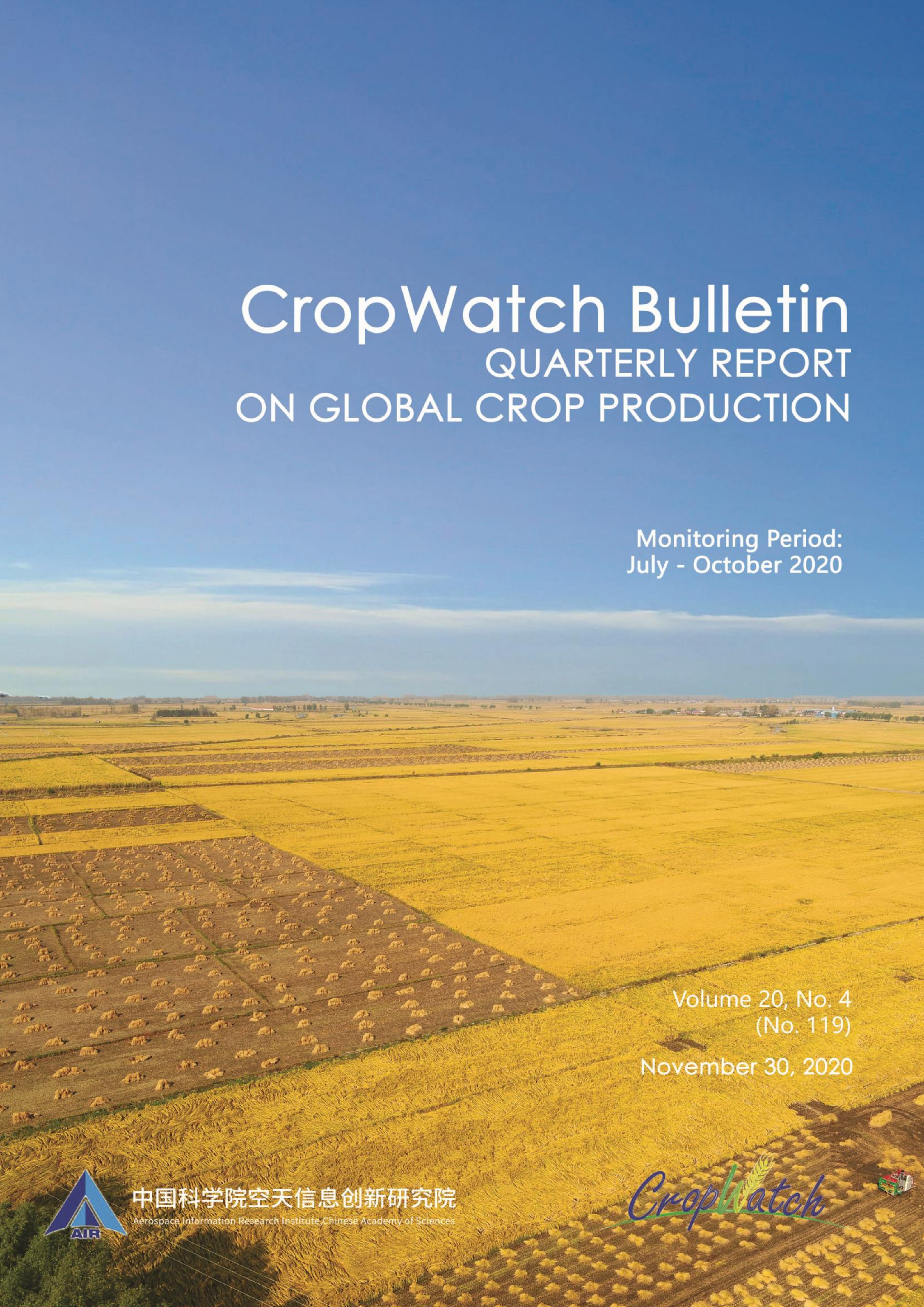

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QUARTERLY REPORT ON GLOBAL CROP PRODUCTION

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CropWatch

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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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Abbreviations

5YA	Five-year average, the average for the four-month period from July to October for 2015-2019; one of the standard reference periods.
15YA	Fifteen-year average, the average for the four-month period from July to October 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 July and October 2020, a period referred to in this bulletin as the JASO (July, August, September and October) period or just the "reporting period." The bulletin is the 119th 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 October 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 third CropWatch production estimates for selected countries and reviews the first production estimation in chapter 5.

This report for the period from July to October 2020 covers wheat, maize, soybean and rice production in the Northern Hemisphere. Winter wheat reached maturity in June/July. The harvest of the summer crops (spring wheat, maize, rice and soybean) started in August and was mostly finished by the end of October. In the southern hemisphere, wheat is the only major crop that was grown during this monitoring period. It reaches maturity in October (Southern Brazil) or in November and December (Argentina, South Africa and Australia).

So far, the outbreak of COVID-19 has had limited impact on the production of the major crops. As this, and other reports, show, production levels of the major staple crops, such as maize, rice, wheat and soybean remained high and also benefitted from generally favorable weather conditions. However, disruptions in the domestic food supply chains, price hikes, loss of remittances and income have mostly hurt the people who were already poor. Before the pandemic outbreak covered the entire globe, 690 million people were already chronically and 135 million were acutely food insecure. The U.N. World Food Programme has warned that an additional 130 million could face acute food insecurity by the end of 2020.

Another plague, the outbreak of desert locusts in East Africa, Middle East and southwest Asia is still not under control either. According to the FAO, the situation remains alarming in Ethiopia, Kenya and Somalia, a region where millions of people already face acute food insecurity.

Agro-climatic conditions

According to the analyses presented in Chapters 1 and 3.1, prevailing climate conditions during the current 2020 JASO 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.

At the global scale, the series of record or close to record high temperatures continued throughout this monitoring period: July and August ranked as 2nd, September as 1st and October as the 4th warmest respective months in past 141 years. For the months from January to October, this was the second warmest period on record. The temperature departure was +1.0°C above the 20th century average.

Overall, the prospects for crop production were quite favorable, mainly because no prolonged, large scale droughts were observed. In many regions, the crops benefitted from the above average rainfall that had been recorded for the previous monitoring period. The stored soil moisture helped sustain crop growth, even when precipitation was below average. Below average rainfall was recorded for Central and South America (-14%) and North America (-11%), mainly in the Western USA. Conditions were drier than usual in Europe as well (-6%). Above average rainfall was recorded for Central Asia (+20%) and East Asia (+19%). The latter started this monitoring period under drought conditions, but a series of typhoons and tropical depression brought large amounts of rainfall to that region. Conditions turned back to normal in Oceania as well, where rainfall was 8% above average.

The following is a summary of the conditions in the key production regions:

- North America: Production conditions were generally favorable for maize and soybean. Harvest benefitted from slightly drier than usual conditions. US maize (+2%), rice (+2%) and soybean (+2%) production is estimated to increase. A reduction by 3 % is expected for wheat. In Canada, soybean production remained at the same level as last year, whereas wheat increased by +5%.

- South America: Wheat production in Brazil was favorable (+3%), but Argentina suffered from drought conditions (-16%). A delay in the onset of the summer rains delayed sowing of maize and soybean in Brazil. La Niña may cause further rainfall deficits in Brazil and Argentina in the coming months.

- Europe: Rainfall was generally on the dry side. Production of summer crops was slightly below normal.

- Africa: Abundant rainfall benefitted the crops in the Horn of Africa and West Africa. Wheat in South Africa also benefitted from favorable weather conditions

- Eastern Europe to the Ural: Romania, the northern Caucasus and Volga regions of Russia, as well as the Ukraine suffered from a rainfall deficit which caused reduced yields of the summer crops.

- Siberia and Kazakhstan: benefited from above average rainfall and above average wheat yields were harvested in that region.

- China: It generally benefitted from abundant rainfall and production slightly increased over last year's levels: Maize production is estimated to increase by 0.8%, wheat by 2,9% and soybean by 0.9%. Rice production remained stable (-0.2%), despite of the heavy floods in the Yangtze river basin in early summer. The north-east was hit by 3 typhoons, causing wind damage and local floods affecting about 1 million ha of maize.

- South Asia: India, as well as Pakistan benefitted from favorable monsoon rains and rice production increased by more than 6% in both countries. Bangladesh, on the other hand, experienced severe floods and production is expected to decrease by 6%.

- South-East Asia: This region recovered from the drought conditions. Several typhoons, most of them hitting the area just after harvest of the main rice crops, brought plenty of rainfall to the region. Production is estimated at average levels.

- Australia: Especially the south-east recovered from last year's severe drought and a sharp increase by 8.57 million tons (+44.3%) from 2019 is estimated for wheat.

In 2020, global maize production is expected to be at 1.070 billion tons, an increase of 1.4% or equivalent to 15.15 million tons; global rice production is expected to be 760 million tons at an increase of 0.9% or an increase of 6.80 million tons; global wheat production is 738 million tons, an 3.1% increase of 21.98 million tons; global soybean production is expected to be 323 million tons, a slight decrease of 0.2%. In 2020, the global production of the major cereals and oil crops will be generally stable.

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 July 2020 to October 2020, JASO, referred to as "reporting period". In this chapter, we focus on 65 spatial "Mapping and Reporting Units" (MRU) which cover the globe, but CWAIs are averages of climatic variables over agricultural areas only inside each MRU. For instance, in the "Sahara to Afghan desert" MRU, only the Nile valley and other cropped areas are considered. MRUs are listed in Annex B and serve the purpose of identifying global climatic patterns. Refer to Annex A for definitions and to table A.1 for 2020 JASO numeric values of CWAIs by MRU. Although they are expressed in the same units as the corresponding climatological variables, CWAIs are spatial averages limited to agricultural land and weighted by the agricultural production potential inside each area.

We also stress that the reference period, referred to as "average" in this bulletin covers the 15-year period from 2005 to 2019. Although departures from the 2005-2019 are not anomalies (which, strictly, refer to a "normal period" of 30 years), we nevertheless use that terminology. The specific reason why CropWatch refers to the most recent 15 years is our focus on agriculture, as already mentioned in the previous paragraph. 15 years is deemed an acceptable compromise between climatological significance and agricultural significance: agriculture responds much faster to persistent climate variability than 30 years, which is a full generation. For "biological" (agronomic) indicators used in subsequent chapters we adopt an even shorter reference period of 5 years (i.e. 2015-2019) but the BIOMSS indicator is nevertheless compared against the longer 15YA (fifteen-year average). This makes provision for the fast response of markets to changes in supply but also to the fact that in spite of the long warming trend, some recent years (e.g. 2008 or 2010-13) were below the trend.

Correlations between variables (RAIN, TEMP, RADPAR, BIOMSS) at MRU scale derive directly from climatology. For instance, the positive correlation between rainfall and temperature results from high rainfall in equatorial, i.e. in warm areas.

Considering the size of the areas covered in this section, even small departures may have dramatic effects on vegetation and agriculture due to the within-zone spatial variability of weather. It is important to note that we have adopted a new calculation procedure of the biomass production potential in the August 2019 bulletin. The new approach includes sunshine (RADPAR), TEMP and RAIN. Readers are referred to the August 2019 bulletin for details.

1.2 Global overview

At the global scale, the series of record or close-to-record high temperatures continued throughout this monitoring period: July and August ranked as 2nd, September as 1st and October as the 4th warmest respective months in recent history, according to NOAA, which bases its analyses on a global data set spanning 141 years. For the months from January to October, this was the second warmest period on record. The temperature departure was +1.0°C above the 20th century average.

For most crops, warmer temperatures tend to shorten the growth period, especially the grain filling phase. This means that the crops mature earlier and that the plants have fewer days to absorb solar radiation for photosynthesis. This in turn causes a yield reduction. Extreme high temperature events can reduce pollination in maize or cause terminal heat stress in wheat and lead to crop failures. The critical air high temperature threshold for crop growth is 35ºC. The exact thresholds depend on water supply and relative humidity. The plant canopy is usually a few degrees cooler than the air, due to transpiration. Water stress causes closure of the stomata, reduces evaporative cooling and increases leaf temperature. Climate change not only increases the temperatures, it also causes more frequent droughts that tend to last longer. Plants cannot stay cool due to a lack of water for transpiration and suffer even more from high temperatures. Hence, warmer temperatures in combination with droughts, which are fueled by climate change as well, will greatly increase the likelihood of crop failures and agricultural production will become more volatile.

CropWatch calculates the temperatures over cropland only. Averaged over all cropland, temperatures were the same as the 15-year average (15YA) for this period ranging from July to October, 2020. Rain dropped to below average (-1%) and photosynthetically active radiation (RADPAR) by -2.0%. Due to a reduction in solar radiation and rainfall, the estimated biomass (BIOMSS) dropped to below average levels as well (-3%).

Overall, the prospects for crop production were quite favorable, mainly because no prolonged, large scale droughts were observed. In many regions, the crops benefitted from the above-average rainfall that had been recorded for the previous monitoring period. The stored soil moisture helped sustain crop growth, even when precipitation was below average. Below-average rainfall was recorded for Central and South America (-14%) and North America (-11%). Conditions were drier than usual in Europe as well (-6%). Above-average rainfall was recorded for Central Asia (+20%) and East Asia (+19%). The latter started this monitoring period under drought conditions, but a series of typhoons and tropical depression brought large amounts of rainfall to that region. Conditions turned back to normal in Oceania as well, where rainfall was 8% above average.

