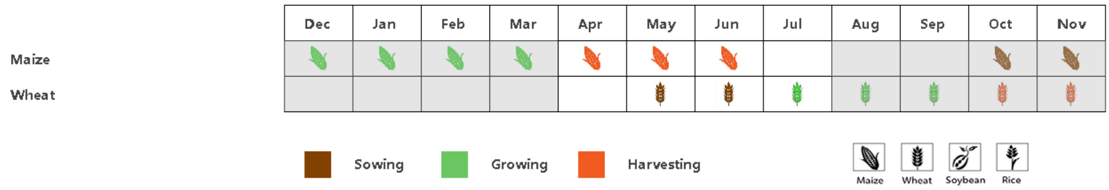
Variable spatial-temporal patterns of rainfall in some parts of the Southern and Western provinces caused localized floods and drought, which in turn negatively impacted crop production. Cereal production was estimated slightly above average at 3.220 million metric tonnes. The COVID-19 pandemic may trigger an increase in the prevalence of malnutrition as a result of a reduction in economic activities and associated income losses, and a knock-on effect on local market supplies.

**Regional analysis:**

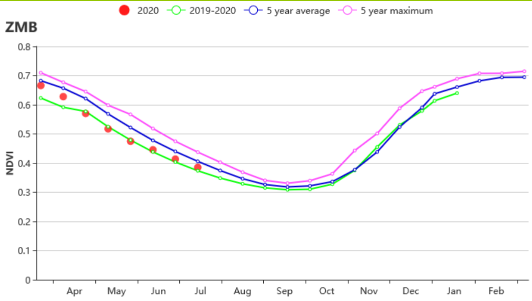
Luangwa and Zambezi Valleys and the Western Semi-Arid Plain received less than 15 mm rainfall representing more than a 65% decrease from the 15-year average. In the Northern High Rainfall Zone, conditions were better. It received 86 mm, which was a 16% decrease from the 15Yr average. The Cropped Arable Land Fraction (CALF) was above 98% in all the AEZs. It was highest in the Northern high rainfall zone, where the Maximum Vegetation Condition Index (VCIx) reached 0.93, while Luangwa and Zambezi Valleys had the lowest VCIx (0.82). Based on a country-wide analysis, the southern, central, Lusaka and eastern provinces had a relatively lower VCIx than the other regions of the country.

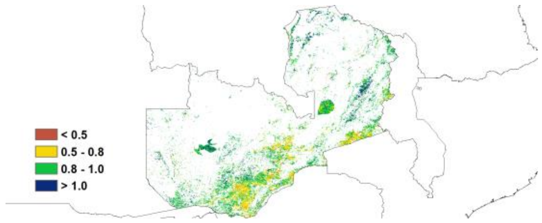
The CropWatch indicators show better conditions than in 2019, however, some shortfalls are expected in the southern and western areas of Zambia. About 15% of the area planted with maize in the southern and central provinces were also affected by Fall Armyworm (FAW), which, together with the COVID-19, may cause hunger and malnutrition for the poor.

**Figure 3.46 Zambia's crop condition, April - July 2020**



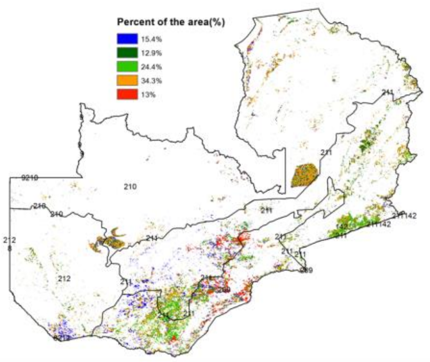

(a). Phenology of major crops

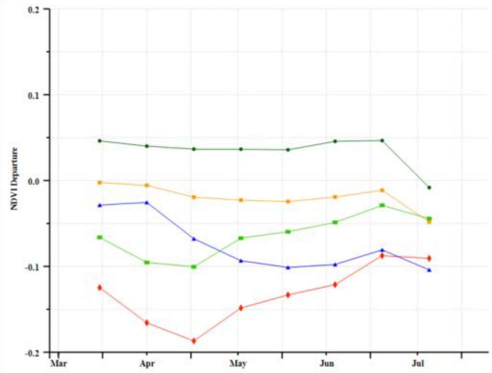



(b) Crop condition development graph based on NDVI

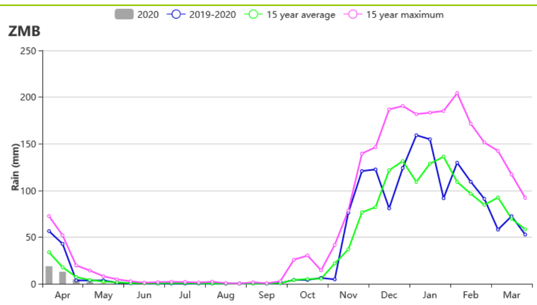
(c) Maximum VCI

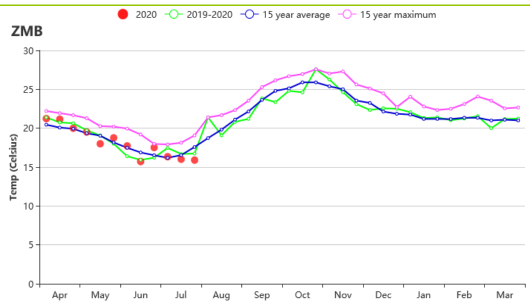



(d) Spatial NDVI patterns compared to 5YA

(e) NDVI profiles




(f) Rainfall profiles

(g) Temperature profiles

**Table 3.83 Zambia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 2020**

| Region | RAIN | | TEMP | | RADPAR | | BIOMSS | |
|---|---|---|---|---|---|---|---|---|
| | Current (mm) | Departure (%) | Current (°C) | Departure (°C) | Current (MJ/m²) | Departure (%) | Current (gDM/m²) | Departure (%) |
| Luangwa-Zambezi Rift Valley | 14 | -66 | 18.1 | -0.1 | 1096 | -2 | 264 | -20 |
| Western Semi-arid zones | 10 | -74 | 18.5 | -0.2 | 1180 | 0 | 155 | -25 |
| Central-Eastern Plateau | 21 | -65 | 18.1 | 0.1 | 1075 | -2 | 362 | -9 |
| Northen High Rainfall Zone | 86 | -16 | 18.1 | 0.0 | 1153 | -2 | 380 | -2 |

**Table 3.84 Zambia's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2020**

| Region | Cropped arable land fraction | | Maximum VCI |
|---|---|---|---|
| | Current (%) | Departure (%) | Current |
| Luangwa-Zambezi Rift Valley | 98 | 2 | 0.82 |
| Western Semi-arid zones | 100 | 1 | 0.93 |
| Central-Eastern Plateau | 99 | 1 | 0.86 |
| Northen High Rainfall Zone | 100 | 0 | 0.93 |

# Chapter 4. China

*After a brief overview of the agro-climatic and agronomic conditions in China over the reporting period (section 4.1), Chapter 4 then presents China's crop prospects (section 4.2), describes the situation by region, focusing on the seven most productive agro-ecological regions of the east and south: Northeast China, Inner Mongolia, Huanghuaihai, Loess region, Lower Yangtze, Southwest China, and Southern China (section 4.3). Section 4.4 provides a closer look at the flooding impacts in the Lower Yangtze River Basin and section 4.5 describes trade prospects of major cereals and soybean. Additional information on the agro-climatic indicators for agriculturally important Chinese provinces is listed in table A.11 in Annex A.*

## 4.1 Overview

Most of the summer crops, such as semi-late rice, spring maize and soybean, were in the field during the reporting period. The period also covered the harvest of early rice and winter crops, like winter wheat, and the sowing of late rice was gradually finished. The agro-climatic conditions were quite favorable, with rainfall slightly above average (+4%), temperature down 0.1°C and RADPAR down 2%. This was beneficial for crop growth and VCIx reached a high value of 0.91 at the national scale.

According to the time series rainfall profile, above-average rainfall was observed nationwide from mid May to early July. Nearly all the main agricultural regions of China recorded above-average rainfall, with the largest positive departure occurring in South-west China (+16%). The only exception was Southern China (-16%). Excessive rainfall (positive departures by more than 20%) occured in the provinces through which the Yangtze River flows (Anhui, Chongqing, Hubei and Yunnan). The largest positive departure was observed in Anhui province (+57%), which increased the pressure on the upstream provinces to constrain the release of water as much as possible.

Rainfall anomalies fluctuated largely over time and space. As can be seen from spatial distribution of rainfall profiles, 76.3% of cropped areas recorded relatively steady rainfall, with the rainfall departure within ±30mm. 13.2% of the cropped areas, mainly located in Southern China (Fujian, Guangdong, Hainan and some parts in Guangxi, Guizhou, Hunan, and Jiangxi), received significantly below-average rainfall (more than -50mm/dekad) during early May, middle to late June, and middle July. 10.5% of crops experienced the largest departure of rainfall (more than +200mm/dekad) during early July, essentially in some parts of Zhejiang, Jiangxi, Anhui, Hubei, Hunan, and Guizhou provinces.

Only two main agricultural regions in China recorded above-average temperature (Lower Yangtze region, +0.1°C; Southern China, +0.2°C), while the other regions all recorded below-average temperatures with negative departures ranging from -0.6°C to -0.2°C. Temperatures fluctuated during the monitoring period as follows: 72.5% of cultivated regions in southern parts and northern parts of China had positive temperature anomalies by more than 2.0°C, occurring in middle April and early May, while 27.5% of the cropped areas in central and eastern China experienced both positive temperature anomalies by more than 2.0°C in early June and negative anomalies by more than 3.0°C in middle July. RADPAR had the largest negative anomalies in Southwest China (-8%), and the biggest positive anomalies in Southern China (+5%), as a result of different rainfall situations during this monitoring period in these two regions.

As for BIOMSS, the situation was quite different among all the main producing regions, with the departures between -9% (Huanghuaihai, Loess region, and South-west China) and +6% (Southern China). CALF increased in the Loess region (+3%) and Inner Mongolia (+1%) as compared to the 5YA, indicating that the outlooks of crop production in these two regions are promising. The remaining regions all showed average

CALF. The VCIx values were higher than 0.9 in almost all the main producing regions of China, with values between 0.91 and 0.94, except for Inner Mongolia (0.87).

In terms of the proportion of NDVI anomaly categories compared with the 5-year average, the former seven 16-day phases, covering from April to early July, shared almost the same proportion pattern, while the last phase had below-average anomalies in more than 40% of the cropped areas, the reason of which might be the heavy rainfall and the impact of floods on the crops.

**Table 4.1 CropWatch agro-climatic and agronomic indicators for China, April to July 2020, departure from 5YA and 15YA**

| Region | Agroclimatic indicators | | | | Agronomic indicators | |
|---|---|---|---|---|---|---|
| | Departure from 15YA (2005-2019) | | | | Departure from 5YA (2015-2019) | Current period |
| | RAIN (%) | TEMP (°C) | RADPAR (%) | BIOMSS (%) | CALF (%) | Maximum VCI |
| **Huanghuaihai** | 10 | -0.5 | -5 | -9 | 0 | 0.92 |
| **Inner Mongolia** | 5 | -0.2 | -3 | -4 | 1 | 0.87 |
| **Loess region** | 2 | -0.6 | -2 | -9 | 3 | 0.94 |
| **Lower Yangtze** | 8 | 0.1 | 0 | 0 | 0 | 0.92 |
| **Northeast China** | 1 | -0.3 | -1 | -2 | 0 | 0.91 |
| **Southern China** | -16 | 0.2 | 5 | 6 | 0 | 0.92 |
| **Southwest China** | 16 | -0.2 | -8 | -9 | 0 | 0.92 |

**Figure 4.1 China crop calendar**

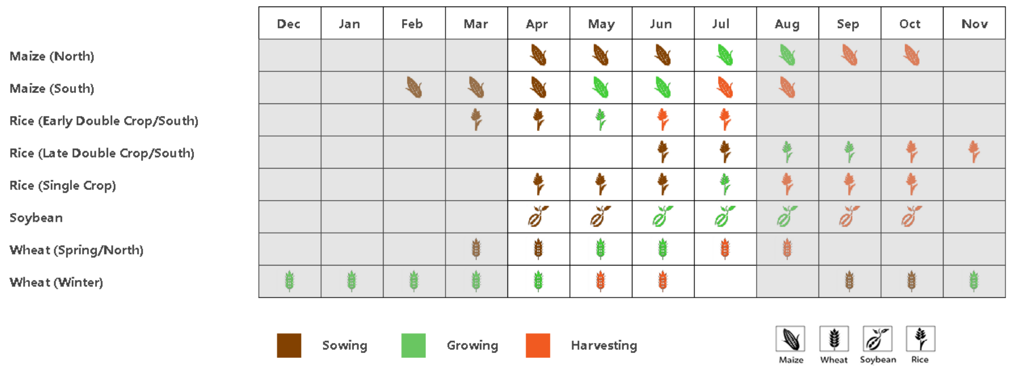



**Figure 4.2 China spatial distribution of NDVI profiles, April - July 2020**

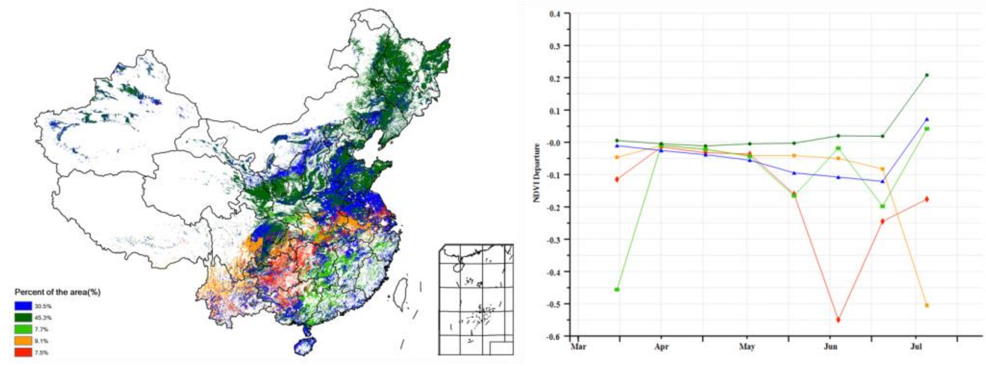


**Figure 4.3 China spatial distribution of rainfall profiles, April - July 2020**

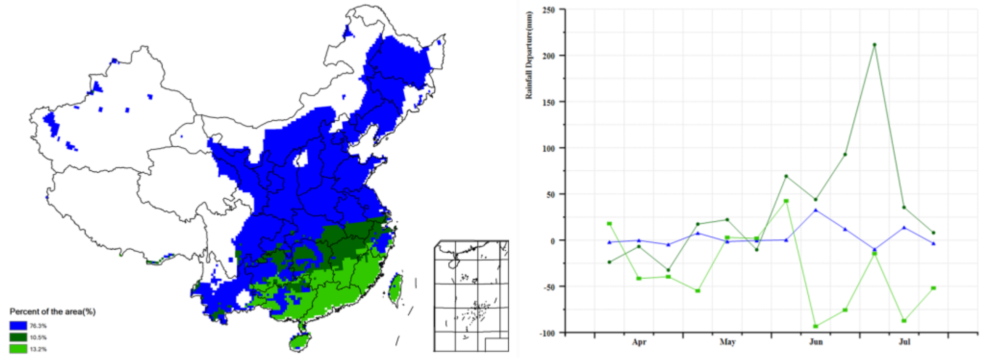



**Figure 4.4 China spatial distribution of temperature profiles, April - July 2020**

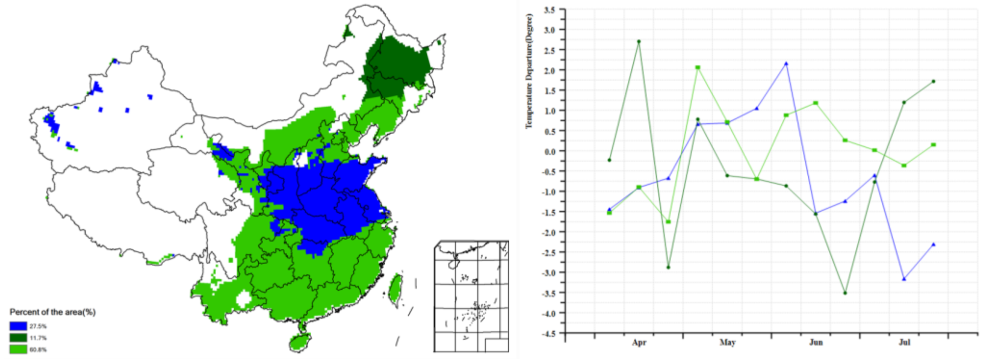



**Figure 4.5 China cropped and uncropped arable land, by pixel, April - July 2020**

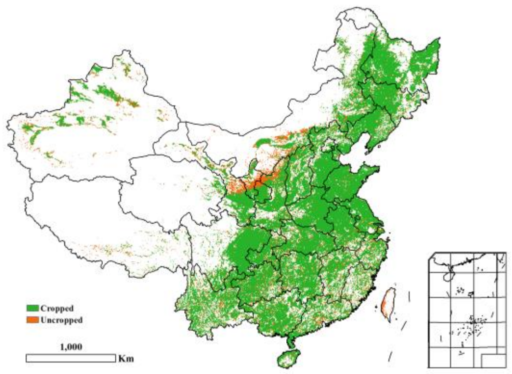



**Figure 4.7 China maximum Vegetation Condition Index (VCIx), by pixel, April - July 2020**

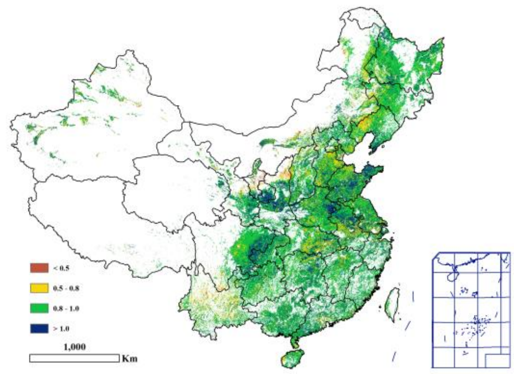



**Figure 4.6 China biomass departure map from 15YA, by pixel, April - July 2020**

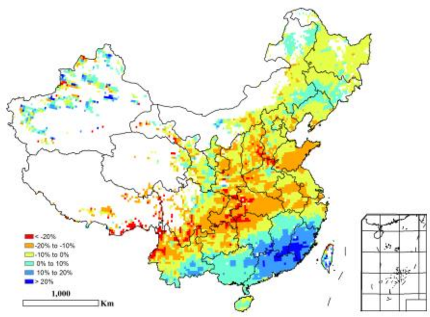



**Figure 4.8 Time series rainfall profile for China**

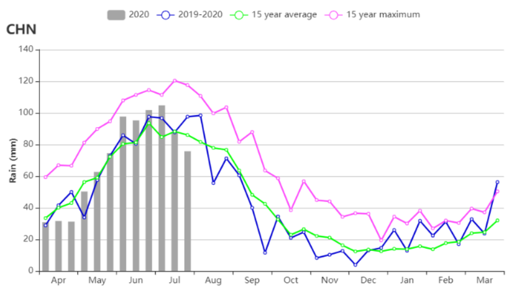
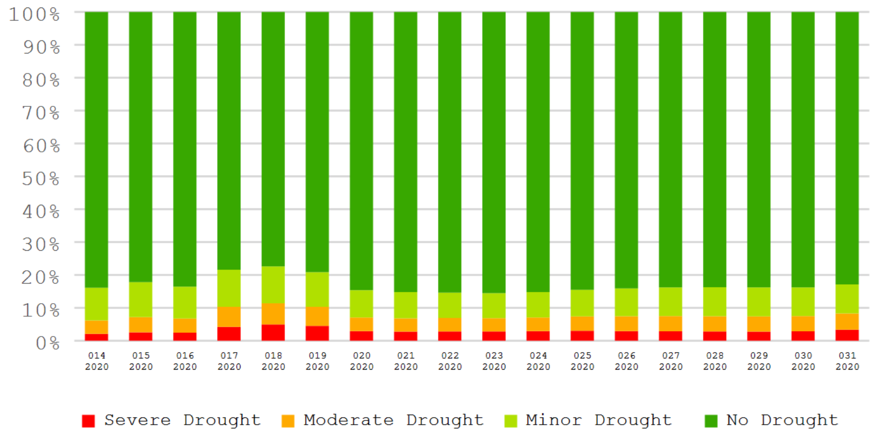


**Figure 4.9 Proportion of different drought categories from April to July 2020**




## 4.2 China crops prospects

Using multi-source remote sensing data, namely Sentinel-1 and Sentinel-2 from European Space Agency (ESA), Landsat 8 from the United States Geological Survey (USGS), and Chinese satellite data of Gaofen-1 and Gaofen-2, together with the latest agro-meteorological data, the yield of China's staple grain and oil crops (mainly including maize, rice, wheat and soybean) in 2020 was quantitatively predicted by integration of remote sensing index model, agro-meteorological yield estimation model. Based on GVG APP, 320,501 crops samples covering 586 counties in 10 provinces and autonomous regions of Northeast China, North China and the Lower Yangtze River were collected (see figure 4.10). Combined with the latest national 10 m resolution cropland data, crop area was estimated using Big Data analysis method. The results are as follows:

In 2020, the total crop output is expected to be 618,405 thousand tons, with a year-on-year increase of 1,267 thousand tons or 0.2%. The total output of summer crops (including maize, single rice, late rice, spring wheat, soybean, coarse grain, tuber crops and other minor crops) is expected to be 453,457 thousand tons, a decrease of 0.5% (2.4 million tons) compared with that in 2019; the total output of winter crops in 2019-2020 is 131,502 thousand tons, which is 346 thousand tons higher than that in 2018-2019, with an increase of 2.7%.

The total production of rice in China is predicted at 199,394 thousand tons, a year-on-year decrease of 1.8% (about 369 thousand tons). The main reason is that the continuous heavy rainfall in the South China has been unfavourable to rice production since June 2020, and the average rice yield in China has decreased by 2.0% year-on-year (Table 4.2 and Table 4.3). The production of early rice was 33,446 thousand tons, an increase of 0.6% over the same period of last year. There were several flooding disasters in the early rice-growing season in Jiangxi, Hunan and other major early rice-producing provinces, the continuous occurrence of heavy rainfall and the accompanying storm weather caused the early rice lodging to be seriously affected than in previous years, which led to a year-on-year decrease in the yield of most major early rice-producing provinces. Even though, China's early rice production still increased by 209 thousand tons from 2019 thanks to the the increased planted area by 2.2% from 2019, indicating limited effect from the COVID-19. The flooding disasters also negatively impacted on the single and late rice production in Jiangxi, Hunan, Hubei and Anhui provinces in the lower reaches of the Yangtze River, with a total of 397 thousand hectares of rice were damaged. At the same time, continuous overcast Rain and fair weather led to a year-on-year decrease in the average yield of single rice and late rice, resulting in decreases in the national single rice production by 242 thousand tons, and the late rice decreased by 1,479 thousand tons. It is also noteworthy that the agro-meteorological conditions of Heilongjiang, Jilin and Liaoning provinces in Northeast China were generally favourable, and the total production of rice in the three provinces increased by 424 thousand tons from 2019.

In 2020, the total output of maize in China is expected to be 225,737 thousand tons, an increase of 1,392 thousand tons (about 0.6%) compared with that in 2019. The national maize planted area is 39,300 thousand hectares, which is almost the same as that in 2019, with a slight increase of 0.1%. Meanwhile, the average yield of maize in China is expected to recover from the lower level in 2019, with a year-on-year increase of 0.5% (Table 4.2). Thanks to the favourable rainfall and heat conditions, the yield of maize in the Loess Plateau, including Shanxi, Shaanxi, Ningxia and Gansu provinces, has increased by more than 3.0%, and the maize planted area has also expanded, resulting in an increase of 8.4%, 6.6%, 5.1% and 3.6% respectively. The agrio-meteorological conditions of the maize growth period in Shandong and Hebei are beneficial, and the maize yield will recover from the 2019 drought conditions. In these provinces, the yield of maize increased by 3.4% and 3.6% respectively. Affected by the continuous rainy weather in July in Northeast China, the maize yield decreased by 1.4%, 4.0% and 1.8% in Heilongjiang, Inner Mongolia and Jilin Provinces, respectively.

The national soybean production continued to increase for the fifth consecutive year, with a total output of 14,797 thousand tons, a year-on-year increase of 356 thousand tons, or 2.5% (Table 4.2). The soybean planted area reached 79,787 thousand hectares, a marginal increase of 1.0% from 2019. Shanxi, Inner Mongolia, Shandong, Liaoning and Hebei had the largest percentage increases in the soybean planted area, with an increase of 2.5%, 2.4%, 1.4%, 1.1% and 1.1% respectively. While in Heilongjiang Province, the largest soybean-producing province, the soybean area decreased by 0.3% compared with 2019. The soybean yield in Hebei, Henan, Shanxi and Shandong provinces increased by 4.1%, 3.7%, 3.8% and 1.8% respectively. The soybean yield in Northeast China dropped from 2019 and the main reason is that the precipitation in July was less than normal, which led to the mild drought in flowering and pod setting period of soybean. The precipitation recovered to the normal level in the first ten days of August, the drought was relieved, and the reduction rate of soybean yield was less than 1%.

It must be pointed out that the heavy rainfall in Sichuan in mid-August led to serious flooding disasters in Sichuan, Chongqing and some other places, which was unfavourable to the summer crops production in Sichuan and Chongqing. The main affected crops were maize and rice. The crop yield of summer crops might be lower than the predicted yield as reported in this bulletin.

Based on the latest remote sensing data and ground observation data throughout the growing season of winter crops, the national wheat production in 2020 is estimated at 127,052 thousand tons, which reveals an increase by 3,537 thousand tons compared with that in 2019 (Table 4.2). The wheat production in the four major winter wheat-producing provinces of Henan, Shandong, Anhui and Hebei increased by 1,117 thousand tons, 708 thousand tons, 177 thousand tons and 37 thousand tons, respectively. The main reason for the increase of wheat production in Henan, Shandong and Anhui was the expansion of planting area, while the wheat yield in Hebei increased by 2.0% from 2019. The total wheat production of other wheat-producing provinces was almost at the same level as 2019.

**Figure 4.10 GVG samples collected during July to August 2020 in supporting to crop area estimation**

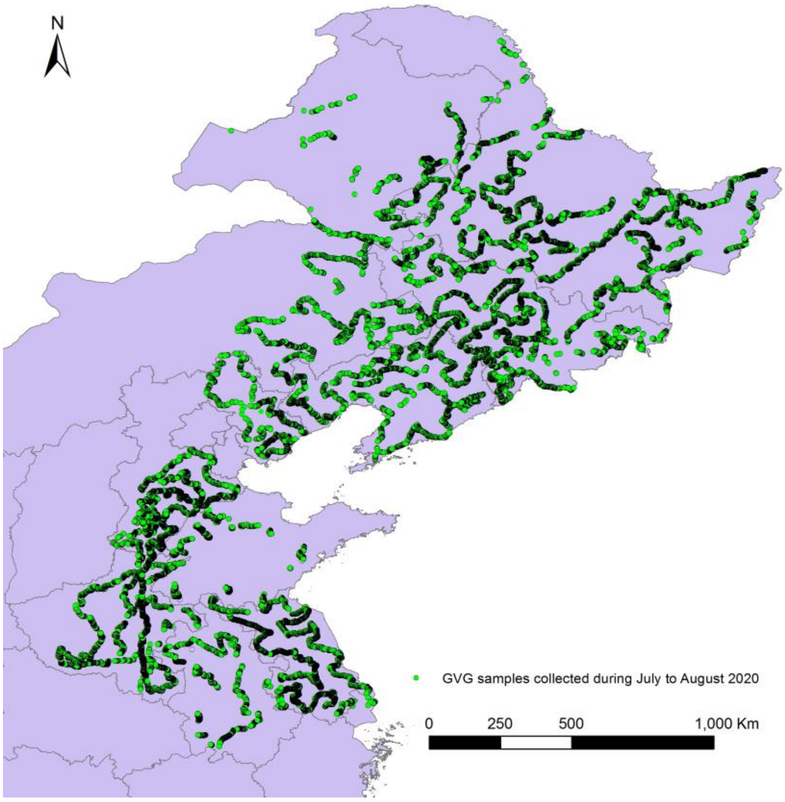



**Table 4.2 China 2020 production of maize, rice, wheat, and soybean, and percentage change from 2019, by province**

| Provinces | Maize | | Rice | | Wheat | | Soybean | |
|---|---|---|---|---|---|---|---|---|
| | 2020 (ktons) | delta (%) | 2020 (ktons) | delta (%) | 2020 (ktons) | delta (%) | 2020 (ktons) | delta (%) |
| **Anhui** | 3582 | 0.8 | 17480 | 0.3 | 11527 | 1.6 | 1053 | 0.1 |
| **Chongqing** | 2085 | -0.1 | 4698 | 0.0 | 1143 | 2.5 | | |
| **Fujian** | | | 2727 | -2.1 | | | | |
| **Gansu** | 5740 | 3.6 | | | 3131 | 2.2 | | |
| **Guangdong** | | | 11149 | 0.2 | | | | |
| **Guangxi** | | | 10306 | -1.3 | | | | |
| **Guizhou** | 5171 | 0.4 | 5540 | -1.8 | | | | |
| **Hebei** | 18630 | 2.9 | | | 12032 | 0.3 | 189 | 5.3 |
| **Heilongjiang** | 41332 | -1.4 | 21846 | 1.6 | 437 | -0.5 | 5151 | -0.4 |
| **Henan** | 14758 | -1.9 | 3965 | 6.7 | 27963 | 4.2 | 779 | 0.2 |
| **Hubei** | | | 15825 | 1.2 | 3945 | 2.0 | | |
| **Hunan** | | | 25166 | -0.7 | | | | |
| **Inner Mongolia** | 22561 | -4.0 | | | 1898 | -4.8 | 1209 | 1.9 |
| **Jiangsu** | 2077 | -4.0 | 16081 | -2.3 | 9990 | -0.6 | 739 | -1.0 |
| **Jiangxi** | | | 16919 | 0.5 | | | | |
| **Jilin** | 30376 | -1.8 | 5769 | -0.6 | | | 796 | -0.2 |
| **Liaoning** | 17980 | 2.9 | 4489 | 2.9 | | | 402 | -1.6 |
| **Ningxia** | 1675 | 5.1 | 427 | 3.7 | 758 | -4.4 | | |
| **Shaanxi** | 4024 | 6.6 | 1043 | -0.6 | 4138 | 5.6 | | |
| **Shandong** | 18938 | 3.4 | | | 25409 | 2.9 | 679 | 3.2 |
| **Shanxi** | 9245 | 8.4 | | | 2277 | 1.7 | 158 | 6.3 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Sichuan** | 7159 | 0.4 | 14778 | 0.3 | 4941 | -1.5 | | |
| **Xinjiang** | 6630 | 4.3 | | | 5132 | -2.3 | | |
| **Yunnan** | 6337 | -0.5 | 5714 | -2.7 | | | | |
| **Zhejiang** | | | 6579 | 1.3 | | | | |
| **Subtotal** | 218301 | 0.3 | 190500 | 0.1 | 114721 | 1.8 | 11155 | 0.3 |
| **China*** | 225737 | 0.6 | 199394 | -1.8 | 127052 | 2.9 | 14797 | 2.5 |

* Production of Taiwan province is not included.

**Table 4.3 China 2020 early rice, single rice, and late rice production and percentage difference from 2019, by province**

| Provinces | Early rice | | Single rice | | Late rice | |
|---|---|---|---|---|---|---|
| | 2020(ktons) | Delta (%) | 2020(ktons) | Delta (%) | 2020(ktons) | Delta (%) |
| **Anhui** | 1911 | 3.2 | 13798 | -0.2 | 1770 | 1.8 |
| **Chongqing** | | | 4715 | 0.0 | | |
| **Fujian** | 1564 | 3.4 | | | 1164 | -8.6 |
| **Guangdong** | 5060 | 4.1 | | | 6088 | -2.8 |
| **Guangxi** | 5137 | 5 | | | 5169 | -6.9 |
| **Guizhou** | | | 5271 | -1.8 | | |
| **Heilongjiang** | | | 21776 | 1.6 | | |
| **Henan** | | | 4186 | 6.7 | | |
| **Hubei** | 2077 | -11.5 | 10576 | 1.2 | 3172 | 10.3 |
| **Hunan** | 8399 | 1.0 | 8702 | -0.7 | 8065 | -5.7 |
| **Jiangsu** | | | 16325 | -2.3 | | |
| **Jiangxi** | 7206 | -1.9 | 3023 | 0.5 | 6690 | 3.2 |
| **Jilin** | | | 5891 | -0.6 | | |
| **Liaoning** | | | 4439 | 2.9 | | |
| **Ningxia** | | | 491 | 3.7 | | |
| **Shaanxi** | | | 1031 | -0.6 | | |
| **Sichuan** | | | 14842 | 0.3 | | |
| **Yunnan** | | | 5623 | -2.7 | | |
| **Zhejiang** | 801 | 0.9 | 4882 | 1.3 | 896 | 1.6 |
| **Subtotal** | 32154 | 0.8 | 125572 | 0.2 | 33013 | -1.8 |
| **China*** | 33446 | 0.6 | 130770 | -1.8 | 35178 | -4.0 |

* Production of Taiwan province is not included.

## 4.3 Regional analysis

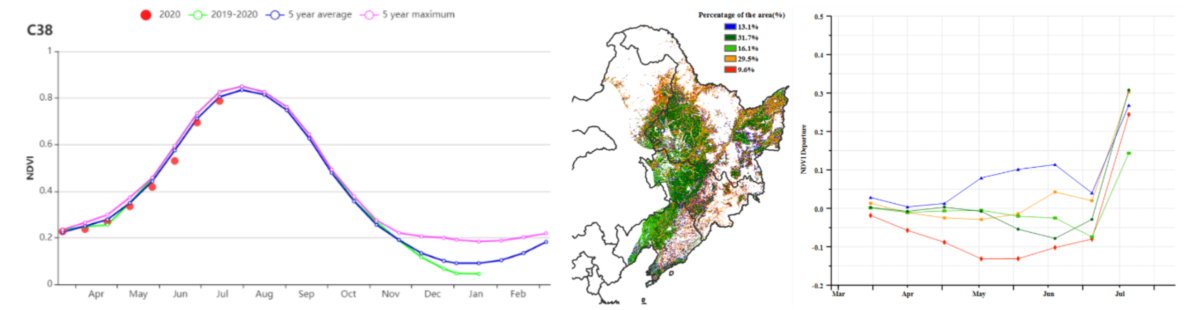
Figures 4.11 through 4.17 present crop condition information for each of China's seven agricultural regions. The provided information is as follows: (a) Phenology of major crops; (b) Crop condition development graph based on NDVI, comparing the current season up to October 2019 to the previous season, to the five-year average (5YA), and to the five-year maximum; (c) Spatial NDVI patterns for April - July 2020 (compared to the (5YA)); (d) NDVI profiles associated with the spatial patterns under (c); (e) maximum VCI (over arable land mask); and (f) biomass for April - July 2020. Additional information about agro-climatic indicators and BIOMSS for China is provided in Annex A.

# Northeast region

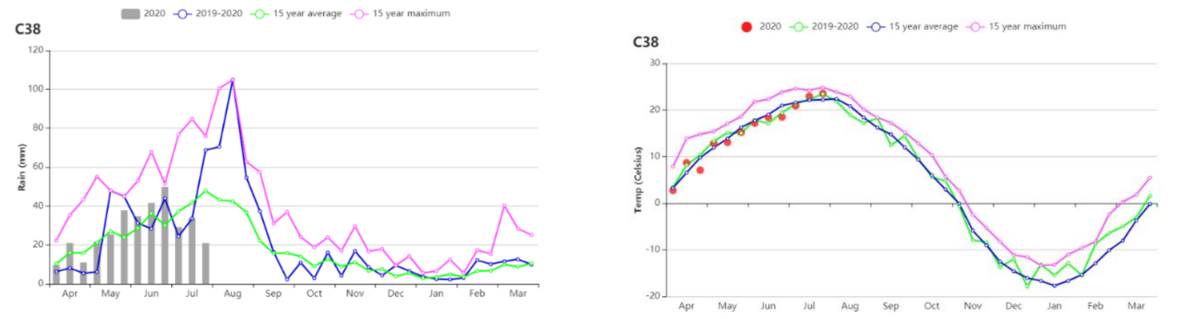
This current monitoring period covers the sowing and the first half of the growing season of the main crops in the northeast of China (April to July 2020). CropWatch Agroclimatic Indicators (CWAIs) revealed that all agroclimatic indicators were slightly below the average level. Precipitation was above the average level before July, but it was generally lower in July, resulting in a slight decrease of 1% in the accumulative precipitation from April to July. The photosynthetically active radiation was lower by 4% and the temperatures were also lower (-0.3°C). Especially in late April, temperatures were significantly lower than usual. From early May to mid-June, the temperatures were close to the average level and significantly lower than average in late June. Biomass in most areas in northeast China was below average level. Only a few areas in southern Jilin and northern Liaoning were slightly above average level, and the overall potential biomass was 2% below average.

In general, the crop conditions during the monitoring period were close to average level. The maximum VCI in the northeast of China showed that the low value areas were mainly distributed in western Liaoning province, northwestern Jilin province, eastern part of Inner Mongolia and the southwest part of Heilongjiang province and a small part of eastern Heilongjiang province. By mid-July, positive departures were observed for all provinces of the Northeast of China.

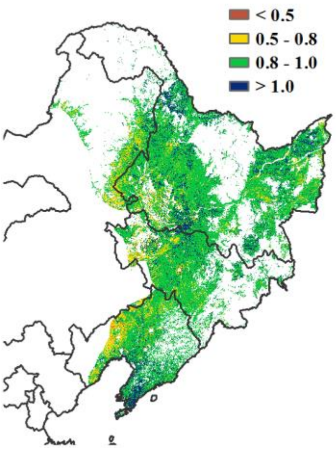
**Figure 4.11 Crop condition China Northeast region, April - July 2020**



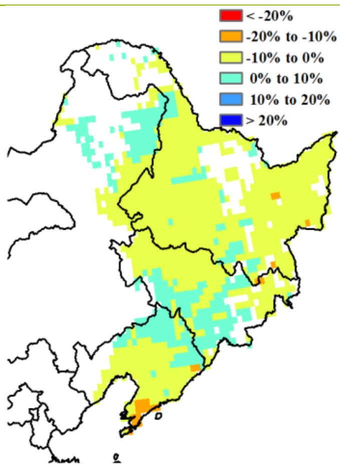

(a) Crop condition development graph based on NDVI (b) Spatial NDVI patterns compared to 5YA (c) NDVI profiles




(d)Time series rainfall profile (e)Time series temperature profile




(f) Maximum VCI



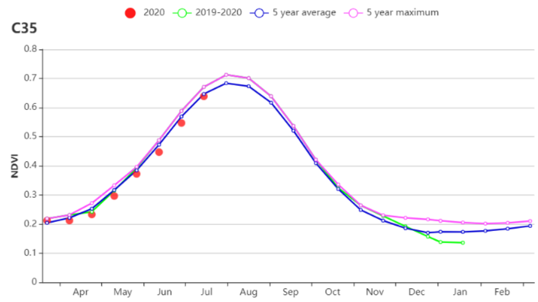

(g) Biomass departure

# Inner Mongolia

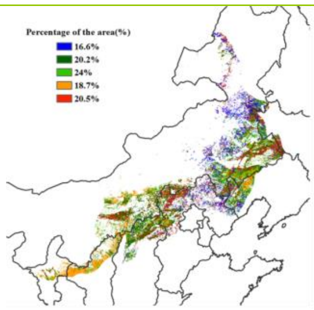
Inner Mongolia produces summer crops, such as maize, wheat and rice. Overall the crop conditions were slightly unfavorable. RAIN was above average (+5%), TEMP and RADPAR were below average (-0.2°C and -3% respectively), resulting in a below-average estimate for BIOMSS (-4%). The spatial and temporal distribution for these indicators was very uneven. Precipitation was insufficient in some region in West Liaoning, North Shaanxi, Central Ningxia and Central Inner Mongolia, which may have a negative impact on the rain-fed crops. Conditions were mainly unfavorable in the early part of the growing season, as illustrated in the crop development graph from May to June. 59% of the cropped areas displayed consistently below-average NDVI especially in the precipitation deficit areas mentioned above from April to June. This is confirmed by VCIx values being lower than 0.5 in the above listed areas, where the biomass accumulation potential (BIOMSS) was also well below average. These areas suffered from drought in May, as indicated by the temporal development of the VHIm categories when compared with 5YA. About 40% of the areas experienced varying degrees of drought, but conditions improved in June. Subsequently, crop conditions improved to close to average in July.

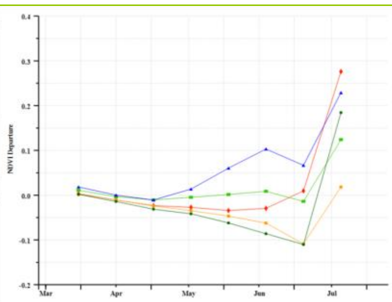
Overall, Inner Mongolia saw the fraction of cropped arable land (CALF) increased by 1% to reach 95%; VCIx was on average (0.87). Crop conditions were slightly unfavorable before June but recovered to average in July. The final outcome of the season will depend on weather conditions in August and September.

**Figure 4.12 Crop condition China Inner Mongolia region, April-July 2020**

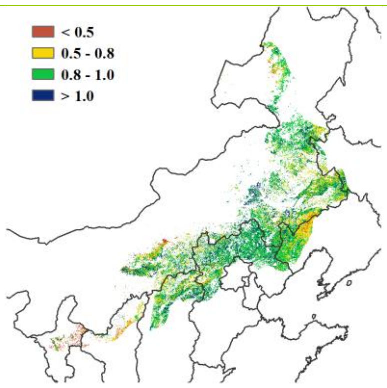



(a) Crop condition development graph based on NDVI

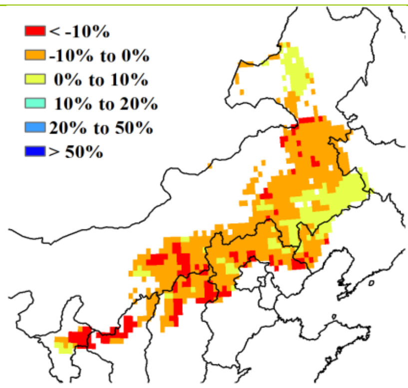


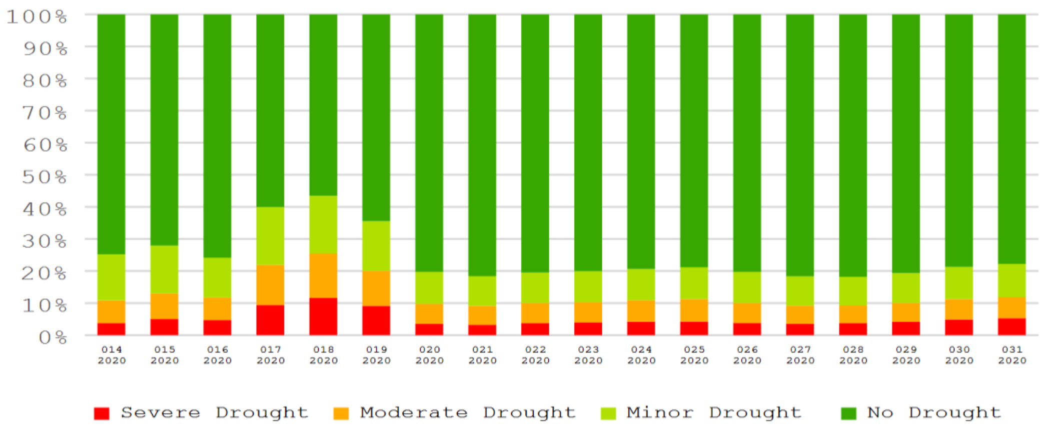

(b) Spatial NDVI patterns compared to 5YA (c) NDVI profiles




(d) Maximum VCI




(e) Biomass departure




(f) Proportion of VHIm categories compared with 5YA

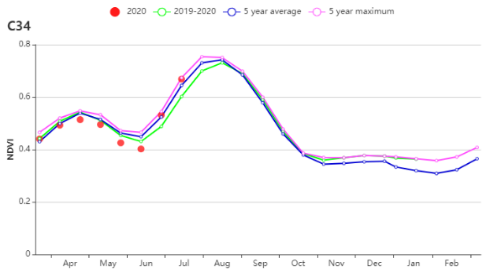
# Huanghuaihai

Crop condition in Huanghuaihai was not favorable over the current monitoring period.The main crop in the region during the period is winter wheat and summer maize.Winter wheat was sowed in early October last year, in full development since April and with harvests starting in early June.And summer maize is planted after the harvesting of winter wheat.