Above-average temperatures were recorded for Central and South America (+0.5ºC) and Europe (+0.4ºC). For Central and East Asia, a drop to below average temperatures was observed (-0.4ºC). On the other continents, temperatures fluctuated around the long-term mean.

A large drop in solar radiation was observed for East Asia (-10%), followed by Central Asia (-5%) and Oceania (-4%). The only positive deviation was observed for Central and South America (+1%).

Biomass dropped by 10% for East Asia. It also dropped in Central and South America (-4%), followed by North America (-3%) and Africa (-3%). Conditions in Africa stayed close to the mean for rainfall (-3%), temperatures (-0.2ºC) and solar radiation (-3%). Hence, conditions for Africa were close to normal.

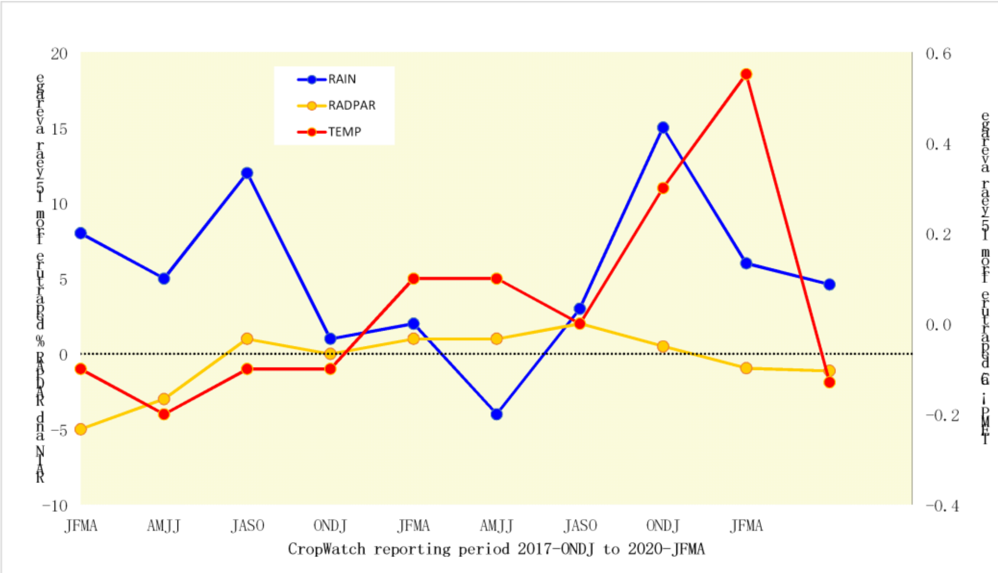

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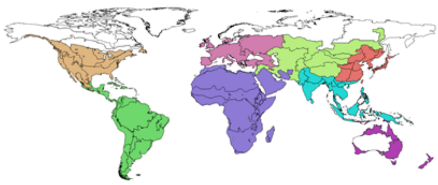
Figure 1.1 Global departure from recent 15 year average of theRAIN, TEMP and RADPAR indicators since 2017 ONDJ period (average of 65 MRUs, unweighted)

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	-3	-0.2	-2.6	-3.3
America S + C	-14	0.5	1.3	-4.1
America N	-11	-0.1	0.1	-3.5
Asia centre	20	-0.4	-4.7	0.9
Asia East	19	-0.4	-10.0	-10.2
Asia South	6	0.2	-1.6	-0.8
Europe	-6	0.4	-1.0	-1.2
Oceania	8	0.2	-4.2	-1.5
Others	-3	0.0	-0.3	-2.2
World	-1.0	0.0	-2.0	-3.0



1.3 Rainfall

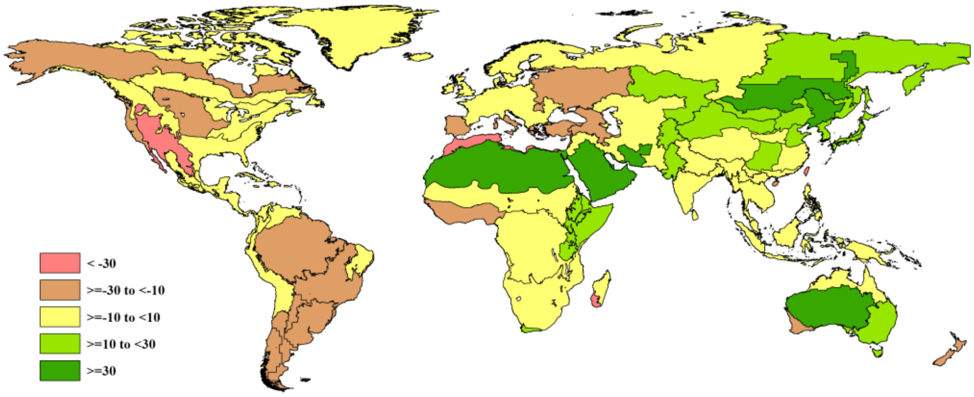


Figure 1.2 Global map of rainfall anomaly (as indicated by the RAIN indicator) by CropWatch Mapping and Reporting Unit: departure of July to October 2020 total from 2005-2019 average (15YA), in percent.

Rainfall was below average in most CropWatch Mapping and Reporting Units (MRU) of North America. The sharpest drop was observed for the Southwest of the United States and North Mexican Highlands (-36%), followed by the West Coast (-30%) and the Northern Great Plains (-17%). Moisture conditions were generally favorable in North America during the previous reporting period, except for the Western United States, where severe drought conditions had already been observed for the April to July period. Hence, the reduced rainfall had a limited negative impact on crop yields. The cotton belt to Mexican Nordeste received 5% more rainfall than the 15YA. The only other MRU with a positive departure in North America was Sub-boreal America. The Caribbean also received above-average rainfall (+7%), whereas all other MRUs in Central and South America experienced a rainfall deficit. The largest deficit was observed for the Pampas (-24%), followed by the Semi-arid Southern Cone (-19%), Amazon (-18%), Western Patagonia (-17%) and Central and Eastern Brazil (-16%). Hence, conditions in the Americas were generally drier than normal.

In Africa, where generally abundant rainfall had been observed for the last period, the conditions were more variable: The MRU from the Sahara to the Afghan desert received 46% more rainfall, yet the total was still low, at 33 mm. The Horn of Africa continued to receive above-average rainfall (+29%), as well as the Western Cape (+13%) and the East African Highlands (+10%). The wheat crops grown in these regions definitely benefitted from the above-average rainfall. Much drier-than-usual conditions were observed for Southwest Madagascar (-42%) and North Africa-Mediterranean (-36%) and the Gulf of Guinea (-22%).

Western Europe, which suffered from a rainfall deficit in the previous reporting period, received 10% more rainfall than usual. In all the other regions, Caucasus (-26%), Ukraine to Ural mountains (-11.5) and Mediterranean Europe and Turkey (-18%) a shortage of rainfall was observed.

In all of Central Asia, more rainfall than usual was recorded. The positive departures ranged between +59% in Eastern Central Asia and +8% for Qinghai-Tibet. This had a positive impact on cereal production in those MRUs.

Above-average rainfall was recorded for all MRUs in East Asia, except for Taiwan (China) (-60%). North-East China, which was hit by typhoons, had 46% higher rainfall, followed by Inner Mongolia (+24%) and Huanghuaihuai (+24%). The East Asia MRU received 25% more rainfall.

Conditions in South Asia were close to normal. Hainan received 25% less rainfall, whereas the largest positive departure was observed for the Punjab to Gujarat (+21%).

In Oceania, conditions were close to average, but mixed as well. Queensland to Victoria received more rainfall (+21%), whereas Nullarbor to Darling (-21%) and New Zealand (-18%) received less rainfall.

1.4 Temperatures

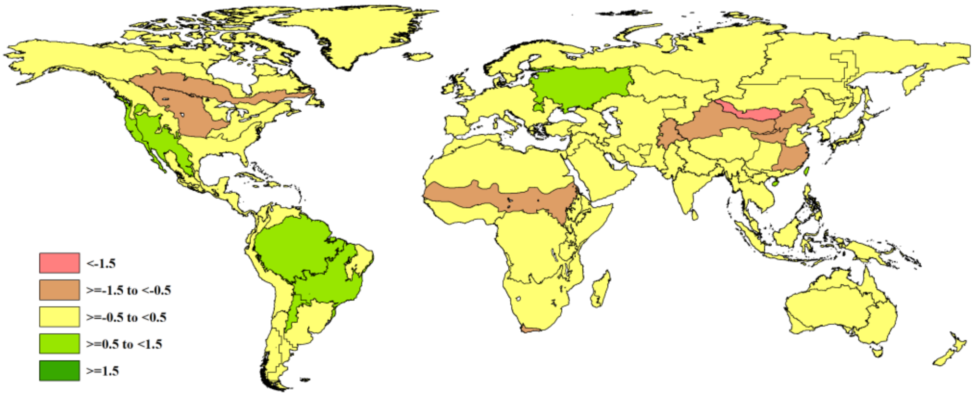


Figure 1.3 Global map of temperature anomaly (as indicated by the TEMP indicator) by CropWatch Mapping and Reporting Unit: departure of July to October 2020 average from 2005-2019 average (15YA), in °C

Temperatures were above average in the West Coast (+1.2ºC) and Southwest of the United States and North Mexican Highlands (+0.9ºC), the two MRUs which had experienced the largest drop in rainfall. Noteworthy are the slightly cooler conditions in the Northern Great Plains (-0.6ºC) and Corn Belt (-0.3ºC).

In South America, warmer conditions were measured for Central eastern Brazil (+0.9ºC), Amazon (+0.6ºC) and Central-north Argentina (+0.6ºC). Slightly above-average temperatures were recorded in the other MRUs of South America, except for Western Patagonia (-0.3ºC) and the Semi-Arid Southern Cone (-0.1ºC).

In Africa, cooler weather was recorded for the Western Cape (-0.6ºC) and the Sahel (-0.6ºC). The East African Highlands also experienced cooler temperatures than the 15YA: (-0.4ºC).

East Asia not only experienced more rainfall, but temperatures were cooler as well in return. The only exception is Taiwan (China), where the departure from the 15YA was +1.1ºC. In the MRUs of China, the largest negative departures were observed for the Loess region (-0.7ºC) and Inner Mongolia (-0.7ºC).

In Oceania, the departures ranged from +0.5ºC in New Zealand and Nullarbor to Darling to no departure for Queensland to Victoria.

1.5 RADPAR

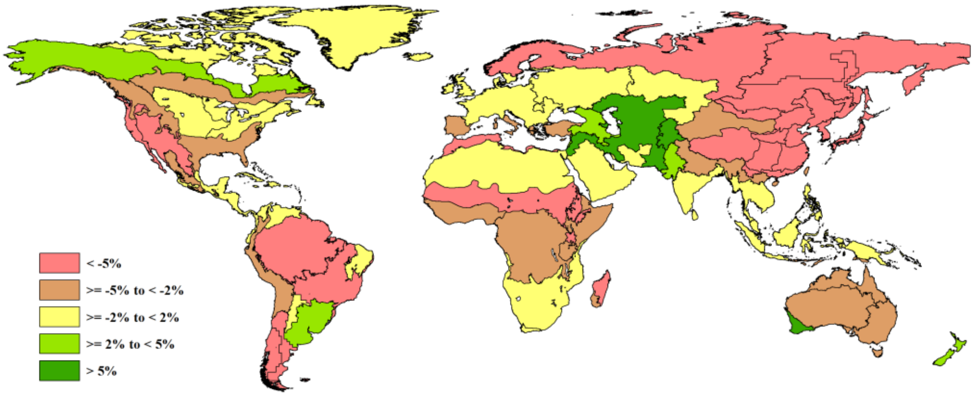


Figure 1.4 Global map of photosynthetically active radiation anomaly (as indicated by the RADPAR indicator) by CropWatch Mapping and Reporting Unit: departure of July to October 2020 total from 2005-2019 average (15YA), in percent.

In the Americas, the photosynthetically active solar radiation generally stayed close to the 15YA. In Africa, the East African highlands received 5.2% less solar radiation than usual, followed by Southern Africa (-3.6%) and Sahel (3.2%). In all the other MRUs of Africa, RADPAR departures were closer to zero. Similarly, RADPAR stayed close to average in Europe. However, sharp negative departures were observed for

Central and East Asia. The MRU Eastern Central Asia received 10.3% less solar radiation. However, the largest drop was observed for East Asia: In Southwest China, the departure was -18%. All important crop production regions of China also received less RADPAR: Lower Yangtze (-9.5%), Huanghuaihai (-5.1%), Loess region (-5.6%) and Northeast China (-8.6%). In South Asia, only Southern China (-6.5%) and Hainan (-5.4%) experienced a serious drop. A drop by -6.4% observed for Queensland to Victoria is noteworthy as well.