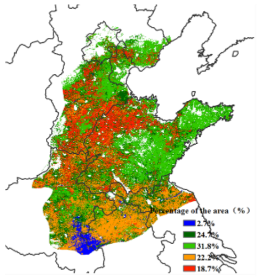
According to the crop condition development graph based on NDVI, crop condition was almost below the 5YA during the early stage of the monitoring period, especially in June, and recovered to average in July.This condition may related to less radiation which dropped 5% compared to 15YA.The temperature dropped 0.5°C compared to 15YA,while precipitation were 10% above compared to 15YA.In addition, the decrease of potential biomass was 9% compared to 5YA which may related to less radiation and temperature.

31.8% of cropland displays average NDVI condition almost throughout the monitoring period. The spatial distribution of crop condition follows patterns that are similar to those of NDVI profiles. Several regions in southern Hebei and western Shandong had above average condition before mid-May while very low values occurred in southern of the region after June.NDVI condition over the whole region improved late in July and the regional average VCIx was 0.92 at the end of July.The map of potential biomass shown the decline in the northern Henan and southern Hebei.

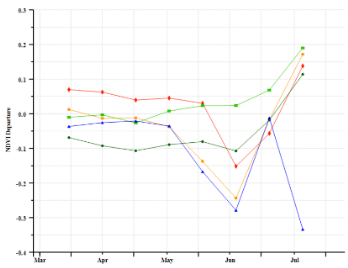
**Figure 4.13 Crop condition China Huanghuaihai region, April - July 2020**



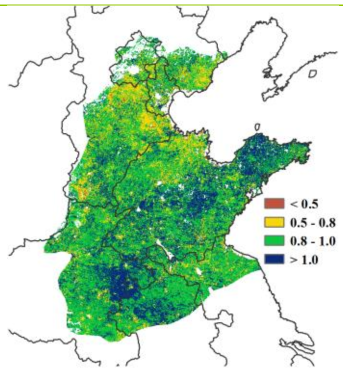

(a) Crop condition development graph based on NDVI



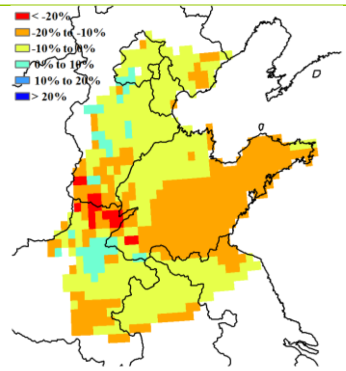
(b) Spatial NDVI patterns compared to 5YA



(c) NDVI profiles




(d) Maximum VCI

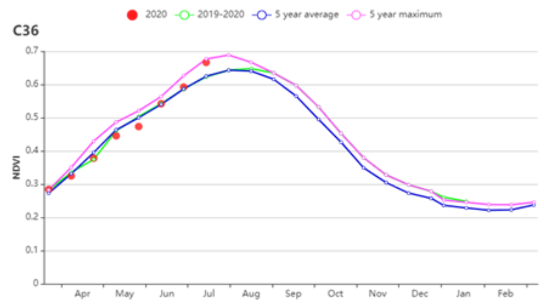



(e) Potential biomass departure from 5YA

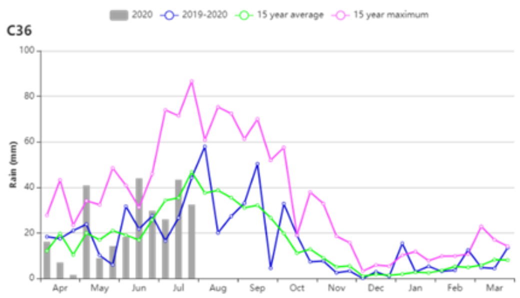
# Loess region

During the reporting period, winter wheat was harvested from early to mid-June, while summer maize was planted from late May to late June. The CropWatch Agroclimatic Indicators (CWAIs) show that the weather conditions in this region were close to the 15YA: Rainfall (RAIN) exceeded the average by 2%, radiation (RADPAR) dropped by 2%, and TEMP was down by 0.6°C. The potential biomass (BIOMSS) was 9% below average as a result of reduced radiation and lower temperature. The low rainfall in April might also be another reason for the low biomass. According to the regional NDVI development graph, the overall crop conditions were favorable in the Loess region over the reporting period. Although the crop conditions were slightly below the 5-year average from late April to early June, they recovered and reached the five-year maximum in July because of the plentiful rainfall. NDVI clusters and profiles show that about 54.5% of cropped area was close to or slightly below the five-year average from April to June, mostly scattered in the north of Shannxi, west of Gansu and southeast of the Loess region. But the crop conditions of most cropped areas were above the average in June and July, because of the favorable agronomic conditions during these months. The Maximum VCI map shows high values of VCIx (0.95) in most cropped areas of the region except for scattered pockets in the north of Shannxi, Gansu and Ningxia. Almost 100% of the farmland was cultivated according to CALF (+3%) as compared to the 5YA. Overall, the current agroclimatic and agronomic conditions (especially rainfall) show favorable crop prospects in this region, especially for the summer season crops.

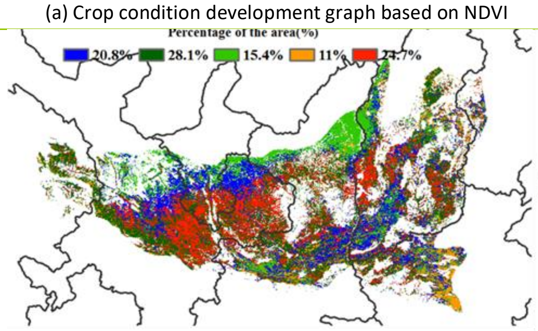
**Figure 4.14 Crop condition China Loess region, April - July 2020**



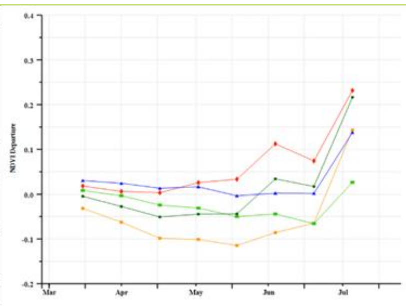

(a) Crop condition development graph based on NDVI



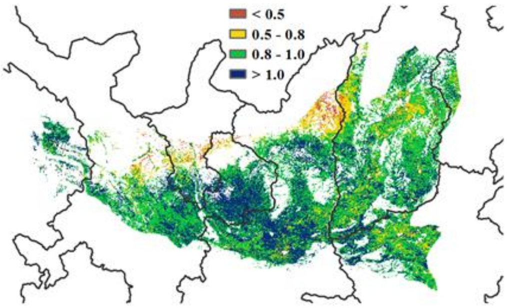

(b) Rainfall profiles



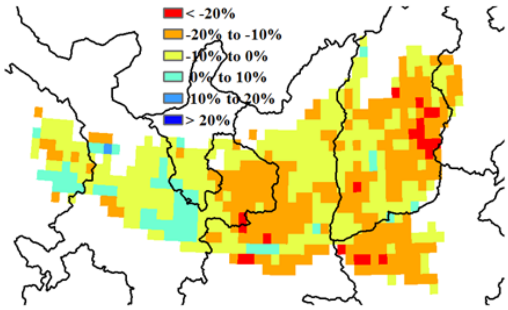

(b) Spatial NDVI patterns compared to 5YA




(c) NDVI profiles




(d) Maximum VCI




(e) Biomass departure

# Lower Yangtze region

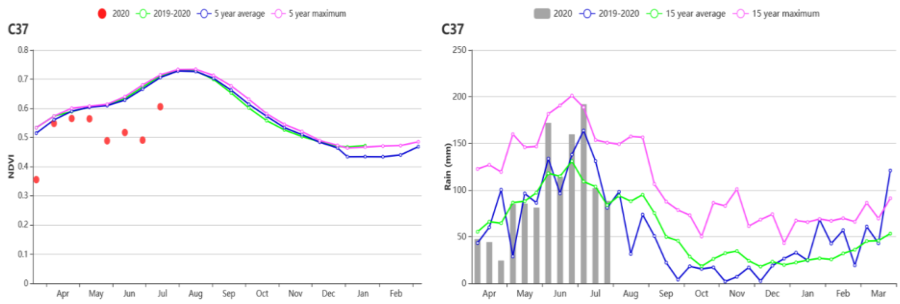
During this monitoring period, winter wheat and rapeseed reached maturity by June in Hubei, Henan, Anhui and Jiangsu provinces. The semi-late and late rice crops are still growing in the south and the center of the region including Jiangsu, Fujian, Jiangxi, Hunan, and Hubei provinces, while early rice has been harvested.

According to the CropWatch agro-climatic indicators, the Lower Yangtze region experienced a wetter and warmer season compared to the 15YA. The accumulated precipitation from late May to early July was significantly above average and was 8% more than the long-term average in this region. The temperature and photosynthetically active radiation were both slightly above average (TEMP +0.1 ℃, RADPAR +0.5%). Above average agro-climatic conditions resulted in a slightly positive departure of biomass production potential. However, the continuous rainfall in the upper stream of the Yangtze River and heavy rainfall in June to early July had led to flooding which destroyed some fields along the Huaihe River. For details, please refer to the impact analysis of flood disaster in the lower Yangtze region in Chapter 5.2.

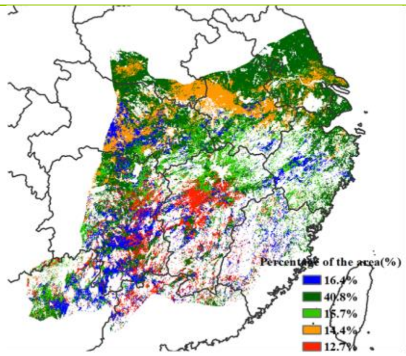
As shown in the NDVI development graph, crop conditions were quite below the 5-year average from late May to July, which coincided with the period of continuous rainfall. As a result of flooding, the vegetation index nearby Poyang Lake and also in the south of Poyang Lake was significantly lower in early June and early July. The areas bordering the Huaihe River were affected by floods in the middle and late July, and crop growth was significantly lower than the 5-year average. According to the Biomass departure, in the Yangtze River basin and its northern regions, continuous precipitation and low photosynthetically active radiation led to lower potential biomass compared to 15YA. The low VCIx area was consistent with the flood impact area. The VCIx in Chuzhou of Anhui, Jingzhou of Hubei and Changde of Hunan was higher than 1, which indicated that sufficent precipitation was favorable for the growth of crops in the above mentioned areas, and the growth conditions exceeded the best of the past 5 years.

The crop condition in the lower Yangtze region is currently assessed as below average level. The continuously rainy and cloudy weather and localized flooding were detrimental to agricultural production.

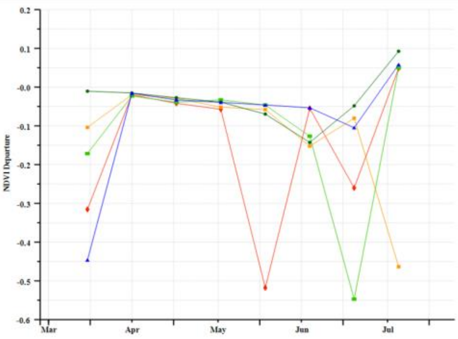
**Figure 4.15 Crop condition China Lower Yangtze region, April - July 2020**



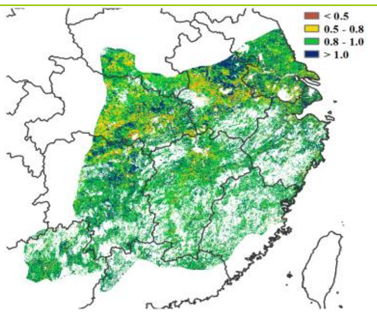

(a) Crop condition development graph based on NDVI (b) Rainfall profiles



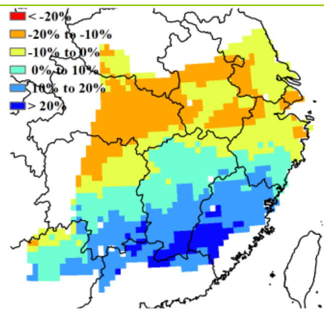

(b) Spatial NDVI patterns compared to 5YA



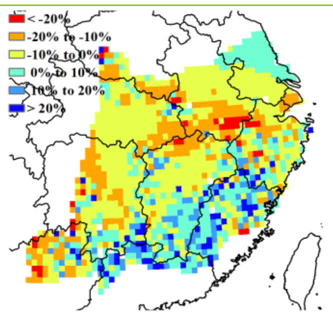

(c) NDVI profiles




(d) Maximum VCI




(e) Biomass departure




(e) Biomass departure from 15YA

# Southwest China

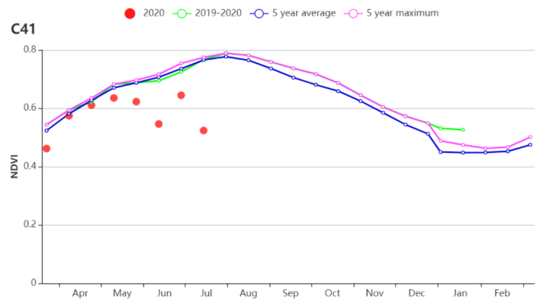
The reporting period covers the flowering and harvest of winter wheat in southwestern China. Summer crops (including semi-late rice, late rice and maize) are still growing. According to the regional NDVI profile, crop conditions remained close to average level before mid-May but dropped below the 5-year average after May.

On average, rainfall was above the fifteen-year average (RAIN +16%), whereas radiation was below (RADPAR -8%). Temperature was close to average as well (TEMP -0.2°C). The resulting BIOMSS was 9% below average mainly due to less radiation and local floods. The cropped arable land fraction remained at the same level as in the previous five years, which indicated there was no change in crop planting for this period.

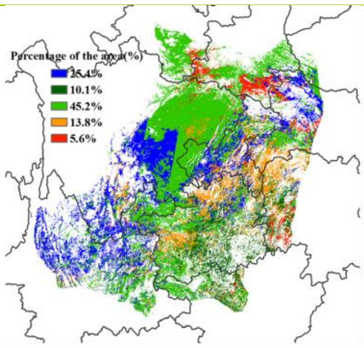
According to the NDVI departure clustering map and the profiles, conditions were close to average from mid-April to June, except in Guizhou and neighboring areas in eastern Chongqing, which recorded low NDVI values. RADPAR was also below average for Guizhou (-8%) and eastern Chongqing (-14%). Average NDVI throughout the monitoring period was observed in eastern Sichuan and Yunnan, where radiation was below average and precipitation above average (See Annex A.11). The maximum VCI reached 0.92, indicating that peak conditions were comparable to the previous five years. At the level of major production zones, the negative impact of above average rainfall and increased cloud cover is expected to be limited.

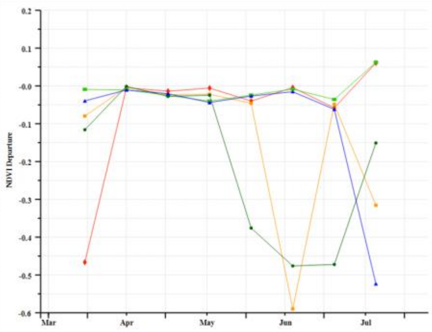
Some local flooding due to heavy precipitation and the mixture of positive, but predominantly negative departures from the long-term average indicate slightly below-average crop conditions.

**Figure 4.16 Crop condition China SouthWest region, April - July 2020**

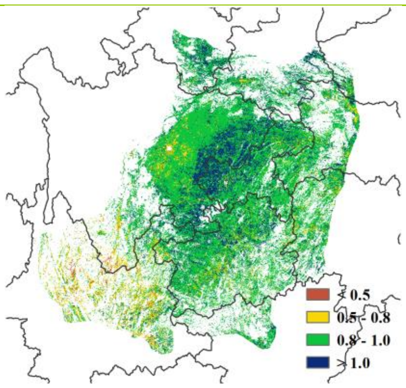



(a) Crop condition development graph based on NDVI

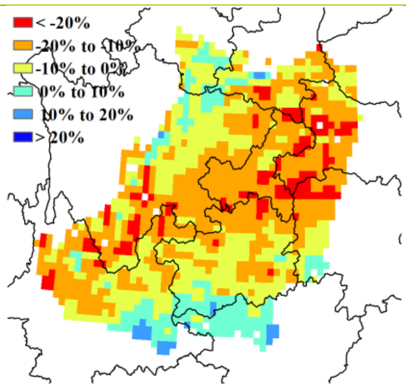


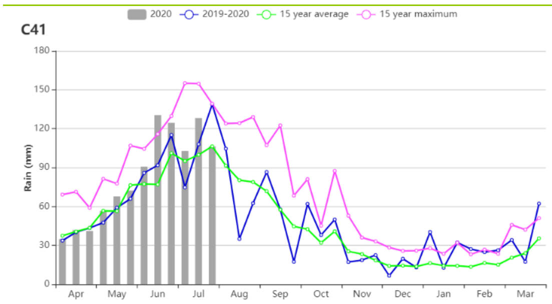

(b) Spatial NDVI patterns compared to 5YA (c) NDVI profiles



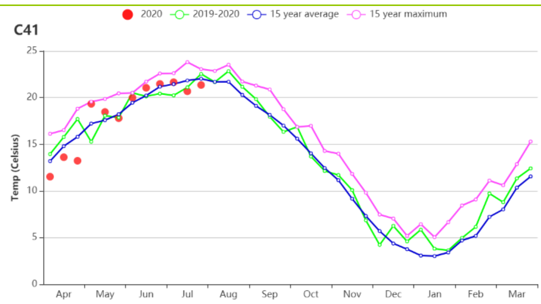

(d) Maximum VCI




(e) Biomass departure




(f) Time series rainfall profile




(g) Time series temperature profile

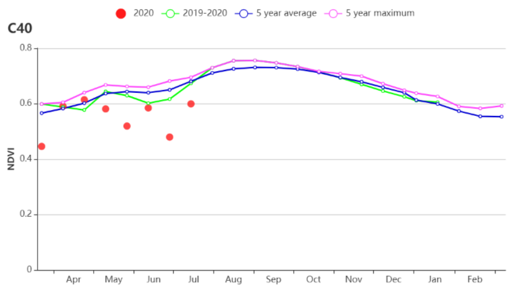
# Southern region

During the monitoring period, the harvest of wheat and early rice was almost concluded, whereas spring maize reached maturity. The rainfall was 16% lower than the average level for the entire region, with -33% in Guangdong, -12% in Guangxi, -34% in Fujian and +20% in Yunnan. The precipitation of Guangdong, Guangxi and Yunnan exceeded 1000 mm while Fujian recorded just 900 mm. According to the rainfall profiles, the rainfall was above the fifteen-year average in the second half of May to early June, but below average in mid-to-late July. The average temperature in Southern China was close to average.

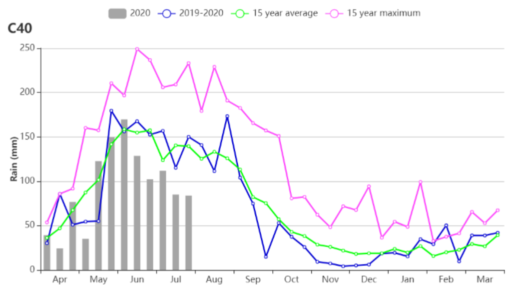
BIOMSS was up (+6%), and so was RADPAR (+5%). In Fujian, Guangdong and Guangxi, the potential biomass increased (+15%, +13% and +6%, respectively) while it decreased in Yunnan (-4%). At the provincial level, the change of the potential biomass was consistent with RADPAR. Meanwhile, less rain in June and July is more conducive to the filling and harvest of summer crops, which also promotes the increase of BIOMSS. The average VCIx of the Southern China region during the monitoring period was 0.92, and most regions presented VCIx above 0.80, except for scattered areas in Yunnan province. The above-mentioned patterns are confirmed by the NDVI departure cluster map. It shows that the crop growth in Yunnan was below the average level for most of the monitoring period.

In conclusion, the weather conditions were favorable for summer crops yields. CropWatch will keep tracking the agroclimatic and agronomic conditions in the future months.

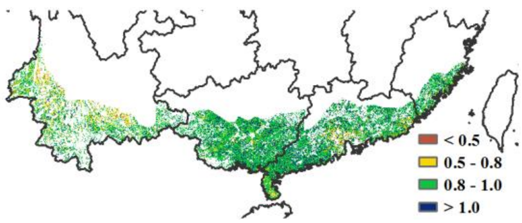
**Figure 4.17 Crop condition China Southern region, April - July 2020**



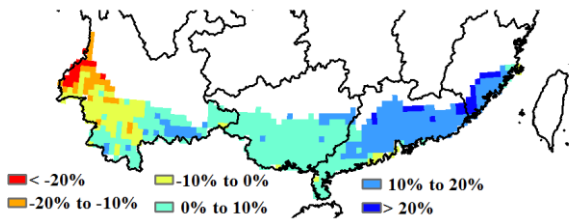

(a) Crop condition development graph based on NDVI



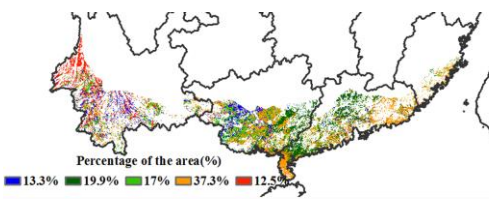

(b) Rainfall profiles



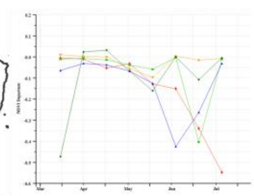

(c) Maximum VCI




(d) Biomass departure




(e) Spatial NDVI patterns compared to 5YA



(f) NDVI profiles

## 4.4 Remote monitoring of flooding in the middle and lower Yangtze River

The 2020 floods in Hunan, Hubei, Jiangxi, and Anhui provinces in the middle and lower stretches of the Yangtze River affected 731,000 hectares of cropland. Anhui is the province that lost the largest area of cropland (275,000 ha) to the floods.