1.6 BIOMSS

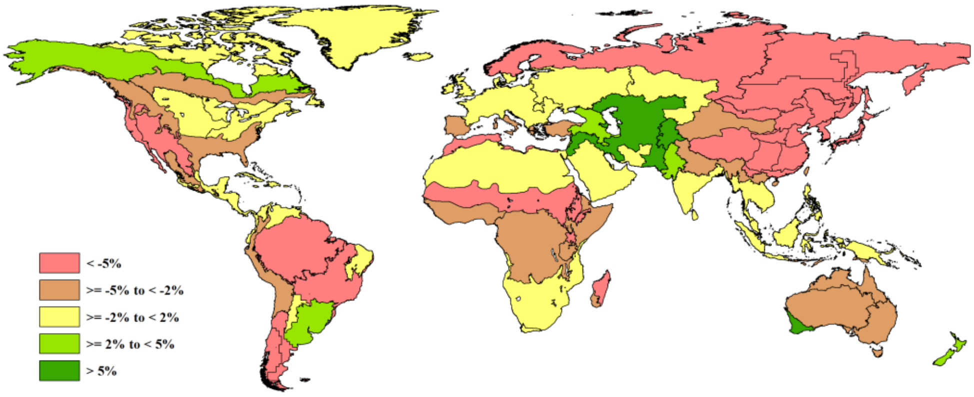


Figure 1.5 Global map of biomass accumulation (as indicated by the BIOMSS indicator) by CropWatch Mapping and Reporting Unit (MRU), departure from 15YA between between July to October 2020

In the Americas, large negative departures in biomass (BIOMSS) production estimates were calculated for SW U.S. and N. Mexican highlands (-14.8%) and the West Coast (-14.3%) because of the drought conditions. For Central eastern Brazil (-8.8%) and Amazon (-7.6%) rather large drops were estimated. Otherwise, the changes were relatively small.

In Africa, negative departures were estimated for the East African Highlands (-8%) and the Horn of Africa (-4.9%). For the other regions with significant crop production during this reporting period, the drops were relatively small.

In Europe, slight drops were estimated as well, with the exception of the Caucasus (+3.9%).

Larger changes were estimated for Central Asia: Eastern Central Asia had a drop by 11.7%, whereas the Pamir area had an increase by 8.9%.

In East Asia, the largest negative departures were calculated during this monitoring period: Southwest China (-17%) was followed by the MRU East Asia (-9.9%), Lower Yangtze (-9.6%), Loess region (-9.2%), North East China (-6.3%) and Huanghuaihuai (-6.1%).

For South Asia, the largest drop was estimated for Southern China (-5.0%). In the other MRUs, departures from the 15YA were minor.

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), minimum vegetation health index (VHIn) and cropping intensity (CI)— 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 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 (July-October 2020)

	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
West Africa	743	-22	24.9	0.1	1071	-1	684	-4
North America	332	-3	20.2	-0.4	1129	-1	606	-1
South America	270	-21	19.2	-0.6	1022	0	398	-9
S. and SE Asia	1374	3	25.8	0.3	1064	-1	664	0
Western Europe	336	11	15.9	0.1	925	-4	416	-2
Central Europe and W. Russia	249	-3	15.8	0.6	885	1	404	0

*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 (July-October) for 2005-2019.*

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

	CALF (Cropped arable land fraction)		Maximum VCI	Cropping Intensity	
	Current	5A Departure (%)	Current	Current	5A Departure (%)
West Africa	97	0	0.94	134	3
North America	94	-1	0.90	101	0
South America	86	-5	0.75	124	0
S. and SE Asia	97	1	0.96	133	1
Western Europe	89	-1	0.90	107	-2
Central Europe and W Russia	95	-1	0.88	102	0

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

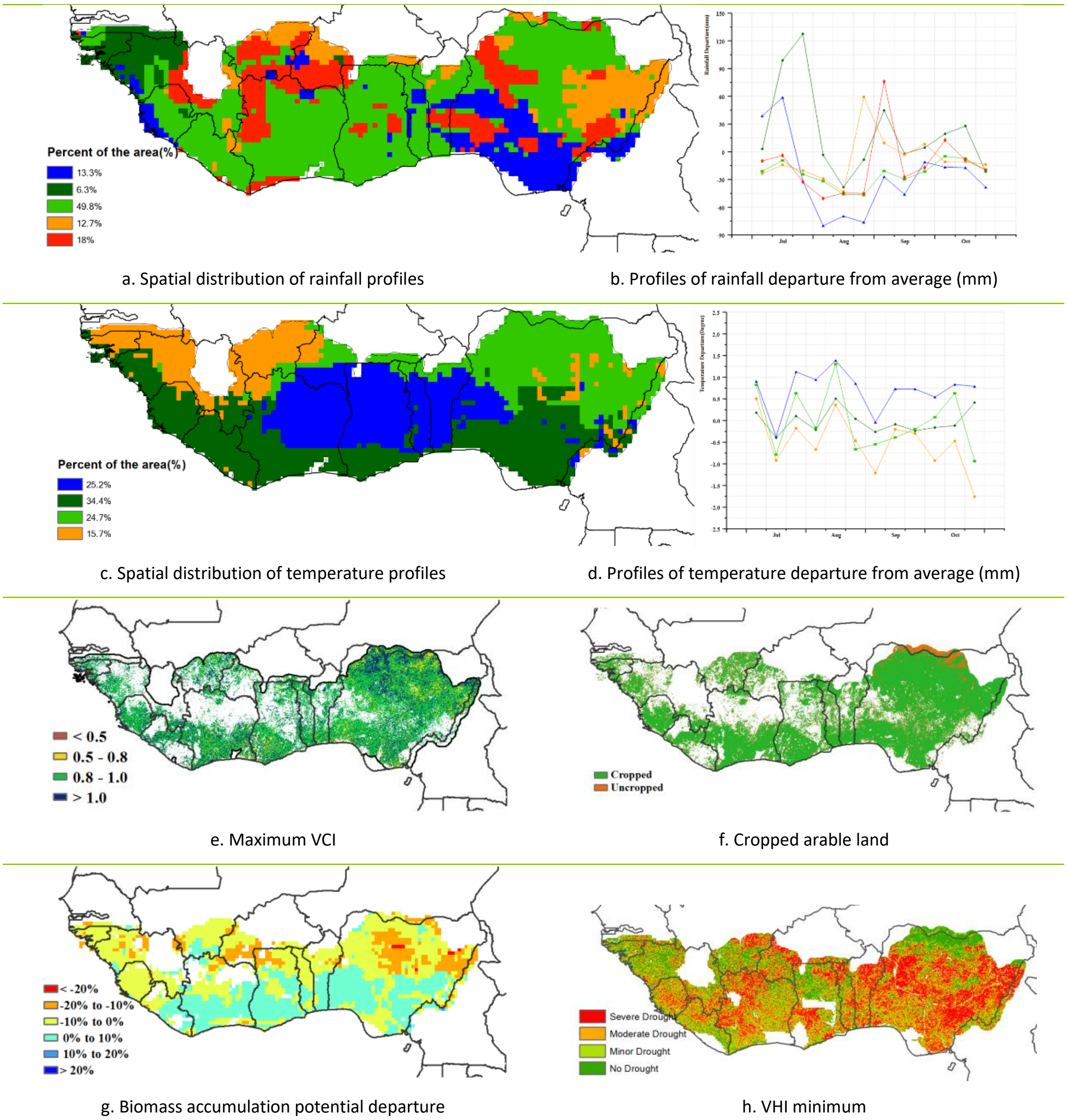
2.2 West Africa

The reporting period covers the onset of the main rainy season throughout the south of the MPZ and the end of the rainy season in the northern Sahelian areas. The harvesting of the main maize crop was completed in August in the south, while ongoing in the rest of the MPZ for other cereal crops (rice, millet and sorghum). The cumulative rainfall in the MPZ was above average in most areas leading to improved vegetation conditions. For Nigeria the abundant rainfall in July and August boosted natural pasture conditions and helped replenish surface water and improving livestock production.

The main activities during this period included the sowing of main cereals (maize, sorghum, millet, and rice) under both rainfed and irrigated conditions. In addition, tuber crops (yam and cassava) were also being harvested. Rice harvest will extend into December/January period. In the southern parts of the region experiencing bimodal rainfall, the first maize crop was harvested in October while cassava was still growing.

Climatic indicators for the MPZ indicate a below-average rainfall of 743 mm (-22%). Highest rainfall was recorded in Sierra Leone (1393 mm, -20%), Guinea Bissau (1275 mm, +12%), Equatorial Guinea (1291mm, -1%), and Guinea (1195 mm, 0%). The average temperature for the MPZ was 24.9°C (+0.1°C) and solar radiation was 1071 MJ/m^2 (+1%). The biomass production potential was slightly below average. The northern parts of the MPZ experienced more negative departures (0 to -20%) than the coastal areas. The cropped arable land fraction (CALF) reached 97% for the region. Cropping intensity was up 3% compared with the five-year-average across the MPZ. The maximum VCI (VCIx) map shows an average value of 0.94 covering most of the region indicating favorable conditions for crop growth. These CropWatch indicators show stable climatic conditions for the MPZ and present favorable prospects for the 2020/2021 season.

Figure 2.1 West Africa MPZ: Agroclimatic and agronomic indicators, July to October 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.

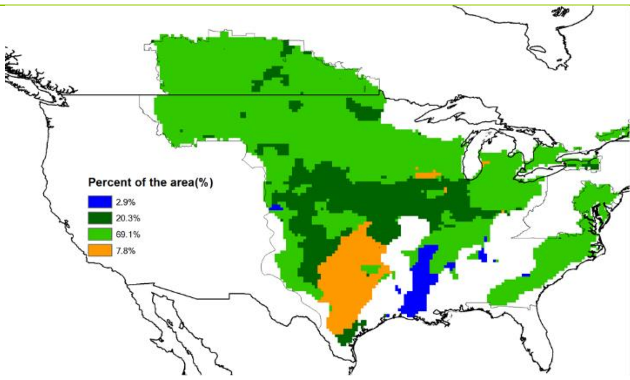
2.3 North America

This monitoring period from July to October 2020 covers the main growing and harvesting seasons of soybean, maize, rice, and spring wheat. Sowing of winter wheat started in September. In general, the crop conditions were favorable.

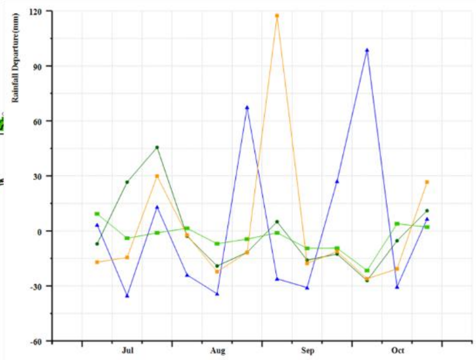
During the monitoring period, the overall agro-climatic conditions in North American production areas were close to the 15-year average. Compared with the 15-year average, rainfall, temperature, and radiation were 3%, 0.4°C, and 1% below average, respectively. The rainfall in most areas varied greatly during the monitoring period. The rainfall in July was close to or above the average, but the rainfall fell below the average level from August to September except for Lower Mississippi region in late August, and late September to early October as well as the Southern Plain areas in early September, when hurricanes and tropical depressions brought abundant rainfall to those areas. The temperature anomaly graph shows that the temperatures in the northern plains and Canadian prairie in August and mid-September were 1-2°C higher than the average.

July and August are the crucial growth periods for the summer crops, and lack of rainfall can cause yield losses. Most areas experienced above-average rainfall until July and subsequently, rainfall trended slightly below average. Hence, only western Texas and Colorado were affected by droughts, apart from California (not shown). The minimum vegetation health index indicates that severe drought occurred during the monitoring period in the western part, and the maximum vegetation index also indicates the unfavorable crop condition in the region. According to the histogram of drought classification statistics, the proportion of drought in the main producing areas was gradually increasing from 10% at the beginning of July to 25% at the end of October. Compared with the 15-year average, the potential biomass is 1% lower than the average, and the cropped arable land fraction also decreased by 1%. In short, moisture supply was adequate in most major crop production regions of the USA. Slightly drier weather in September and October helped provide favorable conditions for harvest. Overall, crop conditions were favorable

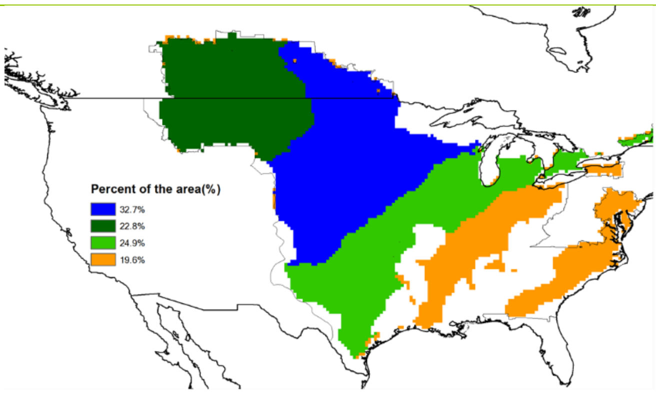
Figure 2.2 North America MPZ: Agroclimatic and agronomic indicators, July to October 2020.