In order to monitor the impact of continuous heavy rainfall on agricultural production, CropWatch used the multi-source satellite remote sensing data of ESA Sentinel-1 and Sentinel-2 from May 1 to August 10, 2020 to map the flood. The monitoring focused on Hunan, Hubei, Jiangxi and Anhui provinces in the middle and lower reaches of the Yangtze River. The monitoring results show that the areas affected by flooding reached the largest extent between mid- and late July. The cropland area affected by the flood disaster in Hunan, Hubei, Jiangxi and Anhui provinces was estimated at 731,000 ha, accounting for about 3.0% of the cropland area in the four provinces. The following are the detailed results from the monitoring:

From mid-July to August 10, 2020, the surface water area in Hunan, Hubei, Jiangxi, and Anhui provinces expanded by about 1.444 million ha in total. The flooded areas, including cropland and non-cropland were as follows: Hubei 376,000 ha, Hunan 350,000 ha, Jiangxi 357,000 ha and Anhui 360,000 ha (Table 4.4).

Since the start of the flood disaster in early July, a total of about 731,000 hectares of cropland have been inundated in Hunan, Hubei, Jiangxi and Anhui provinces. Among them, Anhui Province has the largest affected cropland area of about 275,000 ha, followed by Hubei (217,000 ha), Jiangxi (138,000 ha) and Hunan (101,000 ha). The flooded areas, as percentage of cropland, account for 4% of Jianxi, 3.7% of Anhui, 3% of Hubei and 1.7% of Hunan.

The flooded croplands are mainly located in the surrounding areas of Dongting Lake, Poyang Lake and Huaihe River, as shown in Figure 1. About 54.2% of the farmland inundated by the flood was planted with rice, with a total area of about 397,000 ha.

**Figure 4.18** Flood and affected cropland areas from July 10 to August 10, 2020

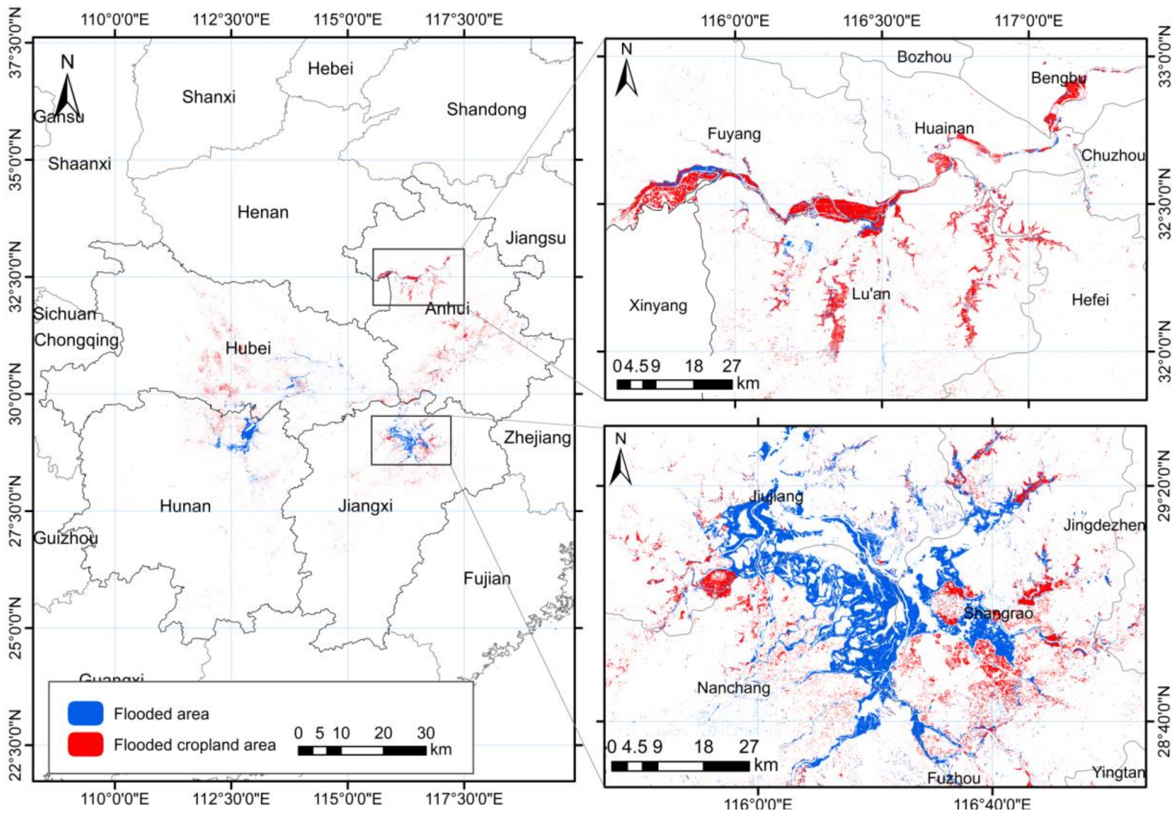


**Table 4.4 Flood area and affected cropland area in Hunan, Hubei, Jiangxi and Anhui provinces in 2020 (July 10 to August 10, 2020)**

| Province | Flooded area (1000ha) | Proportion of the whole province area (%) | Affected cropland area (1000 ha) | Proportion of cropland area in the province (%) |
|---|---|---|---|---|
| **Hunan** | 350 | 1.6 | 101 | 1.7 |
| **Anhui** | 360 | 2.5 | 275 | 3.7 |
| **Hubei** | 376 | 2.0 | 217 | 3.0 |
| **Jiangxi** | 357 | 2.1 | 138 | 4.0 |
| **Subtotal** | 1444 | | 731 | |

## 4.5 Major crops trade prospects

This section analyzes the import and export situation of maize, rice, wheat, and soybean in the first quarters of 2020 in China.

In the first half of the year, China imported 1.2342 million tons rice, down by 2.7% compared to the same period last year. The main sources of rice imports were Vietnam, Myanmar, Pakistan, Thailand and Cambodia, accounting for 36.8%, 22.1%, 12.8%, 11.7% and 10.7% respectively, with an import value of US$684 million. Rice exports totaled 1.3613 million tons, a decrease of 7.4% over the previous year, mainly exported to Egypt, Sierra Leone and South Korea, accounting for 16.6%, 8.8% and 8.1% of the total exports respectively, with a value of US$527 million.

In the first half of the year, China imported 3.3519 million tons of wheat, an increase of 90.3% over same period in the previous year. The main sources of wheat imports were France, Australia and Canada, accounting for 31.1%, 30.4% and 20.7% of the total imports respectively, with an import value of US$960 million. The export volume of wheat and its products was 138.4 ktons, a decrease of 10.5% over the previous year, mainly to North Korea and Hong Kong, accounting for 75.7% and 22.4% of the total exports respectively, with a value of US $52 million.

In the first half of the year, China imported 3.6561 million tons of maize, an increase of 17.6% over the previous year. The main sources of import were Ukraine and Bulgaria, accounting for 93.5% and 3.1% of the total imports respectively, with an import value of US$781 million. Maize export was 1.7 ktons, a decrease of 80.2% over the previous year, and the export value was US$391.3 thousand, a decrease of 82.5% over the previous year.

In the first half of the year, China imported 45.0439 million tons of soybeans, an increase of 17.7% over the previous year. The main sources of imports were Brazil, the United States and Argentina, accounting for 72.3%, 20.5% and 5.6% of the total imports respectively, with an import value of US$17.631 billion. Soybean export was 50.6 ktons, a decrease of 24.9% over the previous year.

### Trade prospects for major cereals and oil crop in China for 2020

Based on remote sensing-based production prediction in major agricultural producing countries in 2020 and the Major Agricultural Shocks and Policy Simulation Model, which is derived from the standard GTAP (Global Trade Analysis Project), it is predicted that the import of major grain crop varieties will increase slightly in 2020. The details are as follows:

Rice import will decrease by 4.3% and export will decrease by 8.2% in 2020. Novel coronavirus pneumonia is a major problem in the global rice market. The supply and demand of the rice market is basically balanced. The price gap persists at home and abroad. Chinese rice supply and demand are loose. The import of rice is stable due to the new crown pneumonia epidemic. It is expected to decrease slightly in 2020.

Chinese wheat import will increase by 35.6% and export will decrease by 8.5% in 2020. The global wheat output is basically the same as that of the previous year, and the price difference between China and foreign countries continues to exist. Affected by factors such as feed substitution, the import of wheat is expected to increase significantly in 2020.

Chinese maize import will increase by 19.5% and export will decrease by 20.8% in 2020. The global supply and demand of maize increased slightly, but the inventory level was further reduced, the domestic maize price was running at a high level, the international maize price was fluctuating at a low level, and the price difference between China and foreign countries was expanded. It is expected that Chinese maize import will grow steadily in 2020.

Chinese soybean import will increase by 15.4% and export will decrease by 9.6% in 2020. According to the results of the model, the global soybean supply is abundant, and the price difference between China and foreign countries remains high, and Chinese soybean import continues to increase. In addition, the first phase of Sino US economic and Trade Agreement continues to advance, and Chinese soybean import is expected to continue to increase in 2020.

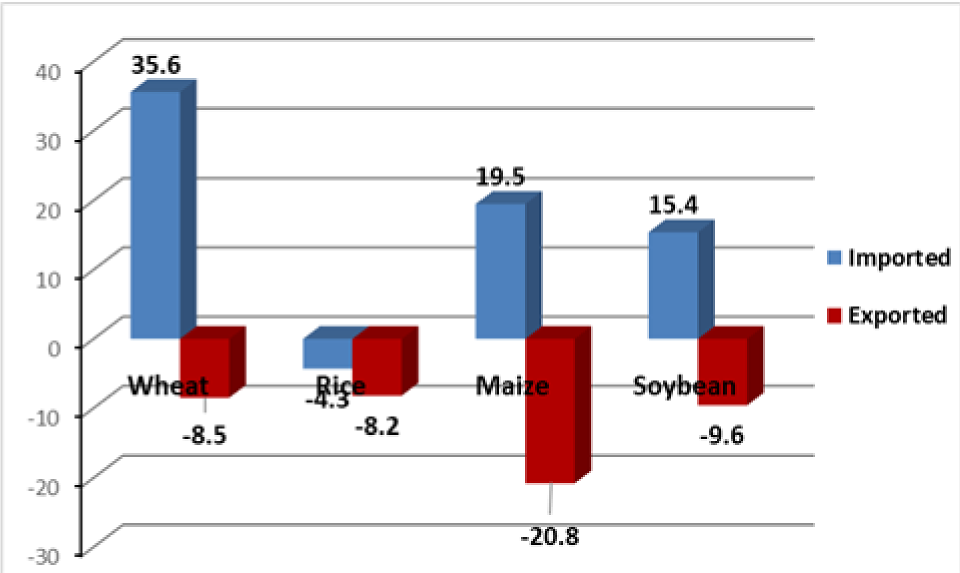



**Figure 4.19 Rate of change of imports and exports for rice, wheat, maize, and soybean in China in 2020 compared to those for 2019(%)**

# Chapter 5. Focus and perspectives

*Building on the CropWatch analyses presented in chapters 1 through 4, this chapter presents first early outlook of crop production for 2020 (section 5.1), as well as sections on recent disaster events (section 5.2), and an update on El Niño (5.3).*

## 5.1 CropWatch food production estimates

### Methodological introduction

CropWatch production estimates are based on a combination of remote-sensing models combined with global agro-meteorological conditions and meteorological observation data from more than 20,000 agro-meteorological stations around the world. We analyze the conditions and production of the major bulk grain crops (maize, rice, wheat and soybean) in the 43 major food producing countries. The results are as follows:

### Production estimates

In 2020, global maize production is expected to be 1,068.010 million tons, due to an increase by 12.9 million tons (+1.2%). Global rice is expected to decrease by 1.1% (-8.41 million tons). Wheat production is estimated to increase by 1.8% to 729 million tons (+12.77 million tons). A slightly lower increase is forecasted for soybean (+0.2%). Production will be 325 million tons. In 2020, the global production of bulk grain and oil crops will be generally stable (Table 5.1).

**Table 5.1 2020 cereal and soybean production estimates in thousand tonnes. Δ is the percentage of change of 2020 production when compared with corresponding 2019 values.**

| | Maize | | Rice | | Wheat | | Soybean | |
|---|---|---|---|---|---|---|---|---|
| | 2020 | Δ% | 2020 | Δ% | 2020 | Δ% | 2020 | Δ% |
| Afghanistan | | | | | 5204 | -21.5 | | |
| Angola | 2961 | 6.6 | 46 | 1.6 | | | | |
| Argentina | 54054 | 1.7 | 1938 | 4.8 | 17001 | -3.6 | 52587 | 2.2 |
| Australia | | | | | 23376 | 20.7 | | |
| Bangladesh | 2589 | 9.3 | 45827 | -5 | | | | |
| Belarus | | | | | 2974 | 1.6 | | |
| Brazil | 82975 | -2.8 | 11271 | -3.3 | 4110 | 0.8 | 99749 | -1 |
| Cambodia | 953 | 3 | 9544 | -5 | | | | |
| Canada | 12533 | 5.4 | | | 31717 | -1.9 | 8099 | 5.7 |
| China | 225737 | 0.6 | 199394 | -1.8 | 127053 | 2.9 | 14797 | 2.5 |
| Egypt | 6066 | 1.8 | 6776 | 1.7 | 12060 | 2.2 | | |
| Ethiopia | 7305 | 1.4 | | | 3858 | 0.7 | | |
| France | 14832 | 1.7 | | | 33319 | -6.4 | | |
| Germany | 4830 | 0.8 | | | 26629 | -4.1 | | |
| Hungary | 6169 | 3.8 | | | 4786 | -2 | | |
| India | 17521 | -4.9 | 170821 | 1.6 | 95806 | 6.1 | 12158 | 7.5 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Indonesia | 16371 | 0.1 | 64501 | 0.5 | | | | |
| Iran | | | 2970 | 5.3 | 17304 | 7.6 | | |
| Italy | 6433 | 1.9 | | | 7307 | -5.3 | 1601 | 1 |
| Kazakhstan | | | | | 13270 | 4.1 | | |
| Kenya | 3119 | 14 | | | 309 | 1.1 | | |
| Kyrgyzstan | 707 | 5.6 | | | 626 | 6.2 | | |
| Mexico | 22477 | 1.4 | | | 4311 | 2.9 | 769 | 0.2 |
| Mongolia | | | | | 277 | 2 | | |
| Morocco | | | | | 6303 | -5.3 | | |
| Mozambique | 2020 | -3.1 | 382 | -0.3 | | | | |
| Myanmar | 1630 | -12.3 | 27677 | 0.3 | | | | |
| Nigeria | 9845 | -14.2 | 4089 | -10.8 | | | | |
| Pakistan | 5592 | 6.9 | 11269 | 3.5 | 27502 | 4.1 | | |
| Philippines | 7037 | 0.8 | 20488 | 0.2 | | | | |
| Poland | | | | | 10720 | 5.7 | | |
| Romania | 12332 | -7 | | | 7173 | -7.4 | | |
| Russia | 13813 | 4 | | | 55843 | 4.7 | 3757 | 3.5 |
| South Africa | 11763 | 1 | | | 1472 | 7.6 | | |
| Sri Lanka | | | 2430 | 1.2 | | | | |
| Thailand | 4780 | 12.1 | 40625 | 2.7 | | | | |
| Turkey | 6727 | -2.2 | | | 19337 | 3.9 | | |
| Ukraine | 28297 | 2.3 | | | 20534 | -1.9 | | |
| United Kingdom | | | | | 12726 | -5.5 | | |
| United States | 378120 | 2.6 | 11656 | 1.2 | 52659 | -3.7 | 106107 | 3.4 |
| Uzbekistan | | | | | 8187 | 0.2 | | |
| Vietnam | 5228 | 1 | 42929 | -6.5 | | | | |
| Zambia | 1969 | 5.1 | | | 82 | 1 | | |
| **Total** | **976785** | **1.1** | **674633** | **-0.8** | **653835** | **1.5** | **299624** | **1.9** |
| **Others** | **91225** | **2.7** | **70640** | **-4.1** | **75075** | **4.3** | **25094** | **-16.1** |
| **Global** | **1068010** | **1.2** | **745273** | **-1.1** | **728910** | **1.8** | **324718** | **0.2** |

### *Maize*

U.S. maize production is forecasted at 378.12 million tons, an increase by 2.6%. The main reason for the increase is the generally favorable weather conditions in the main maize-producing areas. Due to the average distribution of precipitation, maize yields will increase by 4.2%, offsetting the impact of the area reduction. China's maize production will increase slightly by 0.6%, reach to 225.737 million tons, while production in the world's third-largest maize producer, Brazil, decreases by 2.8% to 82.975 million tons. Argentina's maize production was 54.054 million tons with an increase of 1.7%. Most European countries have recovered from the dry weather conditions during early spring. Countries such as Germany, France, Hungary, Italy and Ukraine have maintained normal precipitation since the maize sowing period and maize production has generally increased. In Mozambique, Myanmar, Nigeria and Turkey, drought occurred during the key growth periods of maize jointing and tasseling, and the yield of maize decreased by 3.1%, 12.3%, 14.2%, and 2.2% respectively. In Romania, affected by drought during the planting period, the growth period of maize was lagging behind as compared to previous years and the planting area was low, resulting in a 7.0% reduction in maize production. Early warning indicators of crop planting area show that India's maize planting area has shrunk by 4.6%, leading to a reduction in maize production. The maize output of other countries has increased by different degrees. The production situation in the countries from which China sources its maize import and the global maize supply comes remains normal.

### *Rice*

Affected by drought, rice production in Brazil, Cambodia, Vietnam, and Nigeria decreased by 3.3%, 5.0%, 6.5%, and 10.8%, respectively. Bangladesh's rice production decreased by 5.0%, Mozambique's rice production decreased slightly by 0.3% and other major rice producers all experienced a small production increase. However, affected by floods and unfavorable agrometeorological conditions in the world's largest rice producing country, China, rice production decreased by 1.8% with a reduction of 3.69 million tons. Since the output of other small rice producers fell by 4.1%, global rice production decreased 8.41 million tons, which is a 1.1% reduction at the global scale. In general, the global rice production and supply situation are stable.

### *Wheat*

Most of the winter wheat in the main producing countries in the northern hemisphere has been harvested in June 2020. Wheat was under drought stress in many European major wheat producing countries such as France, Germany, Hungary, Italy, Romania, Ukraine and the United Kingdom, where wheat output was reduced by 6.4%, 4.1%, 2.0%, 5.3%, 7.4%, and 1.9% respectively. During the COVID-19 pandemic, travel bans from various countries have also affected the timely harvest of wheat to varying degrees in some countries. The wheat producing areas in the United States suffered from a cold wave in mid-April and the wheat in the flowering period was affected, resulting in an output reduction by 3.7%. Even so, global wheat production still increased by 12.77 million tons, mainly due to the increase of wheat production in the three major wheat-producing countries: China, India and Russia, by 2.9%, 6.1%, and 4.7%. Meanwhile, wheat production of Iran, Turkey, Kazakhstan, Kyrgyzstan, Pakistan and Poland, as well as Mexico, Australia, Brazil, South Africa, Zambia and other countries in the southern hemisphere have also increased. Overall, the global wheat supply situation is good.

### *Soybean*

In 2020, Brazil's soybean production decreased slightly by 1.0% to 99.749 million tons. The output of the main soybean producing countries increased except for Brazil. Thanks to the good agro-meteorological conditions in the main soybean producing regions, the yield of soybeans in the United States increased by about 3.3%. The country's soybean production is expected to increase by 3.5% to 1061.07 million tons, surpassing Brazil again to become the world's largest soybean producer in 2020. It needs to be emphasized that the enthusiasm of US farmers to plant soybeans is still not high, and the soybean planting area increased slightly by 0.2%, which is still significantly lower than the peak level in 2018. Soybean production in Argentina increased by approximately

2.2% to 52.587 million tons. Early warning indicators of crop planting area show that soybean planting area in India has increased significantly by about 7.5% and soybean production in India is expected to increase. China has continued the trend of continuous soybean production increases during recent years and its soybean production increased by 2.5%. The total global soybean production increased slightly by 0.2% and the production of major soybean exporting countries increased. The global soybean market is expected to be generally stable.

## 5.2 Disaster events

### Introduction

The number of people exposed to the risk of acute hunger increases in 2020 according to United Nations estimates. The recently released 2020 Global report on food crises estimated that additional 83 million people, and possibly as many as 132 million, are expected to go hungry in 2020. This massive setback has thrown people into further doubt as to whether the Sustainable Development Goal 2 (Zero Hunger) can be achieved. The main drivers of increasing the global hunger risk were reported as; the conflict/insecurity, weather extremes, desert locusts, economic shocks, and COVID-19. Although Asia remains home to the greatest number of undernourished people (381 million), Africa is second (250 million) but with the portion of its people (19.1%) undernourished compared to 8.3% in Asia. Thus, Africa is the hardest hit continent on current trends and by 2030, more than half of the world chronically hungry is expected to be in Africa (Figure 5.1). This must be taken as a serious call of actions by local governments to cope with current and future hunger threat.