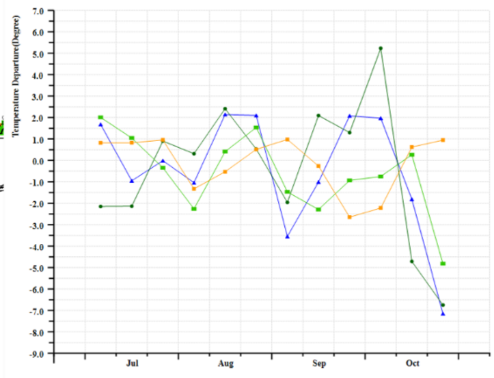
a. Spatial distribution of rainfall profiles



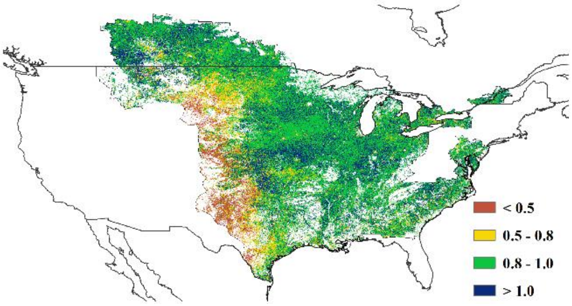
b. Profiles of rainfall departure from average (mm)



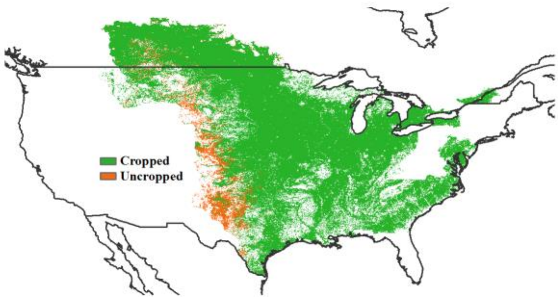
c. Spatial distribution of temperature profiles



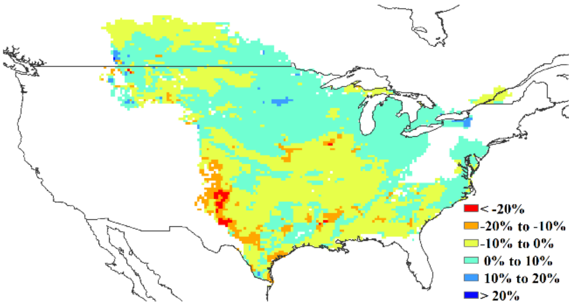
d. Profiles of temperature departure from average (mm)



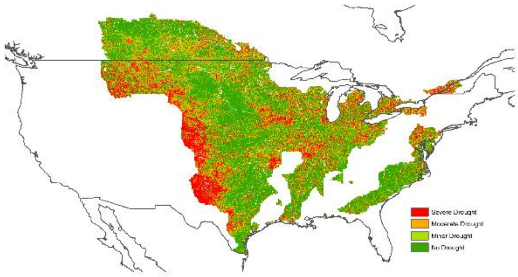
e. Maximum VCI



f. Cropped arable land



g. Biomass accumulation potential departure



h. VHI minimum

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

2.4 South America

This reporting period covers the main growing period for wheat and the beginning of planting of maize, soybean and rice. Dry conditions observed in some regions may have reduced or delayed the planting of summer crops.

For the whole region, rainfall showed strong negative anomalies with 21% below average during the monitoring period. Spatial distribution of rainfall profiles showed two homogeneous patterns over the southern Brazilian agricultural area and Paraguay. These patterns (blue and green areas) showed a high positive anomaly during August and a negative anomaly at the end of this reporting period. The green profile showed also a positive anomaly in July. The rest of the MPZ (Argentina and Uruguay and North of Brazilian agricultural area) was dominated by mixed patterns. Their profiles showed below average values over this monitoring period in other regions.

Temperature profiles were clearly grouped along a North-South gradient. Nevertheless, the four profiles generated showed high variability in temperature along the period and are not clearly distinguishable. Both positive and negative anomalies were observed in all profiles, but in general positive anomalies were stronger.

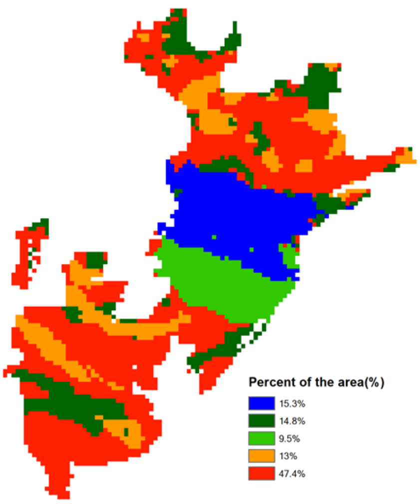
BIOMSS showed strong negative anomalies in the north of the MPZ in Brazil. Moderate negative anomalies (about 10% below average) were observed in most of the Argentine Pampas. Positive anomalies were mostly observed in North of Argentina and South and Center of Brazil and Paraguay, where above average rainfall was observed as indicated in the rainfall departure clusters.

Maximum VCI showed quite generalized and low values in Center West Pampas, Chaco and Subtropical highlands in Argentina. The south and center of the Brazilian agricultural area showed good conditions for this index.

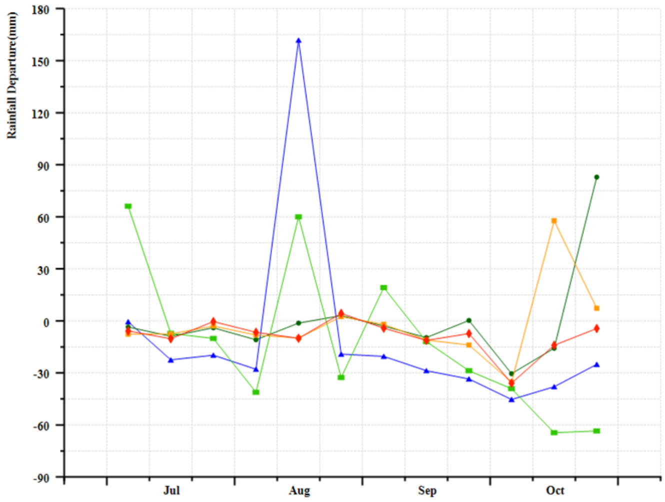
The weekly proportions of different drought categories showed that drought conditions were getting worse starting in mid-September, mainly due to the overall below average rainfall at the later stages of this monitoring period. CALF showed a strong reduction in Center West Pampas and Chaco in Argentina, suggesting a delay in planting of summer crops. The uncropped areas coincided with the regions of low VCIx.

In summary, the MPZ showed critical conditions in several indices. In particular, some regions like Pampa (poor values in Maximum VCI, BIOMSS and CALF), Chaco (Maximum VCI and CALF) and the north of MPZ in Brazil (BIOMSS and rainfall).

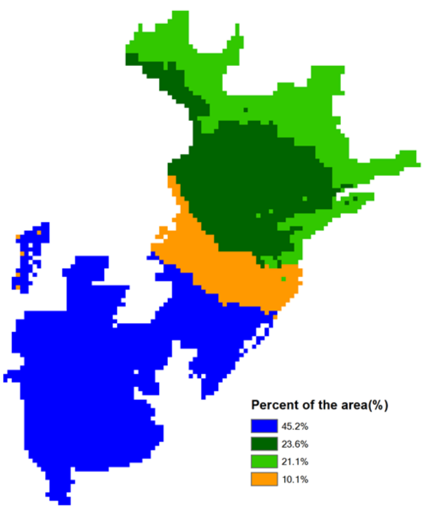
Figure 2.3 South America MPZ: Agroclimatic and agronomic indicators, July to October 2020.



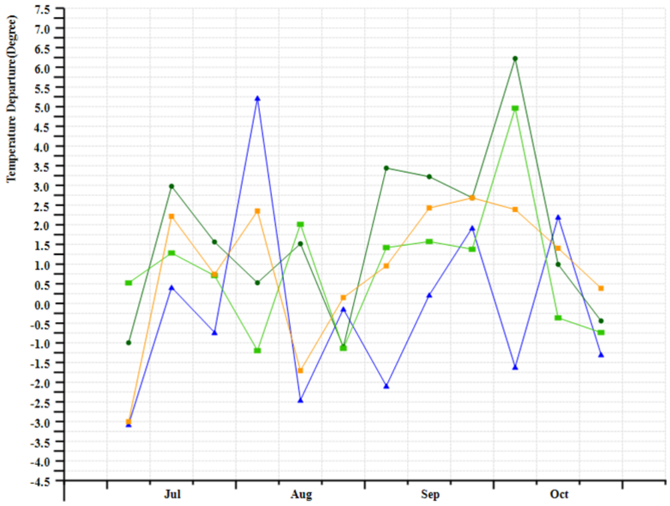
a. Spatial distribution of rainfall profiles



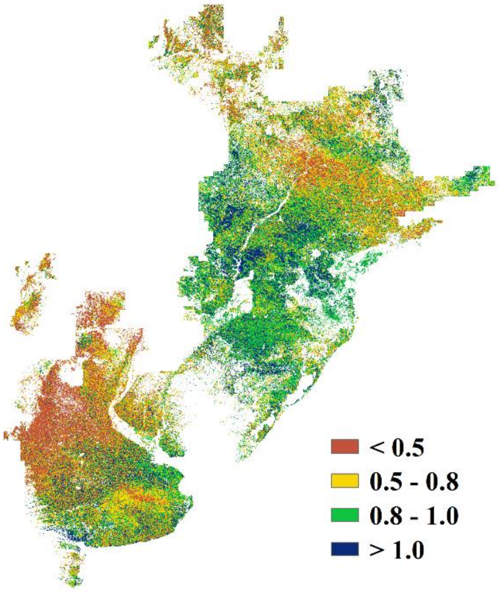
b. Profiles of rainfall departure from average (mm)



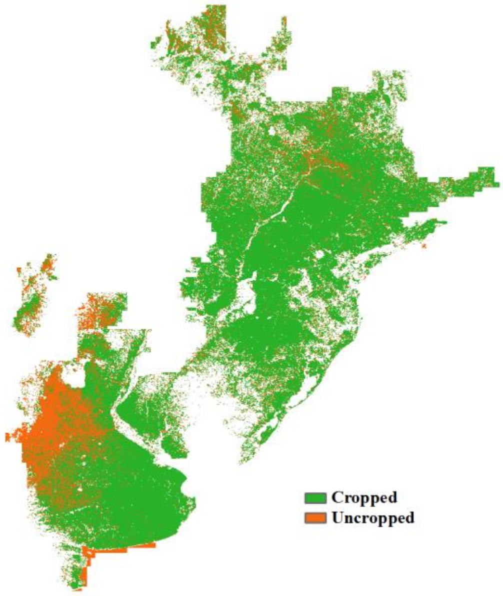
c. Spatial distribution of temperature profiles



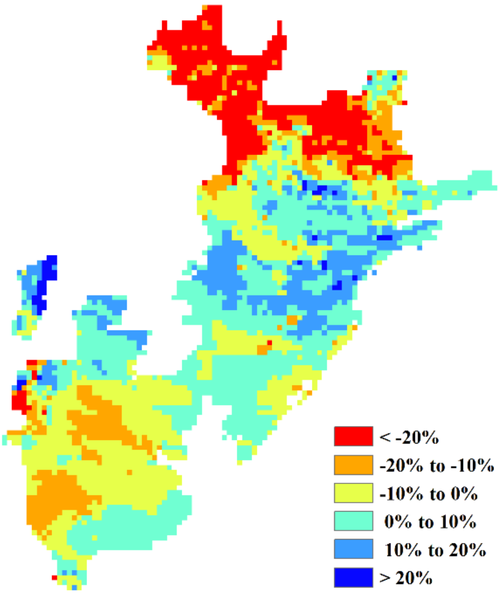
d. Profiles of temperature departure from average (mm)



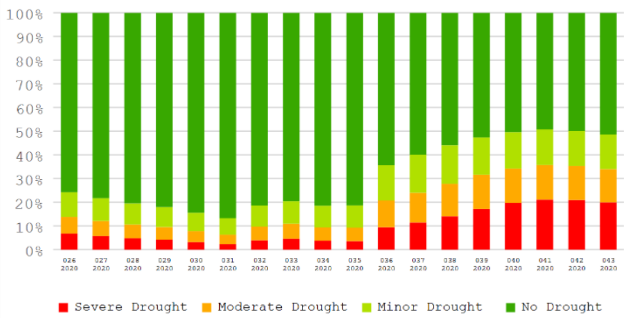
e. Maximum VCI



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

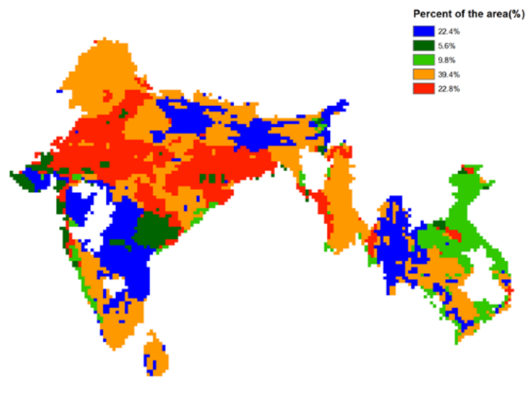
The South and Southeast Asia MPZ spans a large geographic area, including India, Bangladesh, Cambodia, Myanmar, Nepal, Thailand, Laos and Vietnam. This reporting period covers the growth period of maize, and the growth and harvest period of summer rice and soybean. This MPZ experienced close-to-average agroclimatic conditions: Compared to the average of the past 15 years, rainfall was slightly higher by 3%, temperature rose 0.3°C and RADPAR was slightly reduced by 1%. Meanwhile, BIOMSS was close to average and CALF increased by 1%, reaching 97%. A high value for VCIx (0.96) was observed. Almost all agroclimatic conditions and agronomic indicators stayed close to the average over this monitoring period and the crop growth conditions are generally normal.