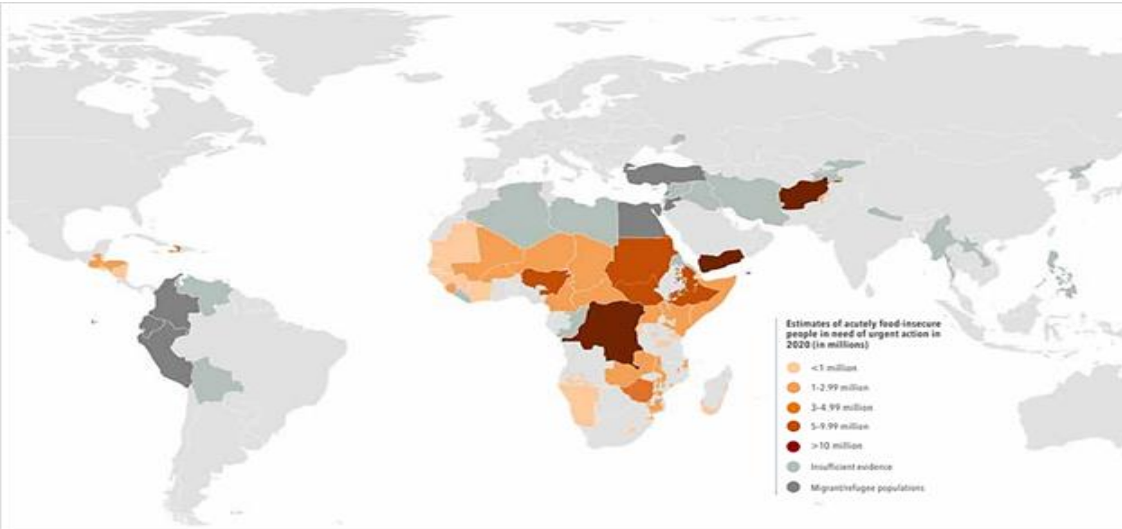



Figure 5.1 **Estimates of acutely food-insecure people in need of urgent action in 2020 (in millions).** This map reflects analyses produced before COVID-19 became a pandemic and does not account for its direct and/or indirect impact on acute food insecurity (Source: FSIN GRFC March 2020).

The entry point to analyze the main disasters that threaten the global food security, during the current reporting period, is monitoring the weather conditions due to its connections to many disasters (such as drought, floods, etc.). During the current reporting period (April - July 2020), rainfall amount was significantly higher than the 15-year average in western African coast (Senegal, Mauritania, Morocco), Eastern Africa (Kenya, Tanzania, Ethiopia, and Somalia), Arabian Peninsula (Saudi Arabia, Yamen and Oman), Central Asia (such as in Iran, Afghanistan, Uzbekistan, Kazakhstan, Turkmenistan, and Tajikistan), Ukraine, Russia, Mongolia, and India, as measured by CropWatch in Figure 5.2. While the average temperature was particularly above average in Mexico and Venezuela (South America), Portugal and France (in Europe), Oman and Thailand (in Asia), and Nigeria, Niger, Togo, Ghana and Cote le’ devoir (in Africa), significantly below-average temperature was observed in the South African region, north and east Europe, India, and Canada, as in Figure 5.3.

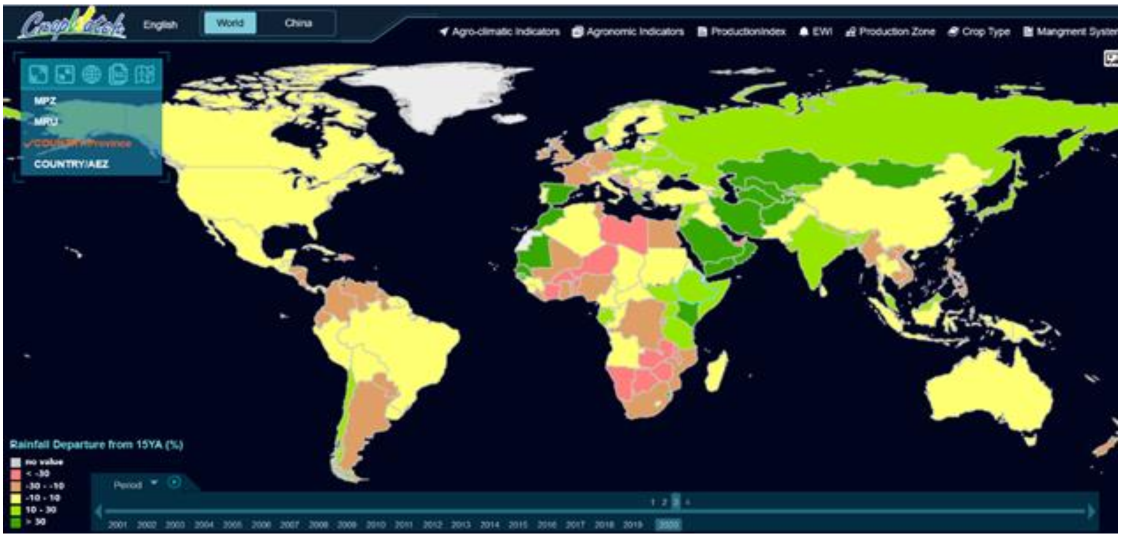



**Figure 5.2 Agro-climatic indicators (Rainfall Departure from 15YA). Source; CropWatch Explorer (http://cropwatch.com.cn/newcropwatch/main.htm).**

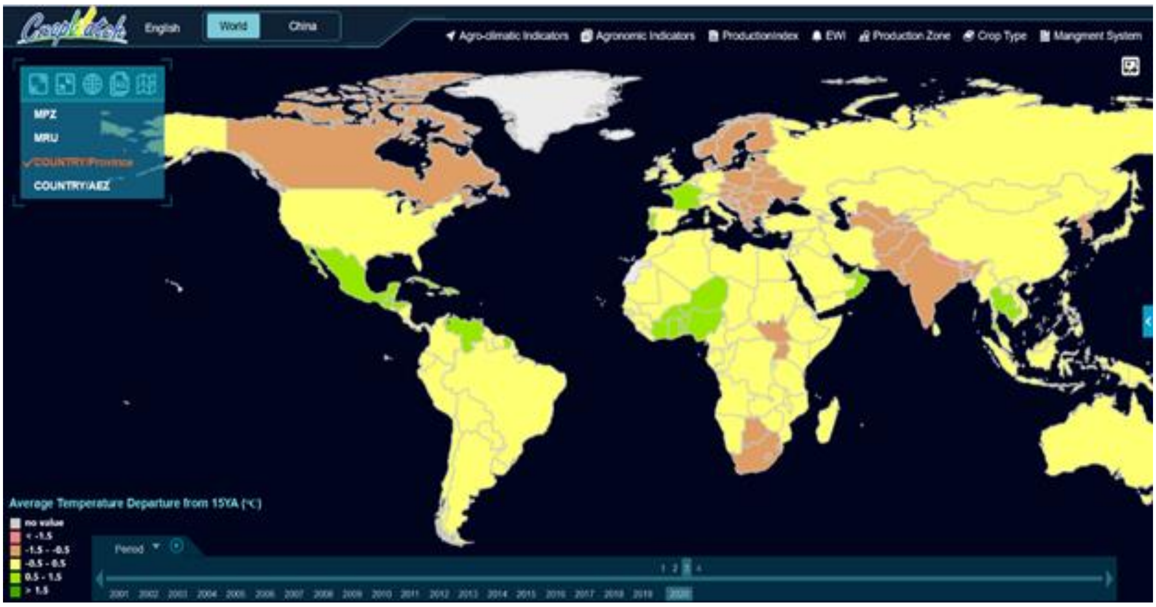



**Figure 5.3 Agro-climatic indicators (Average temperature departure from 15YA). Source; CropWatch Explorer (http://cropwatch.com.cn/newcropwatch/main.htm).**

### *Extreme conditions by type*

### *COVID-19*

Many reports around the world indicated the rising of food prices due to COVID-19, particularly in the U.S. At the beginning of the pandemic, customers rushed to stock up on foods leading to a sudden and sharp increase in food demand and prices. Besides, the sharp restrictions on movements also increased demand for food from grocery stores, rather than going to restaurants. The pandemic has also increased the trade conflicts, supply chain slowdowns, and agro inputs shortage, and delayed the planting.

Another aspect of concern is the overlapping between COVID-19 and other disasters over particular regions, such as the desert locust over East Africa, floods in China and drought conditions over South-East Asia. The restrictions on the movement of people or goods could hamper the efforts of fighting against the spread of desert locusts. Furthermore, the restrictions in human flow during the COVID-19 pandemic in China affected the regular the construction of hydraulic projects on the Yangtze River, which were scheduled in the winter of 2019 and spring of 2020, as reported by National Disaster Reduction Centre.

Only time will reveal the severity of the impacts on agriculture from the novel coronavirus. The current challenge for the agriculture sector is continuing farming and livestock activities in the face of COVID-19 health threats and control measures.

### *Desert locust*

The frequent cyclones of the Indian Ocean, mostly due to global heating, are causing heavy rains, particularly over east Africa and Yemen. The heavy rains created perfect breeding conditions for locusts leading to an increase in the spring swarms second-generation. Swarms are moving towards the north highland and eastern coast of Ethiopia coming from Yamen and Kenia, to join existing swarms. The large numbers of swarms by now are mainly clustered in the north and east Ethiopia and northwestern Somalia. These groups are expected to move towards India and Pakistan in early August. In Asia, a large number of swarms were reported in the Indo-Pakistan border (Figure 5.4).

With more heavy rains, Yamen and Ethiopia are likely to be the epicenter of summer infestations. The second generation of summer breeding is expected to start in September, and swarms could reach Nepal. Good rains in summer breeding areas in the Sahel and West Africa are expected to raise favorable breading conditions (Figure 5.5).

Locusts keep causing huge devastation to cropland areas in threatened regions; however, large scale control operations are running. As reported by FAO, the total area treated in July was more than 222,446 ha compared to 331,126 ha in June, particularly in India (102,645 ha), Ethiopia (79,574 ha), Kenia (38,769 ha), and Pakistan (33,599 ha).

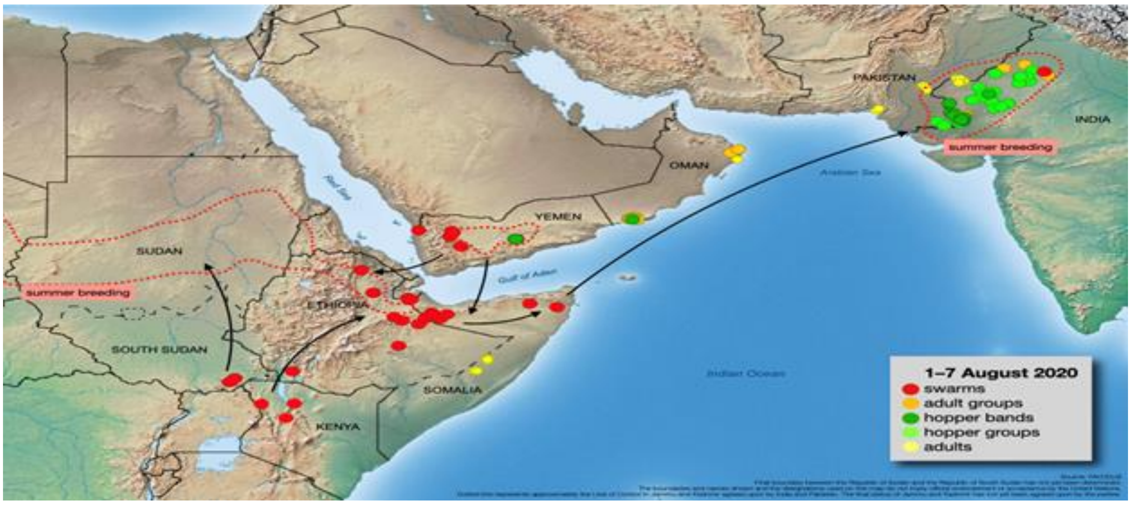



**Figure 5.4 FAO desert locust bulletin, the current situation during July 2020. Source: http://www.fao.org/ag/locusts/common/ecg/75/en/200807DLupdate.jpg**

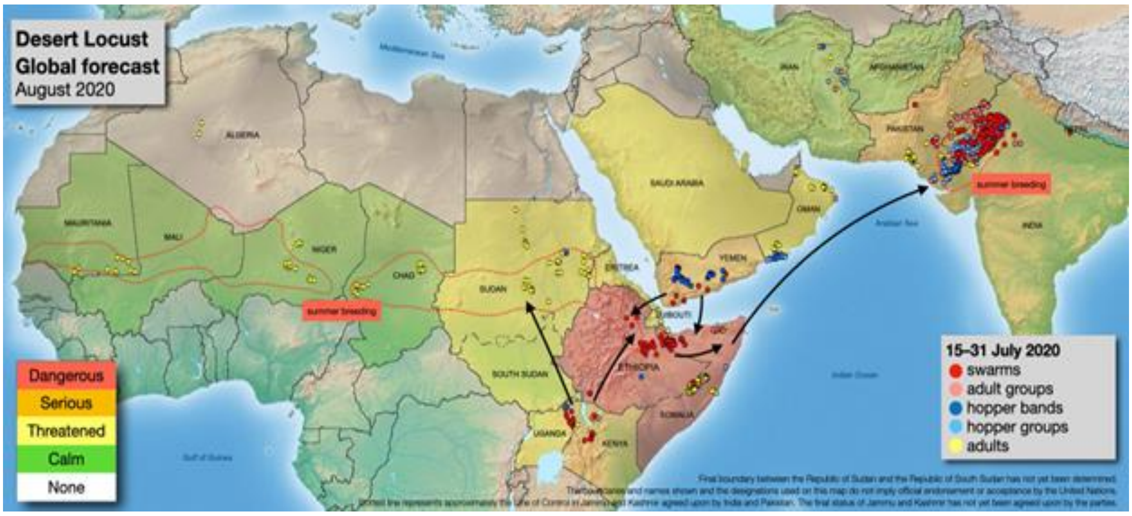



**Figure 5.5 FAO desert locust bulletin, forecast until mid-September 2020. Source: http://www.fao.org/ag/locusts/common/ecg/75/en/200803forecast.jpg)**

### *Floods*

In Africa, in late July, the White Nile has caused flooding in Jonglei State, South Sudan. The UN Office for the Coordination of Humanitarian Affairs (OCHA) initially reported more than 5,000 people were displaced, while thousands of homes have been reportedly destroyed, along with crops and livestock damages. In Ethiopia, OCHA reported the displacement of more than 30,000 people due to floods in Afar, Gambella, Oromia, and SNNP regions since 20 July. OCHA reports that all major rivers in the Gambella region are at full capacity where hundreds of hectares of crops have been damaged in the region. In Niger, the situation was even more serious since 9 people had died, 20174 people affected and 2244 houses destroyed. Severe floods were reported in the regions of Maradi and Tahoua due to heavy rains and floods by end of July. Additional cases of floods in Africa (from Mali and Nigeria) were reported by OCHA.

In Yemen, ongoing rain and flash floods continue to cause infrastructure damages, destroying homes and shelters and causing death and injuries. About 130 persons have died and 35,000 families have been affected by the flooding since late July. In northeastern India, flooding began in Bihar state in mid-July, initially affecting around 300,000 people.

In China, since early June 2020, unprecedented floods have severely impacted large regions in the upper and middle river basin of the Yangtze, due to heavy rains caused by the regional rainy season. The severely impacted regions were in southern China, including Guangxi, Guizhou, Sichuan, Hubei, Yunnan, Hunan and Chongqing provinces. With more rain, floods started to extend to lower regions of the Yangtze basin such as Anhui, Jiangxi, Zhejiang and Fujian. The Yangtze flows through some of the most productive agricultural, economic and industrial centers in China. By the middle of August, the floods have affected 63.46 million people and caused a direct economic loss of 178.96 billion CNY, according to the Chinese Ministry of Emergency Management. About 219 people were found dead or are missing, and 54,000 houses collapsed. Great efforts were made by national government to cope with the disaster impacts by allocating about 309 million yuan (44.2 million U.S. dollars) for disaster relief in flood-hit regions and deploying more than 7,000 officers and soldiers to participate in flood fighting and emergency rescue tasks. With the consideration of growing season and production areas, crops such as rice, rapeseed and cotton crops could be the most affected by the flood since their production areas are largely located in the Yangtze River Basin.

Intensive monsoon rains caused widespread flooding in South Asia. The Bangladesh Flood Forecasting and Warning Center reported that almost 1 million homes had been inundated as of July 31. 150'000 ha of farmland had been damaged. This flooding occurred in the middle of the main growing season for rice. While most farmers are growing flood tolerant varieties, prolonged submergence will reduce the yield potential and can even kill the crops.

***Drought***

A severe drought was observed over South-East Asia, particularly in Cambodia, Thailand, and Vietnam. The severe drought conditions were driven by the El Niño weather phenomenon that leads to a huge reduction in seasonal rains. Therefore, many rice farmers in the region have been unable to plant their main crop, raising fears of a heavily diminished harvest this fall.

Europe has suffered from severe drought during this season. In Romania, severe drought caused huge damage to wheat (southeast near the Black Sea), while in Ukraine, the drier-than-average conditions throughout early spring, leading to deteriorating conditions to wheat production, particularly in Odessa and Crimea. The wheat crop in the United Kingdom (UK) has also struggled due to the drought that occurred during late spring and caused extensive damage to the winter crops. Mild drought conditions were reported in Hungary and Bulgaria (Figure 5.6).

In Africa, delayed planting of peanuts in South Senegal was also reported. Planting typically begins in southern Senegal in May, but a late onset of rains in May delayed planting. While in South America, a large reduction in Mexico cotton planted area has been reported and was attributed to seed shortages and drought (Figure 5.6).

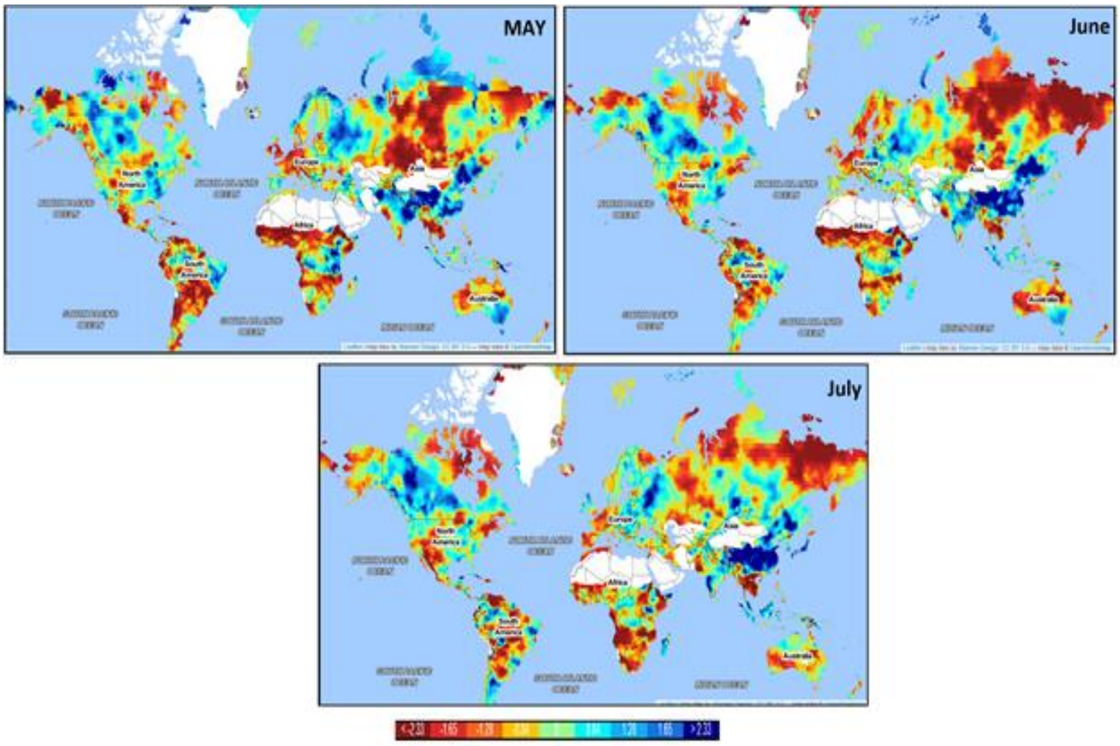



**Figure 5.6 The Standardised Precipitation-Evapotranspiration Index (SPEI) estimated globally for the months; May to July of 2020, Source: (https://spei.csic.es/map/)**

### *Fires*

Thousands of fires alarms were reported on the Global Forest Watch website (https://www.globalforestwatch.org/) over the central African region (Angola, Tanzania, Zambia, and the Democratic Republic of the Congo) by end of June and early July. Fires of this number are not uncommon at this time of year in Africa. This period (June - early July) is usually the time for clearing agriculture fields and land preparation for the next growing season. It is a common agriculture practice for farmers to set fire to the remains of old crop fields to rid them of the leftover grasses and scrub. This action also helps return nutrients to the soil to ensure a good crop during the next planting season. Not in Africa only, "Slash and burn" agriculture is a common practice in other regions as well, including parts of northern South America, and Southeast Asia (Figure 5.7).

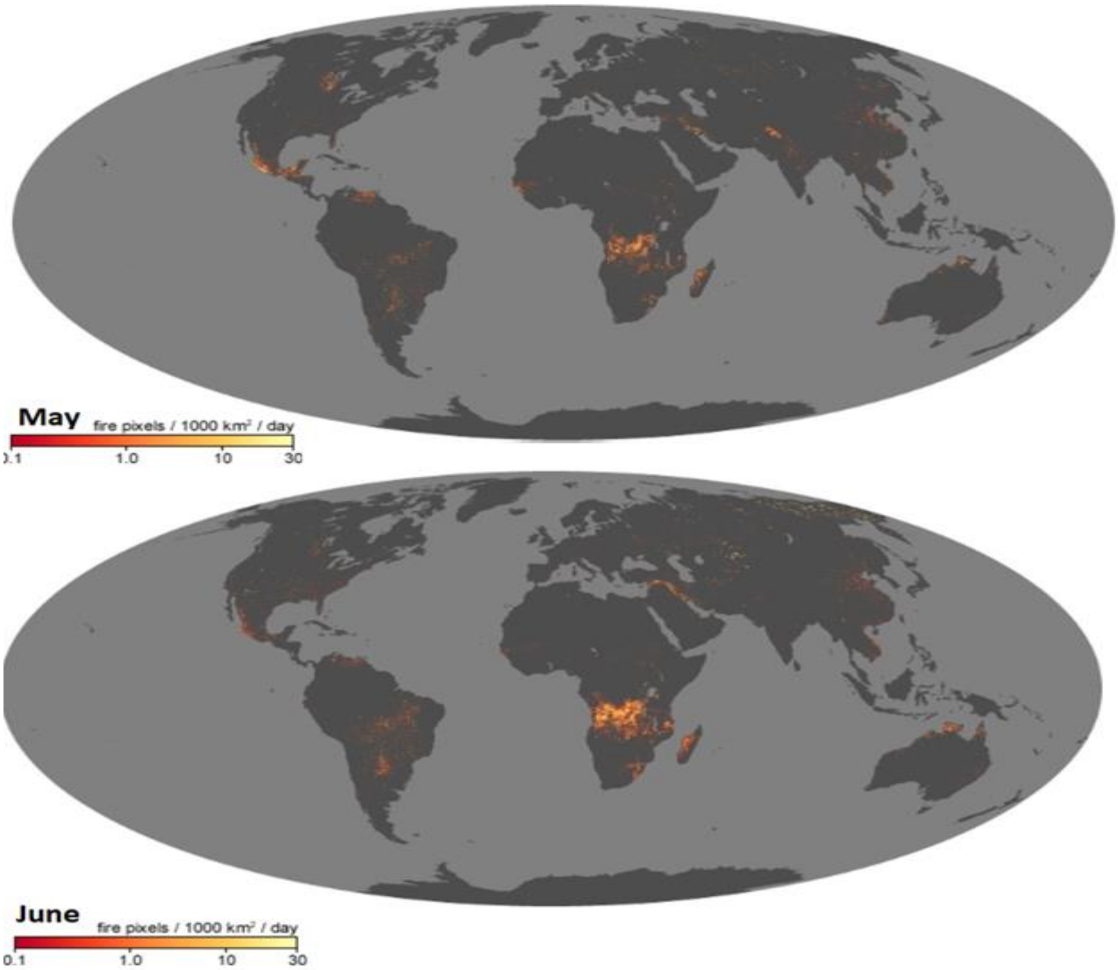



**Figure 5.7 Fires occurred during May and June 2020.**

**Source: https://earthobservatory.nasa.gov/global-maps/MOD14A1_M_FIRE**

## 5.3 Update on El Niño

Neutral El Nino condition prevailed across the Pacific Ocean. Figure 5.8 illustrates the behavior of the standard Southern Oscillation Index (SOI) published by the Australian Bureau of Meteorology (BOM) for the period from July 2019 to July 2020. Sustained positive values of the SOI above +7 typically indicate La Niña while sustained negative values below -7 typically indicate El Niño. Values between about +7 and -7 generally indicate neutral conditions. During this monitoring period, SOI increased from -0.5 in April to 2.8 in May, then decreased to -9.6 in June, then increase to 4.2 in July, indicating a neutral El Niño situation.

The sea surface temperature anomalies in July 2020 for NINO3, NINO3.4, and NINO4 regions were -0.3°C, +0°C, and +0.2°C, respectively, somewhat warmer than the 1961-1990 average according to BOM (see Figure 5.8 and Figure 5.9). Both BOM and NOAA conclude that the currently warmer conditions indicate a neutral El Niño (www.climate.gov/enso). CropWatch will keep monitoring the situation (Figure 5.10).

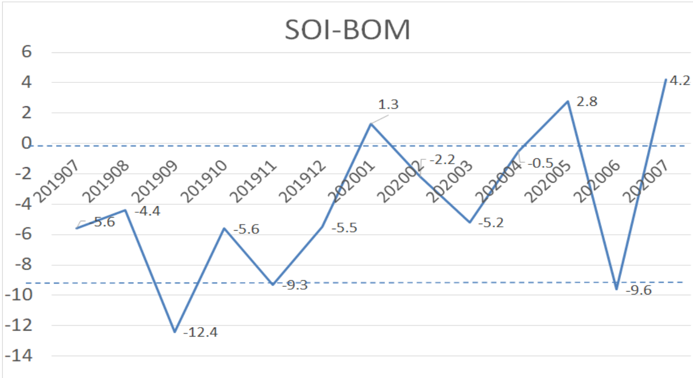



**Figure 5.8 Monthly SOI-BOM time series from July 2019 to July 2020 (Source: http://www.bom.gov.au/climate/current/soi2.shtml)**

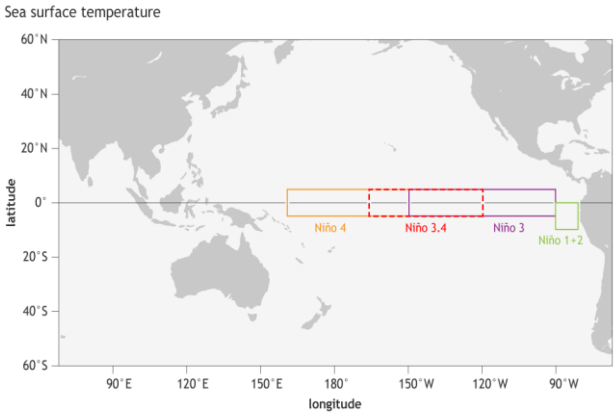



**Figure 5.9 Map of NINO Region (Source: https://www.climate.gov/sites/default/files/Fig3_ENSOindices_SST_large.png)**

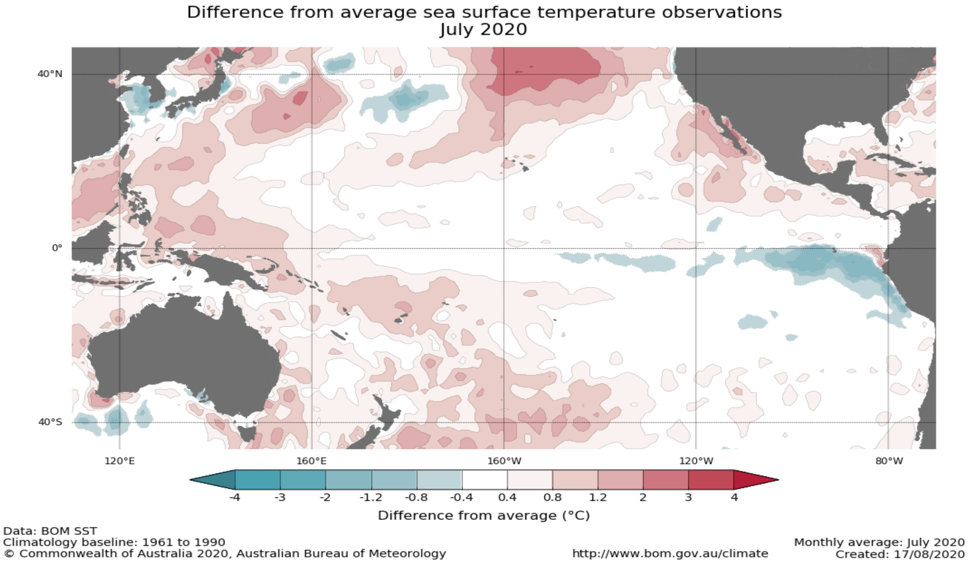



**Figure 5.10 July 2020 sea surface temperature departure from the 1961-1990 average (Source:**http://www.bom.gov.au/climate/enso/wrap-up/#tabs=Sea-surface**)**

# Annex A. Agroclimatic indicators

**Table A.1 Apr 2020 - Jul 2020 agroclimatic indicators and biomass by global Monitoring and Reporting Unit (MRU)**

| 65 Global MRUs | | RAIN Current (mm) | RAIN 15YA dep. (%) | TEMP Current (°C) | TEMP 15YA dep. (°C) | RADPAR Current (MJ/m²) | RADPAR 15YA dep. (%) | BIOMSS Current (gDM/m²) | BIOMSS 15YA dep. (%) |
|---|---|---|---|---|---|---|---|---|---|
| **C01** | Equatorial central Africa | 590 | -4 | 22.4 | -0.1 | 1131 | -1 | 563 | -4 |
| **C02** | East African highlands | 923 | 23 | 18.5 | -0.5 | 1131 | -5 | 538 | -2 |
| **C03** | Gulf of Guinea | 506 | -18 | 27.5 | 0.4 | 1196 | 1 | 776 | 3 |
| **C04** | Horn of Africa | 455 | 54 | 20.3 | -0.3 | 1124 | -3 | 570 | -1 |
| **C05** | Madagascar (main) | 260 | 7 | 19.5 | -0.1 | 878 | -7 | 414 | -10 |
| **C06** | Southwest Madagascar | 69 | 0 | 21.1 | -0.1 | 962 | -1 | 421 | -1 |
| **C07** | North Africa-Mediterranean | 103 | 10 | 21.1 | 0.3 | 1534 | -2 | 619 | -2 |
| **C08** | Sahel | 282 | -5 | 30.2 | 0.1 | 1288 | -2 | 685 | 5 |
| **C09** | Southern Africa | 85 | -26 | 17.3 | -0.3 | 1002 | 0 | 324 | -8 |
| **C10** | Western Cape (South Africa) | 197 | -12 | 13.4 | 0.1 | 719 | 6 | 255 | 4 |
| **C11** | British Columbia to Colorado | 345 | 7 | 9.5 | -0.5 | 1342 | -3 | 409 | -6 |
| **C12** | Northern Great Plains | 405 | 13 | 16.1 | -0.9 | 1310 | -3 | 593 | -4 |
| **C13** | Corn Belt | 416 | -4 | 15.2 | -0.7 | 1230 | -1 | 533 | -1 |
| **C14** | Cotton Belt to Mexican Nordeste | 477 | 12 | 22.7 | -0.5 | 1368 | -2 | 807 | -1 |
| **C15** | Sub-boreal America | 436 | 23 | 9.1 | -1.4 | 1072 | -8 | 343 | -11 |
| **C16** | West Coast (North America) | 192 | -1 | 15.4 | 0.2 | 1446 | -3 | 430 | -10 |
| **C17** | Sierra Madre | 715 | 1 | 21.1 | 0.4 | 1452 | -1 | 662 | 5 |
| **C18** | SW U.S. and N. Mexican highlands | 188 | 5 | 20.3 | 0.4 | 1567 | -1 | 654 | 5 |
| **C19** | Northern South and Central America | 962 | -11 | 24.9 | 0.5 | 1249 | 1 | 749 | 0 |
| **C20** | Caribbean | 506 | -15 | 26.6 | 0.8 | 1391 | -1 | 934 | 0 |
| **C21** | Central-northern Andes | 509 | -11 | 14.1 | 0.2 | 1045 | -1 | 326 | -1 |
| **C22** | Nordeste (Brazil) | 279 | 23 | 23.6 | -0.1 | 1024 | -2 | 628 | 0 |
| **C23** | Central eastern Brazil | 259 | -11 | 21.2 | 0.1 | 974 | 1 | 472 | 0 |
| **C24** | Amazon | 627 | -3 | 24.2 | 0.4 | 1061 | 0 | 596 | 0 |
| **C25** | Central-north Argentina | 129 | -29 | 15.7 | 0.1 | 777 | 8 | 314 | 11 |
| **C26** | Pampas | 370 | -9 | 14.6 | -0.1 | 677 | 7 | 258 | 7 |
| **C27** | Western Patagonia | 889 | 12 | 7.5 | 0.2 | 450 | -4 | 105 | -5 |
| **C28** | Semi-arid Southern Cone | 143 | 24 | 10.1 | 0.0 | 698 | -2 | 173 | 3 |

| 65 Global MRUs | | RAIN Current (mm) | RAIN 15YA dep. (%) | TEMP Current (°C) | TEMP 15YA dep. (°C) | RADPAR Current (MJ/m²) | RADPAR 15YA dep. (%) | BIOMSS Current (gDM/m²) | BIOMSS 15YA dep. (%) |
|---|---|---|---|---|---|---|---|---|---|
| **C29** | Caucasus | 308 | 2 | 15.9 | -0.3 | 1435 | -2 | 541 | 3 |
| **C30** | Pamir area | 432 | 32 | 16.0 | -1.1 | 1494 | -4 | 561 | 7 |
| **C31** | Western Asia | 133 | 36 | 22.4 | -0.3 | 1514 | -3 | 524 | 5 |
| **C32** | Gansu-Xinjiang (China) | 288 | 20 | 16.3 | 0.0 | 1402 | -3 | 645 | 1 |
| **C33** | Hainan (China) | 486 | -47 | 27.3 | 0.8 | 1320 | 1 | 871 | -1 |
| **C34** | Huanghuaihai (China) | 362 | 10 | 21.7 | -0.5 | 1267 | -5 | 670 | -9 |
| **C35** | Inner Mongolia (China) | 223 | 5 | 16.1 | -0.2 | 1344 | -3 | 572 | -4 |
| **C36** | Loess region (China) | 282 | 2 | 16.7 | -0.6 | 1332 | -2 | 556 | -9 |
| **C37** | Lower Yangtze (China) | 1195 | 8 | 22.0 | 0.1 | 1089 | 0 | 636 | 0 |
| **C38** | Northeast China | 336 | 1 | 15.1 | -0.3 | 1246 | -1 | 525 | -2 |
| **C39** | Qinghai-Tibet (China) | 1251 | 17 | 9.3 | -1.1 | 1104 | -7 | 296 | -13 |
| **C40** | Southern China | 1129 | -16 | 22.8 | 0.2 | 1174 | 5 | 704 | 6 |
| **C41** | Southwest China | 997 | 16 | 18.3 | -0.2 | 993 | -8 | 488 | -9 |
| **C42** | Taiwan (China) | 584 | -43 | 26.2 | 1.0 | 1353 | 8 | 823 | 5 |
| **C43** | East Asia | 576 | 9 | 13.9 | -0.4 | 1137 | -5 | 433 | -8 |
| **C44** | Southern Himalayas | 1083 | 8 | 25.7 | -0.7 | 1226 | -2 | 708 | 6 |
| **C45** | Southern Asia | 905 | 17 | 29.2 | -0.3 | 1246 | 1 | 727 | 7 |
| **C46** | Southern Japan and Korea | 1100 | 33 | 17.6 | -0.1 | 1103 | -7 | 507 | -10 |
| **C47** | Southern Mongolia | 315 | 59 | 8.9 | 1.0 | 1460 | -1 | 419 | 0 |
| **C48** | Punjab to Gujarat | 416 | 14 | 32.0 | -0.4 | 1410 | -2 | 788 | 28 |
| **C49** | Maritime Southeast Asia | 1276 | 5 | 24.6 | 0.3 | 1109 | 1 | 734 | 2 |
| **C50** | Mainland Southeast Asia | 908 | -22 | 27.3 | 0.6 | 1255 | 5 | 810 | 4 |
| **C51** | Eastern Siberia | 320 | -1 | 10.0 | 0.1 | 1038 | -8 | 339 | -8 |
| **C52** | Eastern Central Asia | 382 | 50 | 11.1 | 0.3 | 1249 | -4 | 415 | -4 |
| **C53** | Northern Australia | 332 | -13 | 23.9 | 0.5 | 1056 | 0 | 564 | -4 |
| **C54** | Queensland to Victoria | 192 | -1 | 12.3 | -0.4 | 626 | -3 | 212 | -4 |
| **C55** | Nullarbor to Darling | 188 | -17 | 14.5 | 0.4 | 616 | -2 | 235 | -1 |
| **C56** | New Zealand | 331 | -12 | 9.2 | 0.3 | 442 | 1 | 124 | 2 |
| **C57** | Boreal Eurasia | 371 | 11 | 9.5 | -0.3 | 1100 | 2 | 345 | 2 |
| **C58** | Ukraine to Ural mountains | 370 | 21 | 13.1 | -1.0 | 1119 | -3 | 444 | -7 |
| **C59** | Mediterranean Europe and Turkey | 223 | 7 | 17.1 | 0.0 | 1435 | -2 | 581 | -2 |
| **C60** | W. Europe (non Mediterranean) | 337 | -6 | 14.2 | -0.3 | 1228 | 1 | 474 | -4 |
| **C61** | Boreal America | 345 | -1 | 6.4 | 0.2 | 957 | -5 | 241 | -3 |
| **C62** | Ural to Altai mountains | 347 | 26 | 14.0 | 0.6 | 1190 | -2 | 493 | 2 |
| **C63** | Australian desert | 100 | -30 | 15.1 | -0.2 | 692 | 1 | 249 | -3 |
| **C64** | Sahara to Afghan deserts | 51 | 78 | 27.9 | 0.1 | 1587 | -3 | 456 | 22 |

| 65 Global MRUs | | RAIN Current (mm) | RAIN 15YA dep. (%) | TEMP Current (°C) | TEMP 15YA dep. (°C) | RADPAR Current (MJ/m²) | RADPAR 15YA dep. (%) | BIOMSS Current (gDM/m²) | BIOMSS 15YA dep. (%) |
|---|---|---|---|---|---|---|---|---|---|
| C65 | Sub-arctic America | 134 | 6 | -3.0 | 0.7 | 1192 | -3 | 173 | 4 |

**Table A.2 Apr 2020 - Jul 2020 agroclimatic indicators by country**

| Country code | Country name | RAIN Current (mm) | RAIN 15YA Departure (%) | TEMP Current (°C) | TEMP 15YA Departure (°C) | RADPAR Current (MJ/m²) | RADPAR 15YA Departure (%) | BIOMSS Current (gDM/m²) | BIOMSS 15YA Departure (%) |
|---|---|---|---|---|---|---|---|---|---|
| ARG | Argentina | 225 | -14 | 13.3 | -0.2 | 664 | 6 | 235 | 8 |
| AUS | Australia | 184 | -6 | 13.5 | -0.2 | 661 | -2 | 228 | -3 |
| BGD | Bangladesh | 1692 | 14 | 28.1 | -0.6 | 1248 | -1 | 818 | -2 |
| BRA | Brazil | 388 | -4 | 21.8 | 0.1 | 988 | 1 | 505 | -1 |
| KHM | Cambodia | 853 | -19 | 27.7 | 0.8 | 1202 | 4 | 819 | 5 |
| CAN | Canada | 414 | 8 | 9.8 | -1.1 | 1124 | -5 | 356 | -7 |
| CHN | China | 844 | 4 | 19.3 | -0.1 | 1152 | -2 | 576 | -4 |
| EGY | Egypt | 6 | -24 | 23.2 | -0.3 | 1561 | -2 | 365 | 24 |
| ETH | Ethiopia | 877 | 14 | 19.3 | -0.4 | 1170 | -5 | 570 | 0 |
| FRA | France | 342 | -10 | 15.2 | 0.6 | 1285 | 4 | 523 | 5 |
| DEU | Germany | 268 | -22 | 13.5 | -0.4 | 1214 | 2 | 442 | -4 |
| IND | India | 896 | 15 | 29.1 | -0.5 | 1260 | -1 | 723 | 11 |
| IDN | Indonesia | 1232 | 6 | 24.5 | 0.2 | 1071 | 0 | 699 | 1 |
| IRN | Iran | 117 | 33 | 21.0 | -0.3 | 1571 | -4 | 474 | 10 |
| KAZ | Kazakhstan | 321 | 41 | 15.8 | 0.3 | 1302 | -1 | 567 | 2 |
| MEX | Mexico | 635 | 6 | 24.0 | 0.6 | 1462 | -1 | 744 | 5 |
| MMR | Myanmar | 1149 | -18 | 25.5 | 0.4 | 1207 | 4 | 713 | 1 |
| NGA | Nigeria | 468 | -24 | 28.3 | 0.5 | 1225 | 2 | 728 | 1 |
| PAK | Pakistan | 270 | 8 | 24.6 | -1.2 | 1515 | -3 | 730 | 18 |
| PHL | Philippines | 1125 | -16 | 26.3 | 0.5 | 1356 | 6 | 913 | 6 |
| POL | Poland | 364 | 13 | 13.6 | -1.0 | 1164 | 0 | 436 | -7 |
| ROU | Romania | 397 | 6 | 15.3 | -0.9 | 1296 | -1 | 536 | -9 |
| RUS | Russia | 369 | 20 | 12.9 | -0.3 | 1127 | -4 | 440 | -4 |
| ZAF | South Africa | 69 | -23 | 12.1 | -0.7 | 898 | 2 | 212 | -17 |
| THA | Thailand | 873 | -7 | 27.4 | 0.7 | 1224 | 4 | 818 | 5 |
| TUR | Turkey | 234 | 1 | 15.9 | -0.4 | 1472 | -1 | 521 | -5 |
| GBR | United Kingdom | 319 | -18 | 11.5 | 0.1 | 991 | 2 | 321 | 0 |
| UKR | Ukraine | 356 | 19 | 15.0 | -1.1 | 1224 | -1 | 524 | -7 |
| USA | United States | 401 | 6 | 18.3 | -0.5 | 1341 | -2 | 622 | -2 |
| UZB | Uzbekistan | 203 | 62 | 21.9 | -0.5 | 1502 | -4 | 598 | 5 |
| VNM | Vietnam | 913 | -19 | 25.2 | 0.3 | 1248 | 6 | 799 | 5 |
| AFG | Afghanistan | 230 | 39 | 18.6 | -0.8 | 1561 | -3 | 424 | 9 |
| AGO | Angola | 174 | -7 | 19.7 | -0.1 | 1214 | 0 | 278 | -14 |
| BLR | Belarus | 352 | 11 | 13.1 | -1.0 | 1082 | -3 | 415 | -7 |
| HUN | Hungary | 308 | 17 | 16.2 | -1.2 | 1288 | -2 | 539 | -14 |
| ITA | Italy | 336 | -10 | 16.7 | -0.2 | 1413 | 0 | 583 | -5 |
| KEN | Kenya | 838 | 41 | 19.1 | -0.5 | 1071 | -4 | 550 | -4 |
| LKA | Sri_Lanka | 969 | 9 | 27.1 | 0.3 | 1219 | -4 | 837 | 0 |
| MAR | Morocco | 115 | 36 | 20.6 | 0.3 | 1543 | -3 | 623 | -2 |
| MNG | Mongolia | 459 | 93 | 10.5 | 0.1 | 1313 | -5 | 409 | -7 |
| MOZ | Mozambique | 99 | -24 | 19.9 | -0.1 | 940 | -3 | 493 | -1 |
| ZMB | Zambia | 43 | -39 | 18.2 | 0.0 | 1117 | -2 | 323 | -9 |

*Note: Departures are expressed in relative terms (percentage) forall variables, except for temperature, for which absolute departure in degrees Celsius is given. Zero means no change from the average value; relative departures are calculated as (C-R)/R*100, with C=current value and R=reference value, which is the fifteen-year average (15YA) for the same period between January and April.*