The spatial distribution of rainfall profiles shows that RAIN was below average with small fluctuations in 39.4% of the MPZ, including parts of India, Myanmar, Thailand and Cambodia. Rainfall in 55% of the MPZ was fluctuating during the monitoring period. Large fluctuations were observed, especially for the Malwa Plateau in India, where the rainfall in August was about 100 mm higher than the average, and the rainfall in Vietnam was about 150 mm higher than the average in mid-October. Heavy rainfall in August, exceeding the average by 350 mm, was observed for 5.6% of the MPZ, mainly for the Indian state of Telangana. As this is the growing season of maize, rice and other crops in India, excess rainfall may affect their production. Temperature profiles indicate that temperatures in 6% of main production areas (located in Myanmar) were slightly above the average, and 9% of the MPZ (located in India) was slightly below the average. In the other areas, temperatures slightly fluctuated around the average.

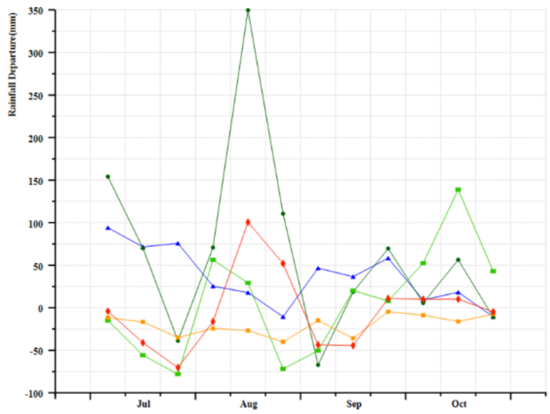
CALF in this MPZ reached 97%, and uncultivated areas were mainly located in a small part of south Tamil Nadu, north Rajasthan and Bangladesh. VCIx was 0.96. Areas with lower VCIx values coincided with the uncropped fields. Potential biomass was mostly near average (BIOMSS, 664 gDM/m^2) but low values occurred in north and south India and Nepal. The VHI minimum map shows that east and north India, regions in Myanmar, Thailand and Cambodia were most affected by periods of severe drought conditions.

In summary, despite the large local rainfall, crops conditions of the MPZ were generally favorable.

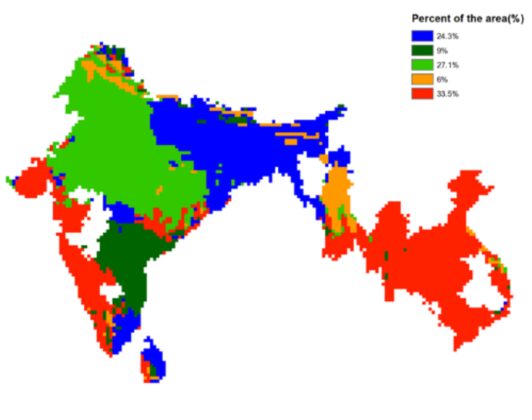
Figure 2.4 South and Southeast Asia MPZ: Agroclimatic and agronomic indicators, July to October 2020



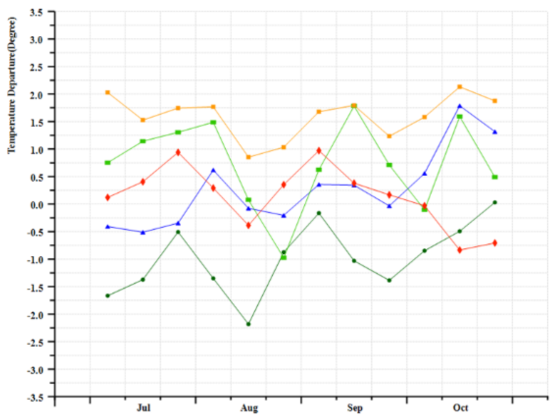
a. Spatial distribution of rainfall profiles



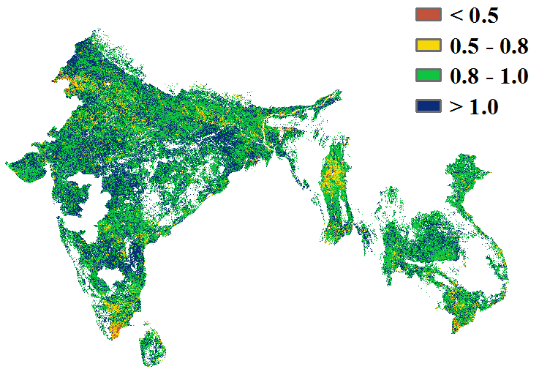
b. Profiles of rainfall departure from average (mm)



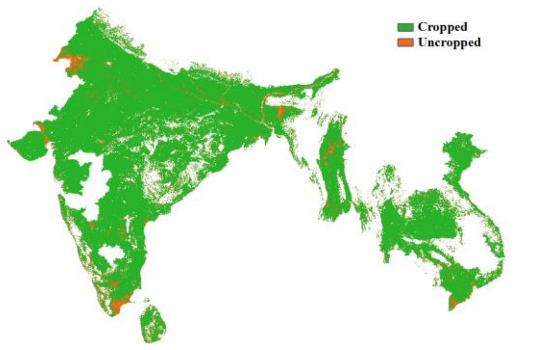
c. Spatial distribution of temperature profiles



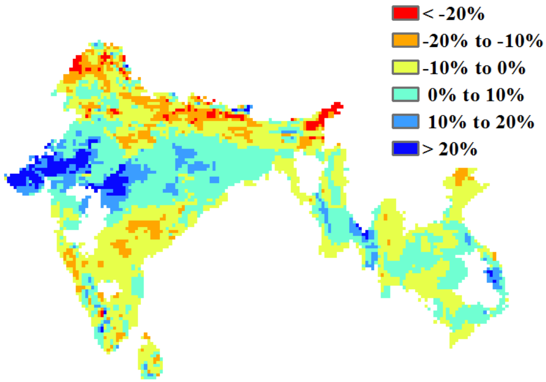
d. Profiles of temperature departure from average (mm)



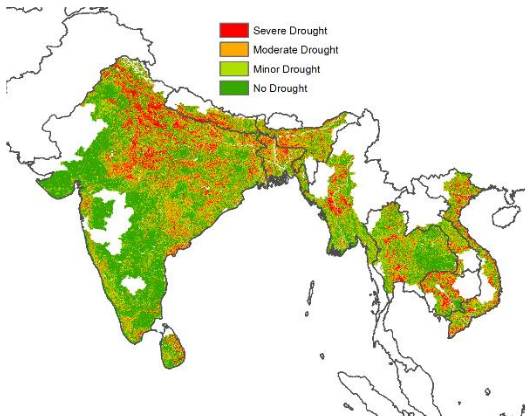
e. Maximum VCI



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 and reproductive periods of the summer crops and sowing of winter crops in the major production zone (MPZ) of Western Europe. Overall, crop conditions were below average in most parts of this MPZ. The agroclimatic and agronomic indicators show warmer-than-usual conditions and a rainfall deficit in the early part of summer and colder-than-usual conditions and above-normal precipitation in the late growing season (Figure 2.6).

Significant spatio-temporal differences in precipitation were observed between different countries but the MPZ as a whole recorded above-average RAIN (+11%). The detailed characteristics of the temporal and spatial changes of precipitation in different countries were as follows: (1) During the whole monitoring period, 33 percent of MPZ areas experienced a situation where the precipitation fluctuated around the average. This was the case for northern Spain, northern and southeastern Italy, eastern Germany, Czech Republic, Slovakia, Austria and Hungary. (2) Before mid-August, in early to mid-September and in mid-October, poor precipitation was observed in more than 70% of the areas (northern Italy, most of France, United Kingdom and Denmark, northern, western and southern Germany) with the most severe shortfalls in Denmark (RAIN -11%). However, frequent and excessive rainfall was observed during the period of mid-August, late September and early October in the southern United Kingdom, western, southwestern and eastern France, and northern Italy. Countries that experienced significant above-average precipitation included the Czech Republic (+39%), Hungary (+39%), Slovakia (+39%), Austria (+328%), Italy (+15%) and the United Kingdom (+12%). Due to the rainfall deficit, flowering and grain filling for the summer crops were negatively impacted, while the harvest season of summer crops coincided with frequent rainfall. Therefore, the crop yields in the Western European Major Production Zone (MPZ) need to be paid attention to.

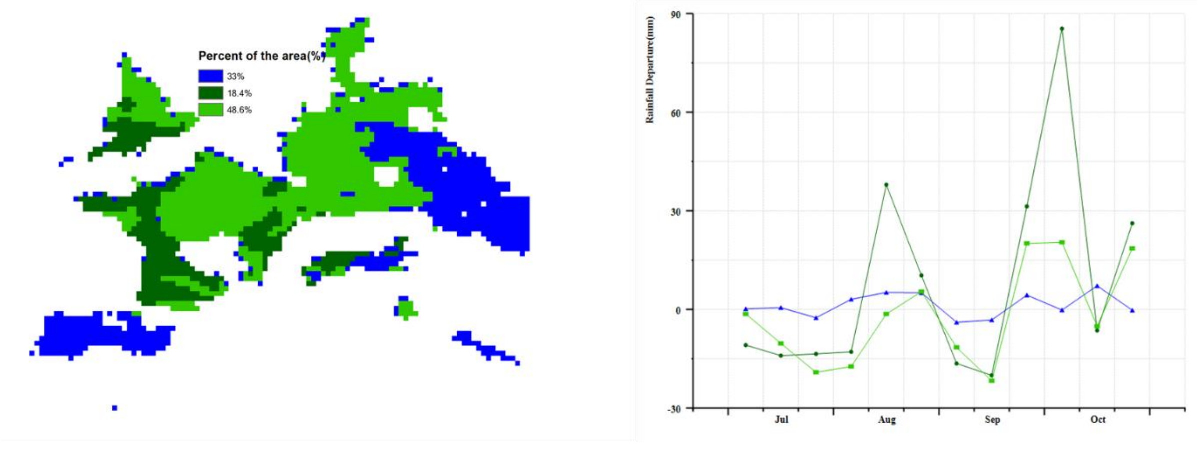
Temperature for the MPZ as a whole was slightly above average (TEMP +0.1°C), and sunshine was below average with RADPAR down 4%. Most areas experienced warmer-than-usual conditions, while below average temperatures occurred mostly in early to mid-July, late August and early September, and late September to mid-October. The spatial distribution of temperature profiles indicates that two warm spells swept across Europe in early to mid-August and in mid-September.

Due to excessive precipitation in mid-August and early October, and unfavorable sunshine, the biomass accumulation potential was 2% below average. Significant BIOMSS departures (-20% and less) occurred in UK, Denmark and north of Germany, and scattered over other countries. In contrast, BIOMSS was above average (sometimes exceeding a 20% departure) over the east of France, south-eastern Italy, and south of Spain. The average maximum VCI for the MPZ reached 0.90.

More than 89% of arable land was cropped, which is 1% below the recent five-year average. Most uncropped arable land was concentrated in Spain and southeastern Italy, with patchy distribution in other countries. The VHI minimum map shows that France, Germany and Spain were most affected by severe drought conditions. Cropping intensity (135%) was up 3% compared with the five-year-average across the MPZ.

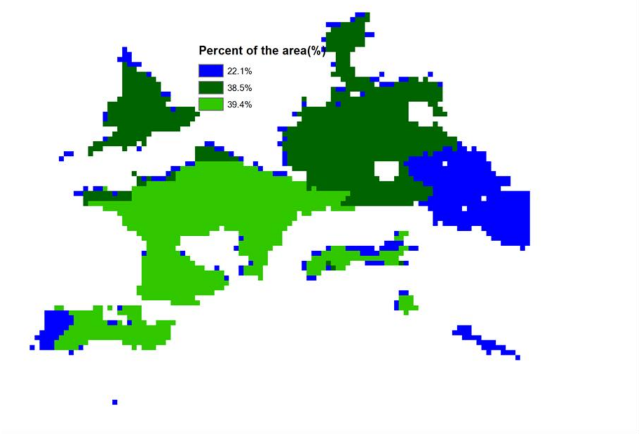
Generally, crop conditions were below average in most parts of this MPZ and the crop yields need to be paid attention to.

Figure 2.5 Western Europe MPZ: Agroclimatic and agronomic indicators, July to October 2020.