**Table A.3 Argentina, Apr 2020 - Jul 2020 agroclimatic indicators (by province)**

| | RAIN Current (mm) | RAIN 15YA Departure (%) | TEMP Current (°C) | TEMP 15YA Departure (°C) | RADPAR Current (MJ/m²) | RADPAR 15YA Departure (%) | BIOMSS Current (gDM/m²) | BIOMSS 15YA Departure (%) |
|---|---|---|---|---|---|---|---|---|
| **Buenos Aires** | 226 | 8 | 11.1 | -0.5 | 561 | -2 | 177 | -2 |
| **Chaco** | 184 | -43 | 16.9 | 0.2 | 710 | 16 | 321 | 22 |
| **Cordoba** | 73 | -38 | 12.7 | -0.3 | 714 | 5 | 235 | 6 |
| **Corrientes** | 368 | -24 | 15.8 | -0.1 | 680 | 15 | 286 | 15 |
| **Entre Rios** | 282 | -18 | 13.7 | -0.2 | 629 | 7 | 236 | 10 |
| **La Pampa** | 159 | 28 | 11.0 | -0.6 | 588 | -2 | 182 | 0 |
| **Misiones** | 687 | 12 | 16.2 | -0.4 | 728 | 12 | 314 | 9 |
| **Santiago Del Estero** | 118 | -32 | 15.4 | -0.2 | 746 | 10 | 298 | 15 |
| **San Luis** | 66 | -20 | 11.3 | -0.3 | 700 | 0 | 212 | 6 |
| **Salta** | 190 | -2 | 14.2 | 0.3 | 837 | 4 | 303 | 7 |
| **Santa Fe** | 173 | -31 | 14.5 | -0.2 | 674 | 10 | 265 | 16 |
| **Tucuman** | 95 | -17 | 12.6 | 0.4 | 835 | -1 | 264 | 2 |

**Table A.4 Australia, Apr 2020 - Jul 2020 agroclimatic indicators (by state)**

| | RAIN Current (mm) | RAIN 15YA Departure (%) | TEMP Current (°C) | TEMP 15YA Departure (°C) | RADPAR Current (MJ/m²) | RADPAR 15YA Departure (%) | BIOMSS Current (gDM/m²) | BIOMSS 15YA Departure (%) |
|---|---|---|---|---|---|---|---|---|
| **New South Wales** | 204 | 17 | 11.7 | -0.5 | 643 | -5 | 204 | -7 |
| **South Australia** | 174 | -15 | 12.9 | -0.7 | 551 | 0 | 200 | -4 |
| **Victoria** | 271 | 6 | 10.2 | -0.7 | 461 | -4 | 146 | -9 |
| **W. Australia** | 175 | -17 | 15.6 | 0.5 | 668 | -2 | 237 | -3 |

**Table A.5 Brazil, Apr 2020 - Jul 2020 agroclimatic indicators (by state)**

| | RAIN Current (mm) | RAIN 15YA Departure (%) | TEMP Current (°C) | TEMP 15YA Departure (°C) | RADPAR Current (MJ/m²) | RADPAR 15YA Departure (%) | BIOMSS Current (gDM/m²) | BIOMSS 15YA Departure (%) |
|---|---|---|---|---|---|---|---|---|
| **Ceara** | 462 | 19 | 25.0 | -0.2 | 1159 | 1 | 754 | 0 |
| **Goias** | 188 | -7 | 21.3 | -0.2 | 1059 | -1 | 420 | -8 |
| **Mato Grosso Do Sul** | 192 | -29 | 21.0 | 0.2 | 918 | 8 | 474 | 11 |
| **Mato Grosso** | 219 | -11 | 23.6 | 0.2 | 1084 | 1 | 465 | -3 |
| **Minas Gerais** | 182 | -16 | 19.0 | -0.1 | 911 | -1 | 420 | -6 |
| **Parana** | 425 | -17 | 16.6 | 0.0 | 826 | 11 | 344 | 5 |
| **Rio Grande Do Sul** | 603 | 3 | 14.9 | -0.1 | 662 | 5 | 266 | 4 |
| **Santa Catarina** | 505 | -15 | 14.5 | 0.1 | 741 | 9 | 287 | 8 |
| **Sao Paulo** | 174 | -45 | 18.8 | 0.3 | 899 | 7 | 412 | 5 |

**Table A.6 Canada, Apr 2020 - Jul 2020 agroclimatic indicators (by province)**

| | RAIN Current (mm) | RAIN 15YA Departure (%) | TEMP Current (°C) | TEMP 15YA Departure (°C) | RADPAR Current (MJ/m²) | RADPAR 15YA Departure (%) | BIOMSS Current (gDM/m²) | BIOMSS 15YA Departure (%) |
|---|---|---|---|---|---|---|---|---|
| **Alberta** | 437 | 27 | 9.3 | -1.6 | 1165 | -8 | 368 | -14 |
| **Manitoba** | 438 | 22 | 11.2 | -1.0 | 1142 | -5 | 422 | -5 |
| **Saskatchewan** | 461 | 42 | 10.4 | -1.8 | 1147 | -7 | 397 | -13 |

**Table A.7 India, Apr 2020 - Jul 2020 agroclimatic indicators (by state)**

| | RAIN Current (mm) | RAIN 15YA Departure (%) | TEMP Current (°C) | TEMP 15YA Departure (°C) | RADPAR Current (MJ/m²) | RADPAR 15YA Departure (%) | BIOMSS Current (gDM/m²) | BIOMSS 15YA Departure (%) |
|---|---|---|---|---|---|---|---|---|
| **Andhra Pradesh** | 751 | 65 | 30.2 | -0.6 | 1233 | 2 | 730 | 6 |
| **Assam** | 2635 | 16 | 24.4 | -0.6 | 999 | -9 | 629 | -11 |
| **Bihar** | 1208 | 59 | 29.9 | -1.9 | 1231 | -8 | 721 | -6 |
| **Chhattisgarh** | 680 | 1 | 29.9 | -0.6 | 1270 | 3 | 761 | 16 |
| **Daman and Diu** | 1188 | 9 | 29.6 | 0.4 | 1413 | -2 | 474 | 0 |
| **Delhi** | 214 | -18 | 32.8 | -0.5 | 1450 | 0 | 930 | 23 |
| **Gujarat** | 850 | 36 | 31.2 | 0.1 | 1392 | 1 | 462 | 3 |
| **Goa** | 1962 | -6 | 27.0 | 0.4 | 1185 | -5 | 563 | -13 |
| **Himachal Pradesh** | 305 | -50 | 20.0 | -1.2 | 1492 | 3 | 628 | 3 |
| **Haryana** | 132 | -46 | 32.6 | -0.5 | 1456 | 1 | 919 | 24 |
| **Jharkhand** | 918 | 38 | 29.3 | -1.4 | 1244 | -2 | 739 | 6 |
| **Kerala** | 1432 | -15 | 26.0 | 0.4 | 1179 | 1 | 788 | 2 |
| **Karnataka** | 630 | -11 | 27.3 | 0.4 | 1140 | 1 | 710 | 5 |
| **Meghalaya** | 1978 | -4 | 24.9 | 0.1 | 1083 | -3 | 673 | -5 |
| **Maharashtra** | 1003 | 30 | 29.5 | -0.1 | 1275 | 3 | 658 | 10 |
| **Manipur** | 1843 | 7 | 21.6 | -0.5 | 1058 | -6 | 603 | -8 |
| **Madhya Pradesh** | 607 | -1 | 30.9 | -0.5 | 1312 | 2 | 698 | 26 |
| **Mizoram** | 1353 | -13 | 24.1 | -0.5 | 1213 | -1 | 751 | -3 |
| **Nagaland** | 2626 | 41 | 21.0 | -0.8 | 973 | -12 | 531 | -15 |
| **Orissa** | 795 | 8 | 29.5 | -0.6 | 1231 | 2 | 754 | 6 |
| **Puducherry** | 938 | -14 | 29.7 | -0.1 | 1310 | 3 | 838 | 5 |
| **Punjab** | 201 | -30 | 31.5 | -1.1 | 1457 | 1 | 912 | 12 |
| **Rajasthan** | 231 | -24 | 33.2 | 0.1 | 1371 | -2 | 835 | 44 |
| **Sikkim** | 459 | -26 | 16.6 | -0.7 | 1317 | -2 | 520 | -1 |
| **Tamil Nadu** | 478 | -2 | 28.5 | 0.1 | 1182 | -2 | 741 | -2 |
| **Tripura** | 1532 | -11 | 26.9 | -0.5 | 1223 | 0 | 833 | 1 |
| **Uttarakhand** | 260 | -55 | 22.5 | -1.0 | 1464 | 3 | 661 | 7 |
| **Uttar Pradesh** | 611 | 24 | 31.5 | -1.4 | 1326 | -4 | 827 | 19 |
| **West Bengal** | 1412 | 32 | 29.1 | -1.1 | 1255 | -2 | 770 | -3 |

**Table A.8 Kazakhstan, Apr 2020 - Jul 2020 agroclimatic indicators (by oblast)**

| | RAIN Current (mm) | RAIN 15YA Departure (%) | TEMP Current (°C) | TEMP 15YA Departure (°C) | RADPAR Current (MJ/m²) | RADPAR 15YA Departure (%) | BIOMSS Current (gDM/m²) | BIOMSS 15YA Departure (%) |
|---|---|---|---|---|---|---|---|---|
| Akmolinskaya | 337 | 73 | 15.4 | 0.6 | 1260 | 0 | 549 | 5 |
| Karagandinskaya | 274 | 52 | 15.2 | 0.7 | 1319 | -1 | 555 | 4 |
| Kustanayskaya | 345 | 64 | 15.1 | 0.0 | 1220 | -1 | 544 | 1 |
| Pavlodarskaya | 290 | 39 | 16.3 | 1.3 | 1264 | 1 | 576 | 8 |
| Severo kazachstanskaya | 320 | 26 | 14.6 | 1.0 | 1170 | 0 | 495 | 6 |
| Vostochno kazachstanskaya | 314 | 15 | 14.1 | 0.2 | 1364 | -1 | 535 | -1 |
| Zapadno kazachstanskaya | 248 | 44 | 17.2 | -0.6 | 1310 | -1 | 640 | 0 |

**Table A.9 Russia, Apr 2020 - Jul 2020 agroclimatic indicators (by oblast, kray and republic)**

| | RAIN Current (mm) | RAIN 15YA Departure (%) | TEMP Current (°C) | TEMP 15YA Departure (°C) | RADPAR Current (MJ/m²) | RADPAR 15YA Departure (%) | BIOMSS Current (gDM/m²) | BIOMSS 15YA Departure (%) |
|---|---|---|---|---|---|---|---|---|
| Bashkortostan Rep. | 366 | 10 | 12.3 | -0.4 | 1135 | -1 | 432 | -3 |
| Chelyabinskaya Oblast | 333 | 16 | 12.8 | -0.2 | 1159 | 1 | 453 | 1 |
| Gorodovikovsk | 339 | 23 | 17.8 | -0.8 | 1298 | -3 | 635 | -5 |
| Krasnodarskiy Kray | 379 | 4 | 14.7 | 0.1 | 1222 | -2 | 491 | -3 |
| Kurganskaya Oblast | 259 | -4 | 13.3 | 0.4 | 1098 | -1 | 441 | 2 |
| Kirovskaya Oblast | 440 | 40 | 11.0 | -0.8 | 965 | -8 | 351 | -10 |
| Kurskaya Oblast | 414 | 40 | 13.4 | -1.3 | 1129 | -4 | 448 | -10 |
| Lipetskaya Oblast | 378 | 30 | 13.3 | -1.4 | 1113 | -5 | 440 | -11 |
| Mordoviya Rep. | 452 | 47 | 12.4 | -1.3 | 1053 | -8 | 406 | -12 |
| Novosibirskaya Oblast | 365 | 32 | 13.7 | 1.3 | 1069 | -4 | 434 | 3 |
| Nizhegorodskaya O. | 405 | 32 | 11.8 | -1.3 | 1010 | -9 | 377 | -13 |
| Orenburgskaya Oblast | 312 | 25 | 14.6 | -0.5 | 1241 | -1 | 541 | -1 |
| Omskaya Oblast | 328 | 20 | 14.0 | 1.5 | 1056 | -3 | 441 | 6 |
| Permskaya Oblast | 394 | 22 | 11.3 | -0.2 | 976 | -6 | 358 | -6 |
| Penzenskaya Oblast | 440 | 51 | 12.9 | -1.2 | 1095 | -6 | 433 | -9 |
| Rostovskaya Oblast | 269 | 0 | 17.0 | -0.8 | 1299 | -1 | 621 | -3 |
| Ryazanskaya Oblast | 430 | 42 | 12.7 | -1.5 | 1024 | -10 | 399 | -14 |
| Stavropolskiy Kray | 422 | 0 | 17.2 | -0.4 | 1327 | 0 | 637 | 0 |
| Sverdlovskaya Oblast | 284 | -10 | 12.0 | 0.3 | 1043 | -1 | 397 | 3 |
| Samarskaya Oblast | 326 | 10 | 13.8 | -0.8 | 1202 | 1 | 493 | -2 |
| Saratovskaya Oblast | 340 | 38 | 14.8 | -1.0 | 1239 | -1 | 544 | -3 |

| | RAIN Current (mm) | RAIN 15YA Departure (%) | TEMP Current (°C) | TEMP 15YA Departure (°C) | RADPAR Current (MJ/m²) | RADPAR 15YA Departure (%) | BIOMSS Current (gDM/m²) | BIOMSS 15YA Departure (%) |
|---|---|---|---|---|---|---|---|---|
| Tambovskaya Oblast | 384 | 34 | 13.5 | -1.3 | 1115 | -7 | 450 | -11 |
| Tyumenskaya Oblast | 289 | 5 | 13.3 | 1.2 | 1035 | -2 | 419 | 5 |
| Tatarstan Rep. | 376 | 22 | 12.3 | -0.8 | 1105 | -1 | 420 | -4 |
| Ulyanovskaya Oblast | 398 | 31 | 12.9 | -1.0 | 1144 | -1 | 452 | -4 |
| Udmurtiya Rep. | 419 | 38 | 11.6 | -0.6 | 1002 | -6 | 371 | -8 |
| Volgogradskaya O. | 274 | 23 | 16.2 | -0.9 | 1257 | -3 | 585 | -3 |
| Voronezhskaya Oblast | 358 | 23 | 14.5 | -1.1 | 1200 | -3 | 507 | -7 |

**Table A.10 United States, Apr 2020 - Jul 2020 agroclimatic indicators (by state)**

| | RAIN Current (mm) | RAIN 15YA Departure (%) | TEMP Current (°C) | TEMP 15YA Departure (°C) | RADPAR Current (MJ/m²) | RADPAR 15YA Departure (%) | BIOMSS Current (gDM/m²) | BIOMSS 15YA Departure (%) |
|---|---|---|---|---|---|---|---|---|
| Arkansas | 440 | 3 | 21.8 | -0.9 | 1361 | -2 | 776 | -3 |
| California | 100 | -8 | 17.6 | 0.3 | 1604 | -1 | 415 | -14 |
| Idaho | 280 | 14 | 11.4 | -0.8 | 1422 | -3 | 450 | -11 |
| Indiana | 392 | -15 | 17.9 | -0.7 | 1276 | -3 | 653 | -3 |
| Illinois | 492 | 12 | 18.2 | -1.0 | 1264 | -5 | 651 | -6 |
| Iowa | 475 | 14 | 17.2 | -0.6 | 1258 | -4 | 631 | -3 |
| Kansas | 359 | 6 | 20.8 | -0.7 | 1372 | -4 | 763 | -4 |
| Michigan | 362 | -5 | 13.7 | -0.3 | 1239 | 0 | 524 | 4 |
| Minnesota | 386 | -4 | 14.4 | -0.4 | 1251 | 2 | 549 | 3 |
| Missouri | 455 | 15 | 19.6 | -1.0 | 1298 | -5 | 700 | -7 |
| Montana | 352 | 7 | 11.8 | -0.9 | 1356 | -2 | 500 | -6 |
| Nebraska | 415 | 21 | 18.0 | -0.5 | 1368 | -2 | 696 | -2 |
| North Dakota | 370 | 4 | 14.0 | -0.8 | 1302 | 1 | 558 | 1 |
| Ohio | 413 | -4 | 16.9 | -0.7 | 1257 | -3 | 621 | -2 |
| Oklahoma | 335 | -4 | 22.8 | -0.5 | 1403 | -1 | 828 | 1 |
| Oregon | 232 | -3 | 12.9 | 0.0 | 1348 | -2 | 464 | -6 |
| South Dakota | 351 | -1 | 16.3 | -0.6 | 1350 | 0 | 647 | 0 |
| Texas | 356 | 14 | 25.2 | 0.0 | 1426 | -1 | 877 | 2 |
| Washington | 287 | 10 | 12.8 | -0.4 | 1269 | -5 | 442 | -10 |
| Wisconsin | 435 | 7 | 14.2 | -0.5 | 1250 | 1 | 542 | 2 |

**Table A.11 China, Apr 2020 - Jul 2020 agroclimatic indicators (by province)**

| | RAIN Current (mm) | RAIN 15YA Departure (%) | TEMP Current (°C) | TEMP 15YA Departure (°C) | RADPAR Current (MJ/m²) | RADPAR 15YA Departure (%) | BIOMSS Current (gDM/m²) | BIOMSS 15YA Departure (%) |
|---|---|---|---|---|---|---|---|---|
| Anhui | 1137 | 57 | 21.8 | -0.3 | 1060 | -10 | 613 | -9 |
| Chongqing | 1183 | 42 | 19.7 | -0.4 | 932 | -14 | 498 | -16 |
| Fujian | 901 | -34 | 21.9 | 0.5 | 1172 | 13 | 696 | 15 |
| Gansu | 348 | -1 | 13.7 | -0.3 | 1294 | -2 | 493 | -6 |
| Guangdong | 1083 | -33 | 24.6 | 0.5 | 1250 | 13 | 805 | 13 |
| Guangxi | 1252 | -12 | 23.4 | 0.2 | 1127 | 5 | 707 | 6 |
| Guizhou | 1180 | 12 | 19.0 | 0.0 | 899 | -8 | 465 | -8 |
| Hebei | 192 | -17 | 19.1 | -0.3 | 1362 | -2 | 631 | -6 |
| Heilongjiang | 364 | 15 | 14.5 | -0.5 | 1228 | -1 | 509 | -3 |

| | RAIN Current (mm) | RAIN 15YA Departure (%) | TEMP Current (°C) | TEMP 15YA Departure (°C) | RADPAR Current (MJ/m²) | RADPAR 15YA Departure (%) | BIOMSS Current (gDM/m²) | BIOMSS 15YA Departure (%) |
|---|---|---|---|---|---|---|---|---|
| **Henan** | 472 | 24 | 21.8 | -0.6 | 1200 | -7 | 650 | -10 |
| **Hubei** | 1107 | 46 | 20.4 | -0.5 | 1015 | -12 | 553 | -14 |
| **Hunan** | 1269 | 14 | 21.6 | 0.1 | 1037 | -2 | 602 | -2 |
| **Jiangsu** | 850 | 38 | 21.5 | -0.4 | 1106 | -8 | 616 | -9 |
| **Jiangxi** | 1344 | 5 | 22.6 | 0.4 | 1125 | 7 | 674 | 8 |
| **Jilin** | 350 | -4 | 15.4 | -0.4 | 1257 | -2 | 550 | -2 |
| **Liaoning** | 248 | -25 | 17.1 | -0.1 | 1285 | -2 | 594 | -3 |
| **Inner Mongolia** | 238 | 11 | 15.5 | -0.1 | 1320 | -3 | 560 | -3 |
| **Ningxia** | 182 | 5 | 16.6 | -0.3 | 1430 | 2 | 613 | -5 |
| **Shaanxi** | 415 | -6 | 17.7 | -0.4 | 1231 | -5 | 570 | -10 |
| **Shandong** | 326 | 3 | 21.1 | -0.8 | 1287 | -5 | 659 | -11 |
| **Shanxi** | 224 | -4 | 17.0 | -0.6 | 1364 | -2 | 570 | -10 |
| **Sichuan** | 970 | 19 | 16.9 | -0.4 | 1040 | -9 | 463 | -10 |
| **Yunnan** | 1134 | 20 | 18.0 | -0.2 | 1036 | -4 | 488 | -4 |
| **Zhejiang** | 1078 | 3 | 21.0 | 0.3 | 1039 | -2 | 573 | -2 |

# Annex B. Quick reference to CropWatch indicators, spatial units and methodologies

The following sections give a brief overview of CropWatch indicators and spatial units, along with a description of the CropWatch production estimation methodology. For more information about CropWatch methodologies, visit CropWatch online at www.cropwatch.com.cn**.**

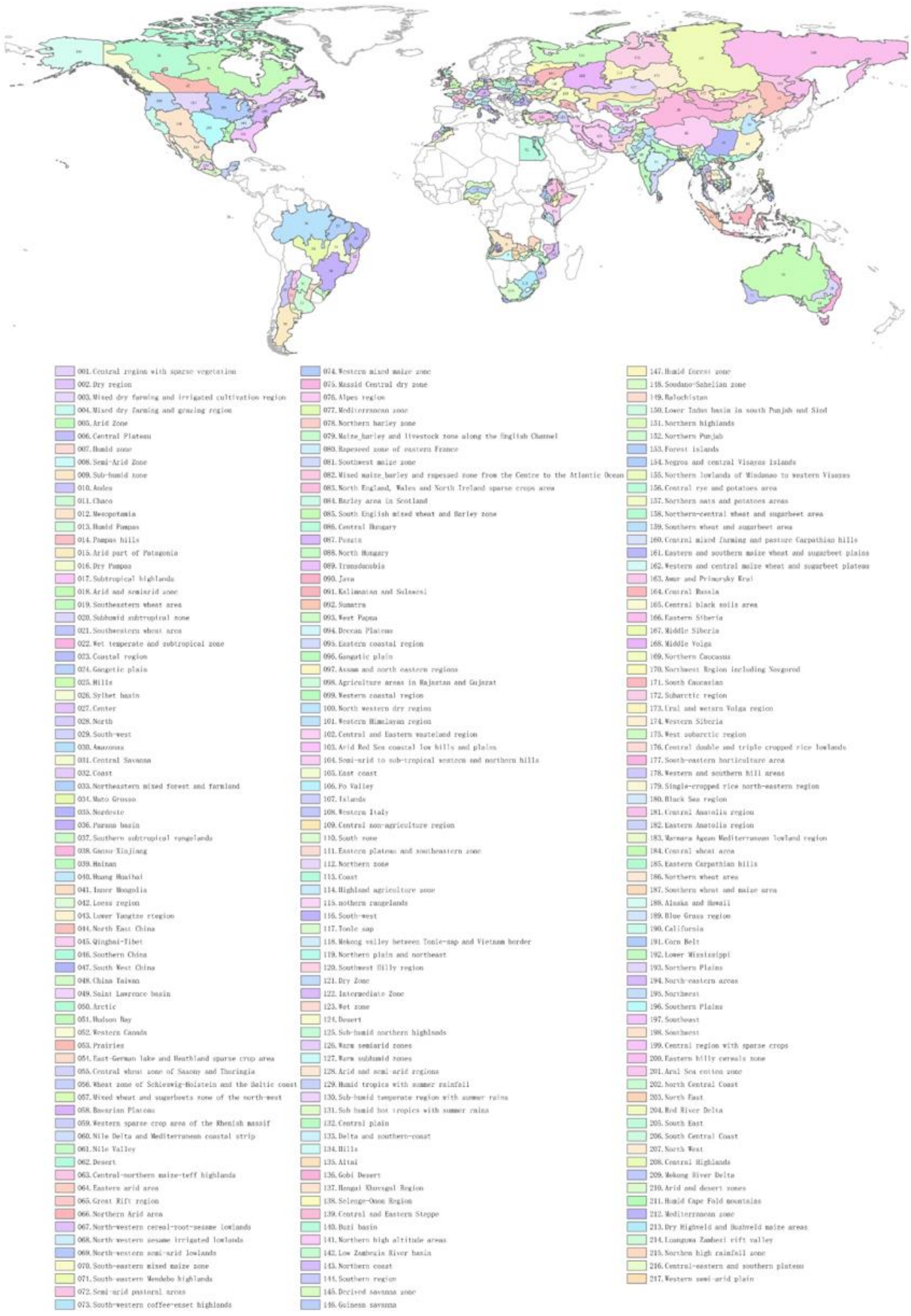
**Agroecological zones for 43 key countries**

***Overview***

217 agroecological zones for the 43 key countries across the globe

***Description***

43 key agricultural countries are divided into 217 agro-ecological zones based on cropping systems, climatic zones, and topographic conditions. Each country is considered separately. A limited number of regions (e.g., region 001, region 027, and region 127) are not relevant for the crops currently monitored by CropWatch but are included to allow for more complete coverage of the 43 key countries. Some regions are more relevant for rangeland and livestock monitoring, which is also essential for food security.




**CropWatch indicators**

The CropWatch indicators are designed to assess the condition of crops and the environment in which they grow and develop; the indicators—RAIN (for rainfall), TEMP (temperature), and RADPAR (photosynthetically active radiation, PAR)—are not identical to the weather variables, but instead are value-added indicators computed only over crop growing areas (thus for example excluding deserts and rangelands) and spatially weighted according to the agricultural production potential, with marginal areas receiving less weight than productive ones. The indicators are expressed using the usual physical units (e.g., mm for rainfall) and were thoroughly tested for their coherence over space and time. CWSU are the CropWatch Spatial Units, including MRUs, MPZ, and countries (including first-level administrative districts in select large countries). For all indicators, high values indicate "good" or "positive."

**INDICATOR**

| | | | |
|---|---|---|---|
| **BIOMSS** | | | |
| **Biomass accumulation potential** | | | |
| **Crop/ Ground and satellite** | Grams dry matter/m$^2$, pixel or CWSU | An estimate of biomass that could potentially be accumulated over the reference period given the prevailing rainfall and temperature conditions. | Biomass is presented as maps by pixels, maps showing average pixels values over CropWatch spatial units (CWSU), or tables giving average values for the CWSU. Values are compared to the average value for the last five years (2015-2019), with departures expressed in percentage. |
| **CALF** | | | |
| **Cropped arable land and cropped arable land fraction** | | | |
| **Crop/ Satellite** | [0,1] number, pixel or CWSU average | The area of cropped arable land as fraction of total (cropped and uncropped) arable land. Whether a pixel is cropped or not is decided based on NDVI twice a month. (For each four-month reporting period, each pixel thus has 8 cropped/ uncropped values). | The value shown in tables is the maximum value of the 8 values available for each pixel; maps show an area as cropped if at least one of the 8 observations is categorized as "cropped." Uncropped means that no crops were detected over the whole reporting period. Values are compared to the average value for the last five years (2015-2019), with departures expressed in percentage. |
| **CROPPING INTENSITY** | | | |
| **Cropping intensity Index** | | | |
| **Crop/ Satellite** | 0, 1, 2, or 3; Number of crops growing over a year for each pixel | Cropping intensity index describes the extent to which arable land is used over a year. It is the ratio of the total crop area of all planting seasons in a year to the total area of arable land. | Cropping intensity is presented as maps by pixels or spatial average pixels values for MPZs, 42 countries, and 7 regions for China. Values are compared to the average of the previous five years, with departures expressed in percentage. |
| **NDVI** | | | |
| **Normalized Difference Vegetation Index** | | | |
| **Crop/ Satellite** | [0.12-0.90] number, pixel or CWSU average | An estimate of the density of living green biomass. | NDVI is shown as average profiles over time at the national level (cropland only) in crop condition development graphs, compared with previous year and recent five-year average (2015-2019), and as spatial patterns compared to the average showing the time profiles, where they occur, and the percentage of pixels concerned by each profile. |
| **RADPAR** | | | |
| **CropWatch indicator for Photosynthetically Active Radiation (PAR), based on pixel based PAR** | | | |
| **Weather /Satellite** | W/m$^2$, CWSU | The spatial average (for a CWSU) of PAR accumulation over agricultural pixels, weighted by the production potential. | RADPAR is shown as the percent departure of the RADPAR value for the reporting period compared to the recent fifteen-year average (2005-2019), per CWSU. For the MPZs, regular PAR is shown as typical time profiles over the spatial unit, with a map showing where the profiles occur and the percentage of pixels concerned by each profile. |
| **RAIN** | | | |
| **CropWatch indicator for rainfall, based on pixel-based rainfall** | | | |
| **Weather /Ground** | Liters/m$^2$, CWSU | The spatial average (for a CWSU) of rainfall accumulation over agricultural | RAIN is shown as the percent departure of the RAIN value for the reporting period, compared to |

| INDICATOR | | | |
|---|---|---|---|
| **and satellite** | | pixels, weighted by the production potential. | the recent fifteen-year average (2005-19), per CWSU. For the MPZs, regular rainfall is shown as typical time profiles over the spatial unit, with a map showing where the profiles occur and the percentage of pixels concerned by each profile. |
| **TEMP** | | | |
| **CropWatch indicator for air temperature, based on pixel-based temperature** | | | |
| **Weather /Ground** | °C, CWSU | The spatial average (for a CWSU) of the temperature time average over agricultural pixels, weighted by the production potential. | TEMP is shown as the departure of the average TEMP value (in degrees Centigrade) over the reporting period compared with the average of the recent fifteen years (2005-19), per CWSU. For the MPZs, regular temperature is illustrated as typical time profiles over the spatial unit, with a map showing where the profiles occur and the percentage of pixels concerned by each profile. |
| **VCIx** | | | |
| **Maximum vegetation condition index** | | | |
| **Crop/ Satellite** | Number, pixel to CWSU | Vegetation condition of the current season compared with historical data. Values usually are [0, 1], where 0 is "NDVI as bad as the worst recent year" and 1 is "NDVI as good as the best recent year." Values can exceed the range if the current year is the best or the worst. | VCIx is based on NDVI and two VCI values are computed every month. VCIx is the highest VCI value recorded for every pixel over the reporting period. A low value of VCIx means that no VCI value was high over the reporting period. A high value means that at least one VCI value was high. VCI is shown as pixel-based maps and as average value by CWSU. |
| **VHI** | | | |
| **Vegetation health index** | | | |
| **Crop/ Satellite** | Number, pixel to CWSU | The average of VCI and the temperature condition index (TCI), with TCI defined like VCI but for temperature. VHI is based on the assumption that "high temperature is bad" (due to moisture stress), but ignores the fact that low temperature may be equally "bad" (crops develop and grow slowly, or even suffer from frost). | Low VHI values indicate unusually poor crop condition, but high values, when due to low temperature, may be difficult to interpret. VHI is shown as typical time profiles over Major Production Zones (MPZ), where they occur, and the percentage of pixels concerned by each profile. |
| **VHIn** | | | |
| **Minimum Vegetation health index** | | | |
| **Crop/ Satellite** | Number, pixel to CWSU | VHIn is the lowest VHI value for every pixel over the reporting period. Values usually are [0, 100]. Normally, values lower than 35 indicate poor crop condition. | Low VHIn values indicate the occurrence of water stress in the monitoring period, often combined with lower than average rainfall. The spatial/time resolution of CropWatch VHIn is 4km/week for MPZs and 1km/dekad for China. |

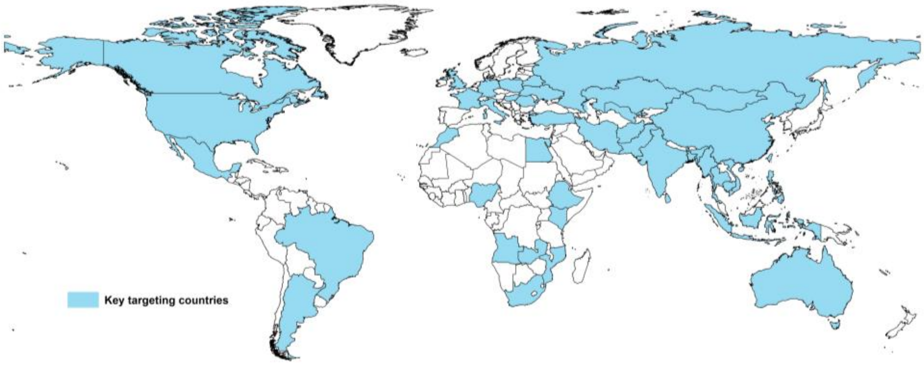
*Note:* Type is either "Weather" or "Crop"; source specifies if the indicator is obtained from ground data, satellite readings, or a combination; units: in the case of ratios, no unit is used; scale is either pixels or large scale CropWatch spatial units (CWSU). Many indicators are computed for pixels but represented in the CropWatch bulletin at the CWSU scale.

### CropWatch spatial units (CWSU)

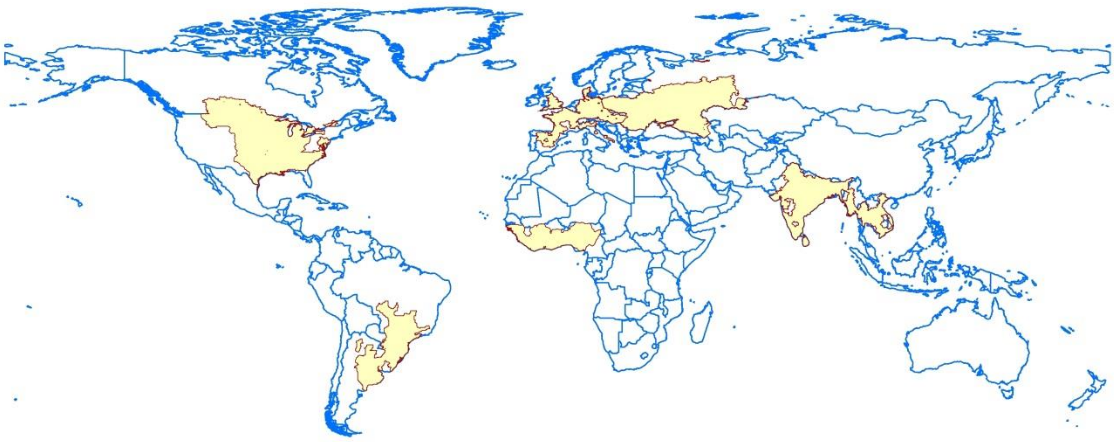
CropWatch analyses are applied to four kinds of CropWatch spatial units (CWSU): Countries, China, Major Production Zones (MPZ), and global crop Mapping and Reporting Units (MRU). The tables below summarize the key aspects of each spatial unit and show their relation to each other. For more details about these spatial units and their boundaries, see the CropWatch bulletin online resources.

| SPATIAL LUNITS | |
|---|---|
| **CHINA** | |
| ***Overview*** | *Description* |
| **Seven monitoring regions** | The seven regions in China are agro-economic/agro-ecological regions that together cover the bulk of national maize, rice, wheat, and soybean production. Provinces that are entirely or partially included in one of the monitoring regions are indicated in color on the map below. |

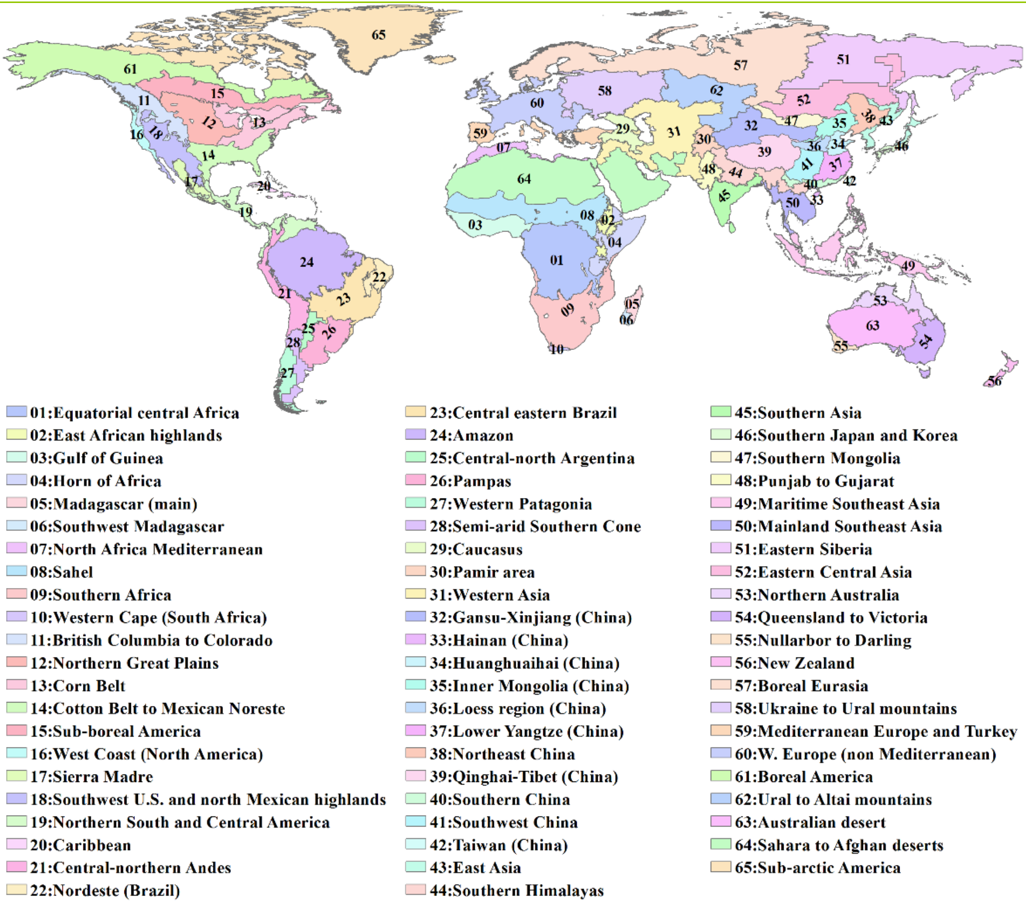
| Countries (and first-level administrative districts, e.g., states and provinces) | |
|---|---|
| *Overview* | *Description* |
| **“42 + 1” countries to represent main producers/exporters and other key countries.** | CropWatch monitored countries together represent more than 80% of the production of maize, rice, wheat and soybean, as well as 80% of exports. Some countries were included in the list based on criteria of proximity to China (Uzbekistan, Cambodia), regional importance, or global geopolitical relevance (e.g., four of five most populous countries in Africa). The total number of countries monitored is “42 + 1,” referring to 42 and China itself. For the nine largest countries—, United States, Brazil, Argentina, Russia, Kazakhstan, India, China, and Australia, maps and analyses may also present results for the first-level administrative subdivision. The CropWatch agroclimatic indicators are computed for all countries and included in the analyses when abnormal conditions occur. Background information about the countries’ agriculture and trade is available on the CropWatch Website, **www.cropwatch.com.cn**. |




| Major Production Zones (MPZ) | |
|---|---|
| *Overview* | *Description* |
| **Seven globally important areas of agricultural production** | The six MPZs include West Africa, South America, North America, South and Southeast Asia, Western Europe and Central Europe to Western Russia. The MPZs are not necessarily the main production zones for the four crops (maize, rice, soybean, wheat) currently monitored by CropWatch, but they are globally or regionally important areas of agricultural production. The seven zones were identified based mainly on production statistics and distribution of the combined cultivation area of maize, rice, wheat and soybean. |



| Global Mapping and Reporting Unit (MRU) | |
|---|---|
| ***Overview*** | *Description* |
| **65 agro-ecological/agro-economic units across the world** | MRUs are reasonably homogeneous agro-ecological/agro-economic units spanning the globe, selected to capture major variations in worldwide farming and crops patterns while at the same time providing a manageable (limited) number of spatial units to be used as the basis for the analysis of environmental factors affecting crops. Unit numbers and names are shown in the figure below. A limited number of units (e.g., MRU-63 to 65) are not relevant for the crops currently monitored by CropWatch but are included to allow for more complete coverage of global production. Additional information about the MRUs is provided online under **www.cropwatch.com.cn** . |




## Production estimation methodology

The main concept of the CropWatch methodology for estimating production is the calculation of current year production based on information about last year's production and the variations in crop yield and cultivated area compared with the previous year. The equation for production estimation is as follows:

$$Production_i = Production_{i-1} * (1 + \Delta Yield_i) * (1 + \Delta Area_i)$$

Where i is the current year, $\Delta Yield_i$ and $\Delta Area_i$ are the variations in crop yield and cultivated area compared with the previous year; the values of $\Delta Yield_i$ and $\Delta Area_i$ can be above or below zero.

For the 42 countries monitored by CropWatch, yield variation for each crop is calibrated against NDVI time series, using the following equation:

$$\Delta Yield_i = f(NDVI_i, NDVI_{i-1})$$

Where $NDVI_i$ and $NDVI_{i-1}$ are taken from the time series of the spatial average of NDVI over the crop specific mask for the current year and the previous year. For NDVI values that correspond to periods after the current monitoring period, average NDVI values of the previous five years are used as an average expectation. $\Delta Yield_i$ is calculated by regression against average or peak NDVI (whichever yields the best regression), considering the crop phenology of each crop for each individual country.

A different method is used for areas. For China, CropWatch combines remote-sensing based estimates of the crop planting proportion (cropped area to arable land) with a crop type proportion (specific type area to total cropped area). The planting proportion is estimated based on an unsupervised classification of high resolution satellite images from HJ-1 CCD and GF-1 images. The crop-type proportion for China is obtained by the GVG instrument from field transects. The area of a specific crop is computed by multiplying farmland area, planting proportion, and crop-type proportion of the crop.

To estimate crop area for wheat, soybean, maize, and rice outside China, CropWatch relies on the regression of crop area against cropped arable land fraction of each individual country (paying due attention to phenology):

$$Area_i = a + b * CALF_i$$

where a and b are the coefficients generated by linear regression with area from FAOSTAT or national sources and CALF the Cropped Arable Land Fraction from CropWatch estimates. $\Delta Area_i$ can then be calculated from the area of current and the previous years.

The production for "other countries" (outside the 31 CropWatch monitored countries) was estimated as the linear trend projection for 2017 of aggregated FAOSTAT data (using aggregated world production minus the sum of production by the 31 CropWatch monitored countries).

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# Acknowledgments

This bulletin is produced by the CropWatch research team at the Aerospace Information Research Institute (AIR), at the Chinese Academy of Sciences in Beijing, China. The team gratefully acknowledges the active support of a range of organizations and individuals, both in China and elsewhere.

Financial and programmatic support is provided by the Ministry of Science and Technology of the People's Republic of China, National Natural Science Foundation of China, and the Chinese Academy of Sciences. We specifically would like to acknowledge the financial support through The National Key Research and Development Program of China, Grant No:2016YFA0600300; National Natural Science Foundation, Grant No: 41561144013; the Strategic Priority Research Program of Chinese Academy of Sciences Grant No: XDA1903020; the Key Collaborative Research Program of the Alliance of International Science Organizations Grant No. ANSO-CR-KP-2020-07.

The following contributions by national organizations and individuals are greatly appreciated: China Center for Resources Satellite Data and Application for providing the HJ-1 CCD data; China Meteorological Satellite Center for providing FY-2/3 data; China Meteorological Data Sharing Service System for providing the agro-meteorological data; short-term weather forecasts, medium- and long-term (extended-period) forecasts and seasonal forecasts from the FGOALS-f2 Weather-Climate Dynamics Ensemble Prediction System provided by the Atmospheric Physics Research Belt and Road Disaster Prevention Service (ANSO-MISSPAD) project, Chinese Academy of Sciences dataset and the National Centers for Environmental Prediction (NCEP) Climate Prediction System version 2 reanalysis data (Coupled forecast system model version 2, CFSv2); and Chia Tai Group (China) for providing GVG (GPS, Video, and GIS) field sampling data.

The following contributions by international organizations and individuals are also recognized: François Kayitakire at FOODSEC/JRC for making available and allowing use of their crop masks; Ferdinando Urbano also at FOODSEC/JRC for his help with data; Herman Eerens, Dominique Haesen, and Antoine Royer at VITO, for providing the JRC/MARS SPIRITS software, Spot Vegetation imagery and growing season masks, together with generous advice; Patrizia Monteduro and Pasquale Steduto for providing technical details on GeoNetwork products; and IIASA and Steffen Fritz for their land use map.

# Online resources

Online Resources posted on **www.cropwatch.com.cn** , **http://cloud.cropwatch.com.cn/**

This bulletin is only part of the CropWatch resources available. Visit **www.cropwatch.com.cn** for access to additional resources, including the methods behind CropWatch, country profiles, and other CropWatch publications. For additional information or to access specific data or high-resolution graphs, simply contact the CropWatch team at **cropwatch@radi.ac.cn**.

CropWatch bulletins introduce the use of several new and experimental indicators. We would be very interested in receiving feedback about their performance in other countries. With feedback on the contents of this report and the applicability of the new indicators to global areas, please contact:

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