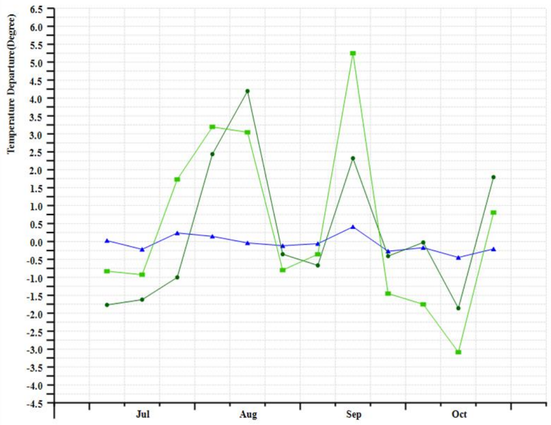


a. Spatial distribution of rainfall profiles

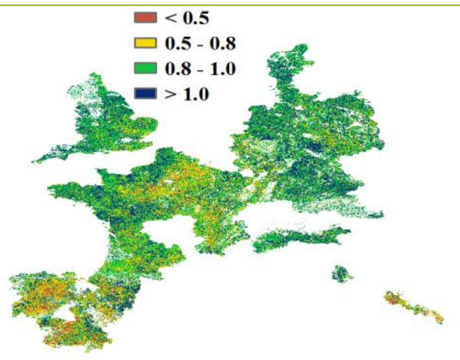
b. Profiles of rainfall departure from average (mm)



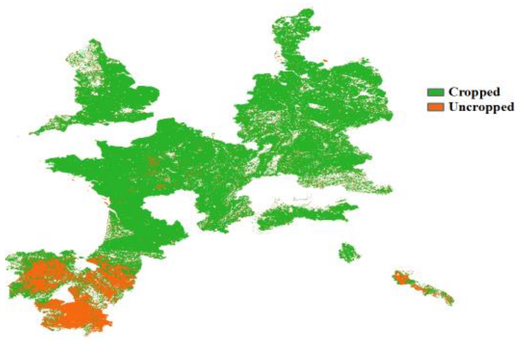
c. Spatial distribution of temperature profiles



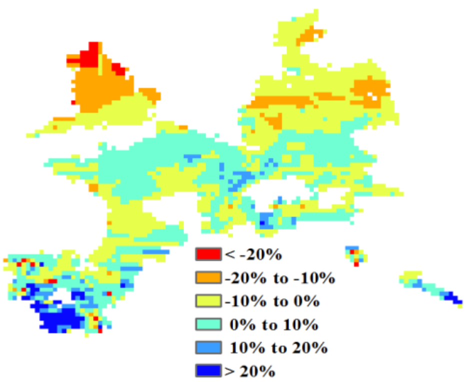
d. Profiles of temperature departure from average (mm)



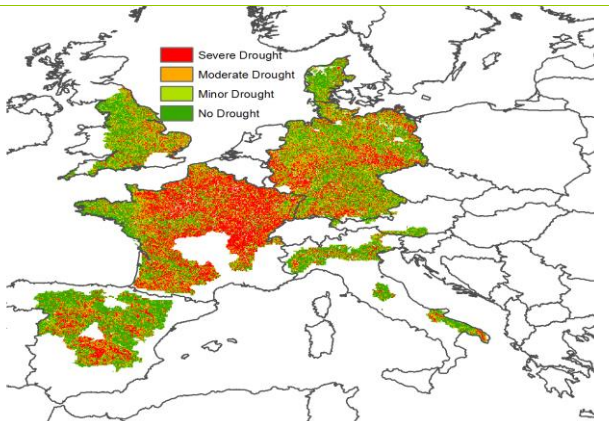
e. Maximum VCI



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

This monitoring period covers the sowing season and the harvest stage of summer cereals in this MPZ. In general, agroclimatic variables demonstrated average conditions for rainfall (-3%), temperature (+0.6°C), and RADPAR (+1%). Crop conditions were mostly normal, except for eastern Ukraine and southern Russia, which suffered from a rainfall deficit.

According to the spatial distribution map of rainfall departure, rainfall fluctuated significantly, but it was below average from July to October for most of the MPZ. The spatial and temporal distribution characteristics were as follows：(1) From July to mid-August, and from late

September to mid-October, the rainfall for 39.4% of this MPZ was above average, with a highest departure of 58 mm. These regions were mainly distributed in the eastern, central and southwestern MPZ, including eastern and southwestern Russia, southern Ukraine and southwest Poland. (2) From July to early October, the rainfall in 60.7% of MPZ was below average, distributed in the northwest, south and east of the MPZ, covering southwest of Poland, southwest of Belarus and southwest of Russia. (3) Rainfall was rather stable in 22.4% of MPZ, which was mainly in the southwest of Poland.

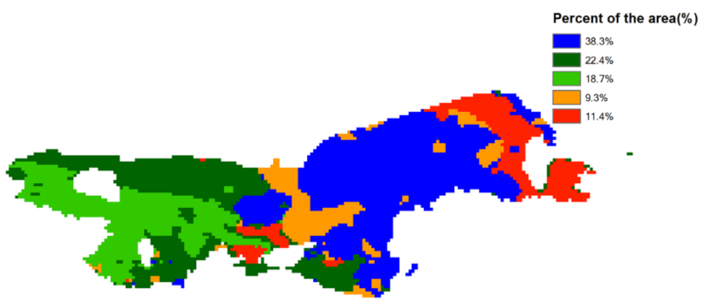
The temperature departure distribution map shows that the temperature fluctuated strongly in the eastern region from July to October, but temperature in this MPZ was generally above average. The spatial and temporal distribution changes were as follows： (1) In the first ten days of July, the temperature in the central and eastern MPZ was higher than average. This was the case for southwest Russia, central and eastern Ukraine and Eastern Belarus. (2) From late July to mid-August, the temperature of 71.4% of MPZ was below average, with lowest drops in August. These regions included southwest Russia, central and eastern Ukraine and Eastern Belarus. (3) From late August to October, the temperature of 72.1% of MPZ was above average, concentrated in the central and western regions, including Ukraine, Belarus, Poland, Czechoslovakia.

CropWatch estimates that the BIOMASS of this MPZ was below the 5YA. BIOMASS in the west and north of the MPZ were lower (-10%), mainly in northwest Russia, Poland, Czech Republic, Slovakia, Moldova and northern Romania. In addition, northern Poland, south-western Ukraine and southern Russia had the largest negative potential biomass (-20% and below) departures. The highest BIOMASS departure was found in the eastern and south-western regions of the MPZ (about +10%), including Belarus, southern Russia, Hungary, Ukraine and parts of southern Romania.

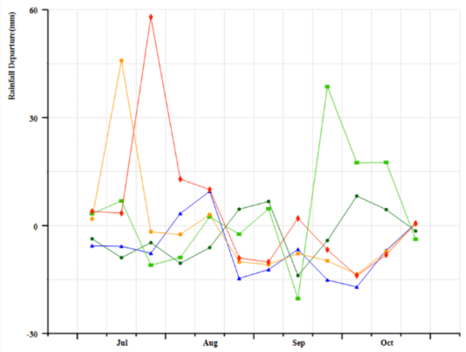
During the monitoring period, most of the arable land in MPZ was cultivated, with a CALF value of 95%. Uncultivated land occurred in the southwestern MPZ, including southern Russia, southern Ukraine and eastern Romania. The VCIx showed significant spatial difference in MPZ, with an average value of 0.88. The regions below 0.8 were mainly distributed in the south of the MPZ, including southern Russia, southeastern Romania, Moldova, southeastern Ukraine and other regions. The VHI is similar to the VCIx in its distribution, with areas of severe drought occurring in the central and southern MPZ.

In general, CropWatch agroclimatic and agronomic indicators show that crop growth was generally near average during the monitoring period.

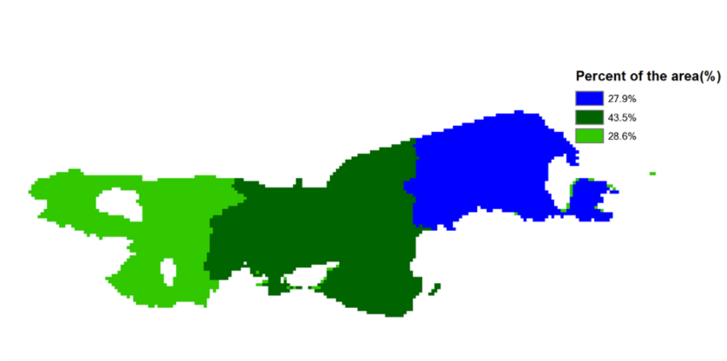
Figure 2.6 Central Europe-Western Russia MPZ: Agroclimatic and agronomic indicators, July to October 2020.



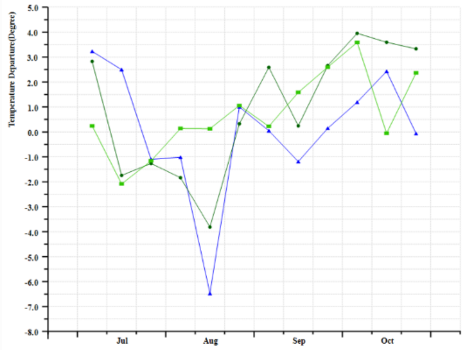
a. Spatial distribution of rainfall profiles



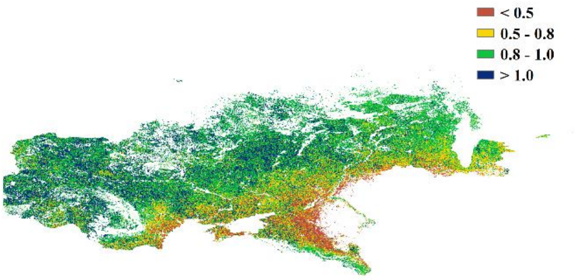
b. Profiles of rainfall departure from average (mm)



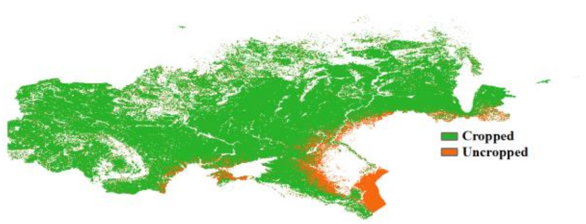
c. Spatial distribution of temperature profiles



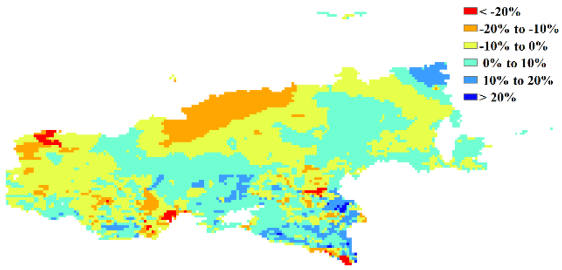
d. Profiles of temperature departure from average (mm)



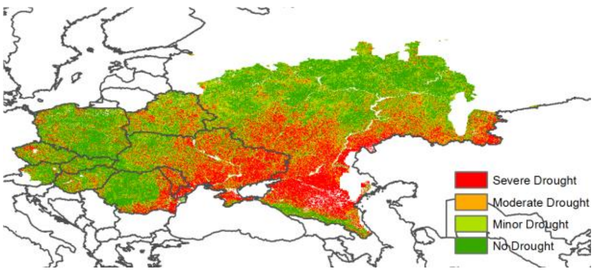
e. Maximum VCI



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

This 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 almost 90% of the maize being traded internationally. During this monitoring period, maize planting had started in late September in southern Brazil. Conditions were generally on the dry side, due to the onset of La Niña conditions, which may further constrain production in southern Brazil and Argentina. In the USA, the largest exporter, conditions were generally favorable. The maize crops benefitted from favorable conditions in the spring and early summer. Good rainfall until July provided enough of a buffer to compensate for the drier conditions that followed, especially in September. The drier-than-usual conditions actually helped harvest activities. A powerful storm, called Derecho, had hit Iowa on August 10, 2020. It flattened about half of Iowa's maize fields and 10% of the maize in that state could not get harvested. However, this is just a minor dent in the total US maize production and close-to-record yields are expected. Maize in the Ukraine, on the other hand, suffered from severe drought conditions, causing considerable yield losses. In Africa, most of the maize is consumed locally. Sufficient rains created generally favorable conditions, in the Horn of Africa, as well as in West Africa. In China, summer rains were above normal, causing a generally favorable environment for maize production.

However, several typhoons and tropical depressions created excessive rainfall and flooding in some areas, especially in the Heilongjiang province, causing yield losses.

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 slightly more than 25%, was suffering from a prolonged drought until the onset of the monsoon rains. This caused some delays in planting. The Mekong delta region had not fully recovered from the low water levels of the Mekong River and production during this monsoon season remained below average. In addition, Central Vietnam was hit by several typhoons right after rice harvest. In Thailand, overall conditions returned to close to normal and an average production was estimated. In India, as well as in Pakistan, conditions for rice production were favorable and above-average production is expected.

Wheat: Wheat production in the southern hemisphere experienced generally favorable conditions. Australia had recovered from a severe drought and the wheat fields in Queensland and southern Australia received sufficient rainfall. Similarly, conditions were favorable in the Cape province of South Africa and in southern Brazil. However, wheat in the Pampas in Argentina suffered from a rainfall deficit. Winter wheat in the northern hemisphere was generally harvested by July and was reported on in the August CropWatch bulletin. Conditions for spring wheat in the northern states of the USA and in Canada were favorable. Spring wheat in Russia generally benefitted from above-average precipitation in the Volga, Southern Caucasus and Siberian production regions. Similarly, conditions were quite favorable in Kazakhstan. Hence, favorable spring wheat production will more than compensate for the winter wheat yield losses caused by droughts in France, Germany, Romania and the Ukraine. Wheat supply is likely to surpass last year's level.

Soybean: Similar to maize, the soybean market is dominated by few countries: Brazil, the USA and Argentina account for more than 80% of total production. Brazil's share is more than half of the soybean traded on the international market, followed by the USA (30%), Argentina (5%), Paraguay (4%) and Canada (3%). Soybean planting for the coming growing season was off to a slow start in Brazil, due to prolonged winter drought conditions. Southern Brazil, Argentina and Paraguay may continue to be negatively impacted by La Niña in the coming months, which tends to cause drought conditions in that region. Soybean production in the USA and Canada benefitted from generally favorable conditions persisting throughout the entire production cycle from sowing to harvest. In China, the province of Heilongjiang, the most important soybean production province of the country, was negatively impacted by excessive rainfall and flood events caused by typhoons.

3. Weather anomalies and biomass production potential changes

3.1 Rainfall

Rainfall anomalies depict the average departure of rainfall from the 15YA. They do not show short term water deficits. Nevertheless, they indicate where rainfall was generally favorable or not for crop production. Fig 3.1 shows that the Western USA was impacted by severe drought conditions, which led to massive forest fires in California, Oregon and Colorado. This was the dry season for the Maghreb and the Levant. Nevertheless, drier-than-normal conditions persisted in these regions. The Caucasus and Western Volga region of Russia also received below-average rainfall. Positive departures were observed for eastern Siberia, most of China and the wheat production regions in South-East Australia.

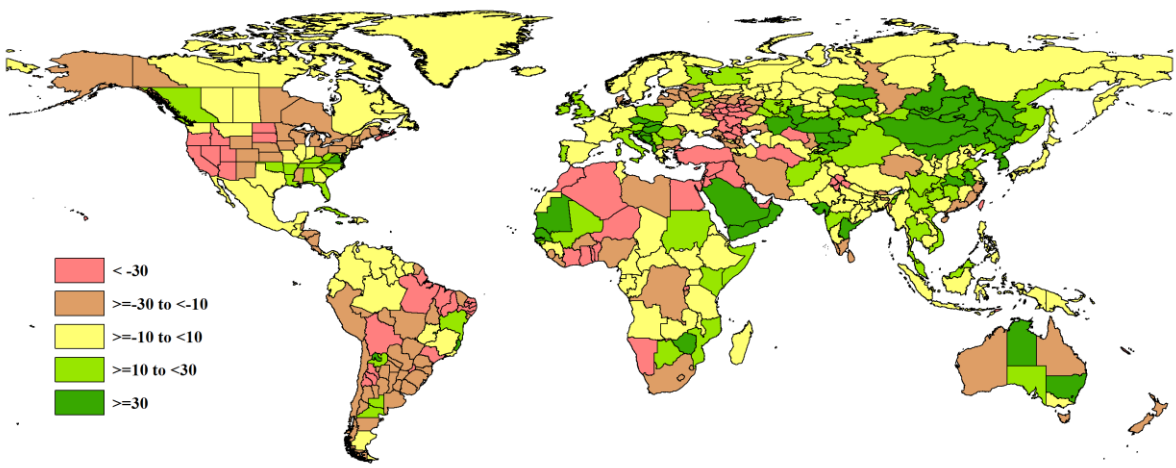


Figure 3.1 National and subnational rainfall anomaly (as indicated by the RAIN indicator) of July to October 2020 total relative to the 2005-2019 average (15YA), in percent

3.2 Temperatures

Warmer-than-average temperatures were observed for most of Brazil and the Western USA. Eastern Europe, including the Ukraine also experienced above-average temperatures, which deviated by more than 1.5ºC from the 15YA. Large negative departures were observed for the Middle Asia and Tianshan mountain region.

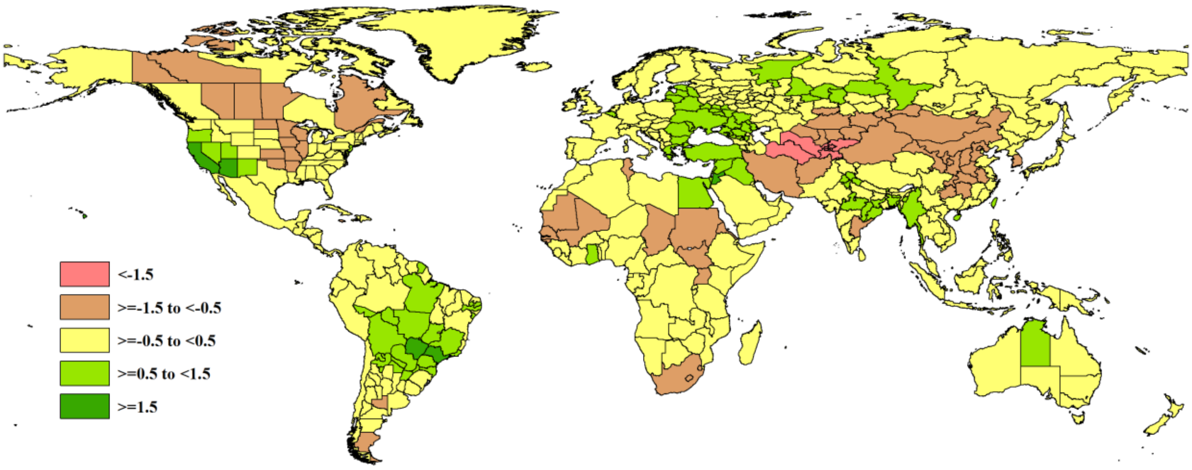


Figure 3.2 National and subnational temperature anomaly (as indicated by the TEMP indicator) of July to October 2020 average relative to the 2005-2019 average (15YA), in °C

3.3 Solar radiation

Most of the Americas experienced average or above-average solar radiation. Only the South-East of the USA, which also received above-average rainfall due to several hurricanes, experienced below-average solar radiation. Northern Europe and northwestern Russia and most of Asia from Iran to Japan experienced below-average solar radiation. The only exception was the Gangetic Plain and Central India, which received above-average solar radiation, i.e., a positive departure by more than 3% from the 15YA. Turkey and the northern Caucasus region, which had suffered from below-average rainfall, also experienced more sunshine than usual.

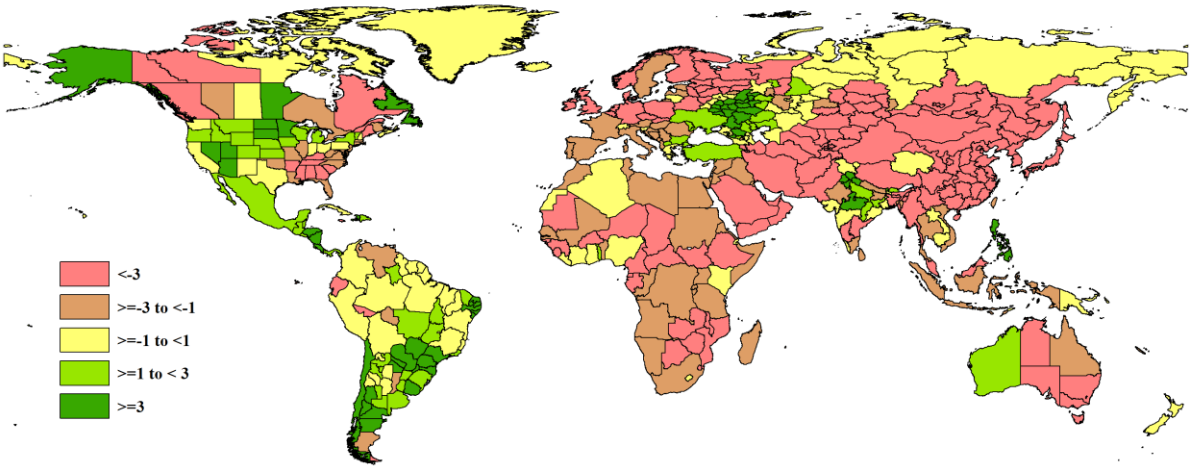


Figure 3.3 National and subnational sunshine anomaly (as indicated by the RADPAR indicator) of July to October 2020 total relative to the 2005-2019 average (15YA), in percent

3.4 Biomass production

Biomass production estimates are the product of rainfall, temperature, and solar radiation. They integrate the three indicators discussed above. Positive departures by more than 5% were calculated for the wheat production regions in Brazil, as well as for the northern Pampas and Chaco region in Argentina. The corn belt in the USA and the North-East also had positive departures. The other key food production regions that experienced large positive departures were the north-west and central part of India and Victoria in Australia. Key production regions that were negatively impacted were California, the Levant and Korea.

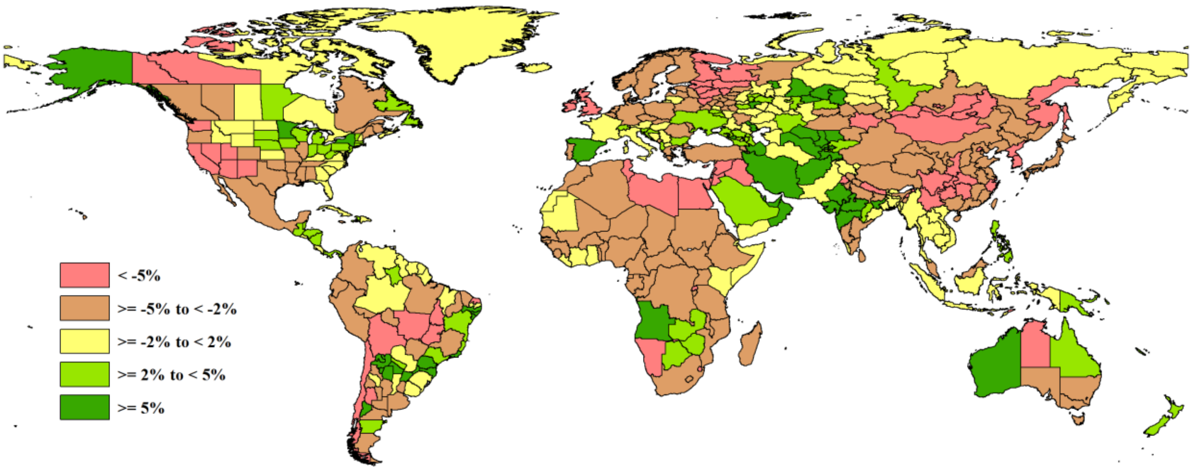


Figure 3.4 National and subnational biomass production potential anomaly (as indicated by the BIOMSS indicator) of July to October 2020 total relative to the 2005-2019 average (15YA), in percent

Table 3.1 July- October 2020 agro-climatic and Agronomic indicators by country, current value and departure from average.

Code		Agro-climatic indicators				Agronomic indicators	
	Country	Departure from 15YA (2005-2019)				Departure from 5YA (2015-2019)	Current
		RAIN (%)	TEMP(°C)	PAR(%)	BIOMSS (%)	CALF (%)	VCIx
AFG	Afghanistan	29	-1.2	-3	17	46	0.64
AGO	Angola	-8	0.0	-2	7	16	0.85
ARG	Argentina	-20	0.1	2	0	-12	0.62
AUS	Australia	12	0.2	-5	-1	4	0.86
BGD	Bangladesh	8	0.5	-3	-2	-1	0.91
BLR	Belarus	-7	1.0	-3	-3	0	0.97
BRA	Brazil	-21	0.7	2	-7	2	0.87
KHM	Cambodia	-2	0.2	1	1	1	0.93
CAN	Canada	-4	-0.6	-1	-1	1	0.96
CHN	China	10	-0.4	-10	-9	1	0.95
EGY	Egypt	-62	0.8	-2	-19	7	0.79
ETH	Ethiopia	6	-0.5	-7	-9	1	0.97
FRA	France	6	0.4	-2	1	0	0.89
DEU	Germany	-1	0.4	-4	-3	0	0.95
HUN	Hungary	39	0.3	-2	0	0	0.95
IND	India	5	0.3	0	1	3	0.97
IDN	Indonesia	10	0.1	-2	-1	0	0.96
IRN	Iran	-13	-0.6	-4	18	26	0.84
ITA	Italy	15	0.0	-1	-2	0	0.86
KAZ	Kazakhstan	23	-0.7	-4	1	-7	0.72
KEN	Kenya	21	-0.2	0	0	11	0.88
MEX	Mexico	55	-1.6	-7	4	0	0.84
MNG	Mongolia	-6	0.3	1	-5	-6	0.84
MAR	Morocco	67	-1.2	-8	-14	2	0.94
MOZ	Mozambique	-39	0.4	-1	-3	6	0.52
MMR	Myanmar	15	-0.4	-7	-4	-3	0.74
NGA	Nigeria	-4	0.6	-3	-2	-1	0.92
PAK	Pakistan	-27	0.0	-1	-5	1	0.94
PHL	Philippines	-2	-0.3	-3	-1	12	0.96
POL	Poland	-2	0.4	3	3	0	0.97
ROU	Romania	13	0.5	-3	-5	0	0.99
RUS	Russia	16	0.7	-1	-2	-2	0.86
ZAF	South Africa	0	0.3	-2	-3	-1	0.86
LKA	Sri_Lanka	-20	-0.6	-1	-4	2	0.72
THA	Thailand	-23	0.2	-3	-3	0	0.95
TUR	Turkey	12	0.1	-2	-1	0	0.97
UKR	Ukraine	-54	1.1	2	-6	3	0.78
GBR	United Kingdom	-3	1.1	2	2	-1	0.88
USA	United States	12	-0.4	-12	-13	0	0.95
UZB	Uzbekistan	-6	-0.1	0	-3	-1	0.87
VNM	Vietnam	4	-1.5	-5	27	19	0.96
ZMB	Zambia	13	0.2	-1	0	0	0.94

3.2 Country analysis

This section presents CropWatch analyses for each of 42 key countries (China is addressed in Chapter 4). The maps refer to crop growing areas only and include several graphs: (a) Phenology of major crops; (b) Crop condition development based on NDVI over crop areas at national scale, comparing the July - October 2019 period to the previous season and the five-year average (5YA) and maximum; (c) Maximum VCI (over arable land) for July - October 2019 by pixel; (d) Spatial NDVI patterns up to July - October 2019 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 regions within the country, again comparing the July - October 2019 period to the previous season and the five-year average (5YA) and maximum.

Refer to Annexes A for additional information about indicator values by country. Country agricultural profiles are posted on **www.cropwatch.com.cn**.

Figures 3.5 - 3.45 are Crop condition for individual countries ([AFG] Afghanistan - [ZMB] Zambia) including sub-national regions during July – October 2020.

[AFG] Afghanistan

Wheat, maize, and rice are the main cereals that are grown in Afghanistan. The sowing of spring wheat starts in March and April and harvest is in August and September. 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 total precipitation in Afghanistan was lower than the 15Y maximum and 2019-2020's rainfall but it still was 29% above the 15YA. However, there was some unseasonal rainfall in mid July (12 mm) and in late August (15mm). Temperature trended slightly below the 15YA. Biomass was estimated to be 17% higher than the 15YA.

Based on the NDVI crop condition development graph, crop conditions were above average and almost equal to the 5-year maximum in all major regions. The cropped arable land was mainly located in Badghis, Faryab, Jawzjan, Sari Pul, Balkh, Samangan, Kunduz, Takhar, Badakhshan, Baghalan and Nuristan. The cropped arable land fraction (CALF) increased by 46% 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 (62%) were above average or close to average from July to October. The most favorable crop conditions, 11.9% of the area, were identified mainly in the north of Afghanistan (Kunduz and Samangan provinces) and South-East (Khost, Paktya, Kunar provinces). About 37.9% the crop conditions were below average, mainly in the northern part of Jawzjan.

Overall, the conditions for wheat and maize were favorable in the study area.

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.

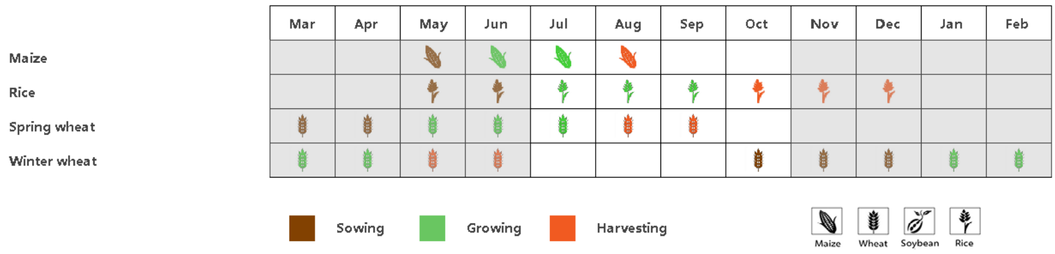
The RAIN in the Central region with sparse vegetation was 28 mm (+14%). The TEMP was 14.3°C (-0.6°C), and RADPAR was 1410 MJ/m^2 (+3%). According to the NDVI-based crop condition development graph, the NDVI was higher than the average level and almost equal to the 5-year maximum. Potential biomass increased by 12%, CALF had increased substantially (+72%) and VCIx was 0.91. Crop production is expected to be favorable.

The Dry region recorded 27 mm of RAIN (+19%). TEMP was 20.8°C (-0.7°C) and RADPAR was 1449 MJ/m^2 (-3%). CALF was 122% higher than the 5YA. VCIx was 0.57 and the potential biomass increased by 23%. According to the crop condition development graph, the NDVI was higher than the maximum level recorded over the past 5 years.

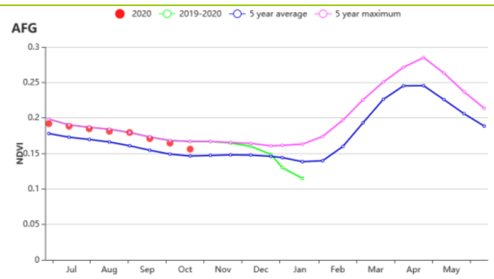
In the Mixed dry farming and irrigated cultivation region, the following indicator values were observed: RAIN 91 mm (+41%); TEMP 16.4°C (-1.3°C); RADPAR 1369 MJ/m^2 (-4%). Potential biomass was 262 gDM/m^2 (+27%) and CALF was 27% above the average. According to the NDVI-based crop condition development graph, NDVI was higher than the average level, but lower than the 5-year maximum. In this reason VCIx reached 0.84. Crop production is expected to be favorable.

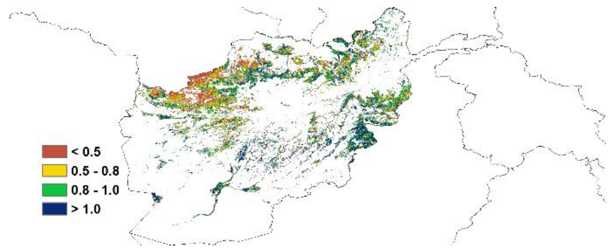
The Mixed dry farming and grazing region recorded 0.54 mm of RAIN (-94%), TEMP was lower than average at 18.8°C (1.6°C), and RADPAR was 1440 MJ/m^2 (-3%). According to the NDVI-based development graph, crop conditions were better than the five-year average but lower than the 5-year maximum. CALF in this region increased by 159% and VCIx reached 0.62.

Figure 3.5 Afghanistan's crop condition, July - October 2020

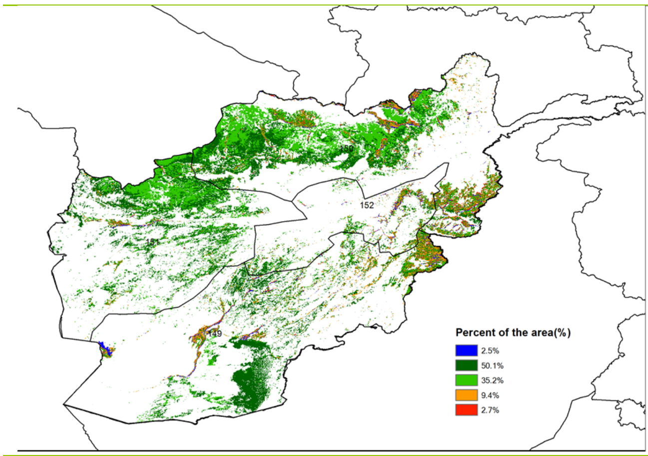


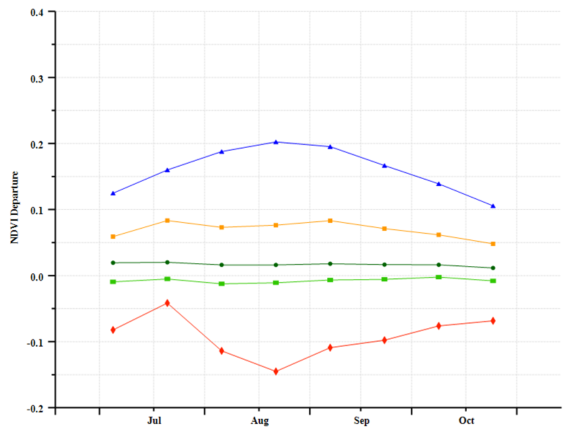
(a). Phenology of major crops



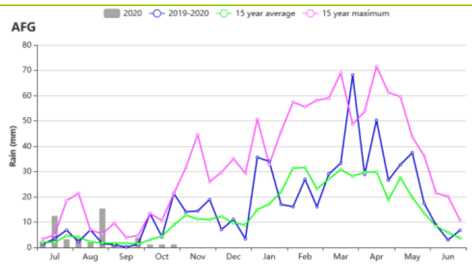


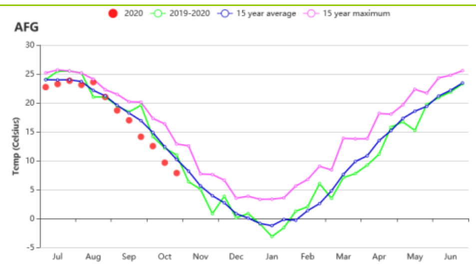
(b) Crop condition development graph based on NDVI (c) Maximum VCI



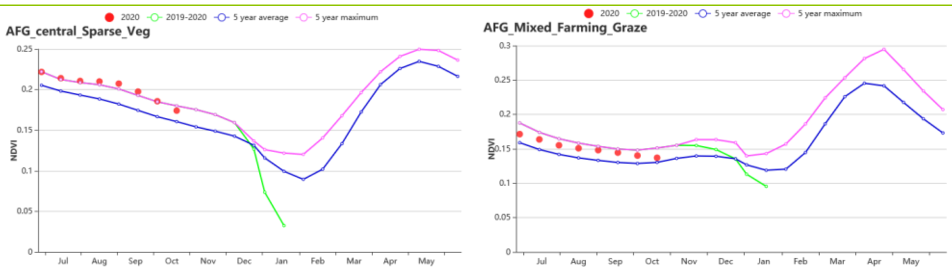


(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles

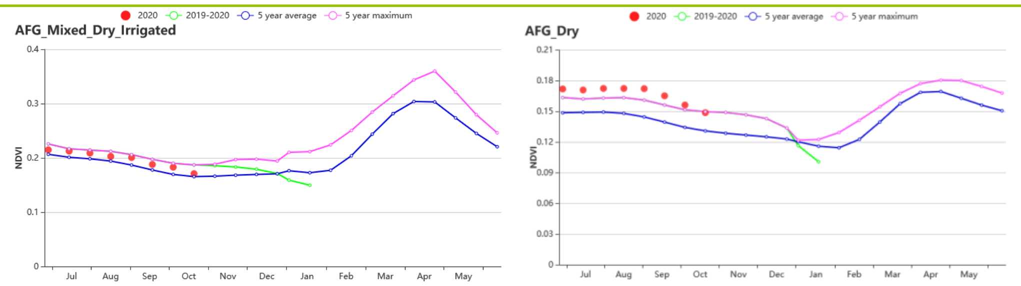




(f) Rainfall profiles (g) Temperature profiles



(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 3.2 Afghanistan's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2020

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Central region	29	14	14.4	-0.6	1411	-4	221	12
Dry region	27	19	20.8	-0.7	1449	-3	171	13
Dry and irrigated cultivation region	91	41	16.4	-1.3	1369	-4	262	27
Dry and grazing region	1	-94	18.8	-1.6	1440	-3	77	0

Table 3.3 Afghanistan's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2020

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure (%)	Current (%)	Departure (%)	Current
Central region	10	72	108	4	0.91
Dry region	6	122	110	-2	0.57
Dry and irrigated cultivation region	13	27	107	0	0.66
Dry and grazing region	1	159	101	-2	0.62

[AGO] Angola

Wheat is the major cereal crop that was grown in Angola during this monitoring period. Its harvest started in October. Planting of maize and rice also started in October. Agroclimatic indicators revealed a below-average rainfall (RAIN -8%), while there was no departure from the average temperature. Nationwide, the radiation decreased by 2%. Altogether, these conditions led to an increase in biomass by 7%.

The crop condition development graph based on NDVI for Angola presents close-to-average crop conditions throughout the monitoring period compared to the previous 5YA. These conditions were mostly influenced by the adequate rainfall recorded in the country, especially during the early wheat growing stages. The spatial patterns of NDVI departures indicate above-average NDVI in 50.3% of the arable land during the entire monitoring period, while 43.9% of arable land remained below average. At the same time, 5.8% of this area experienced a drop in crop conditions in late October. Nationwide, the maximum VCIx reached 0.85. Best VCIx values were recorded in Cuando Cubango, Cuanza Norte and Cuanza Sul. With the cropped arable land fraction increasing by 16%, the general crop conditions during July-October 2020 in Angola were normal.

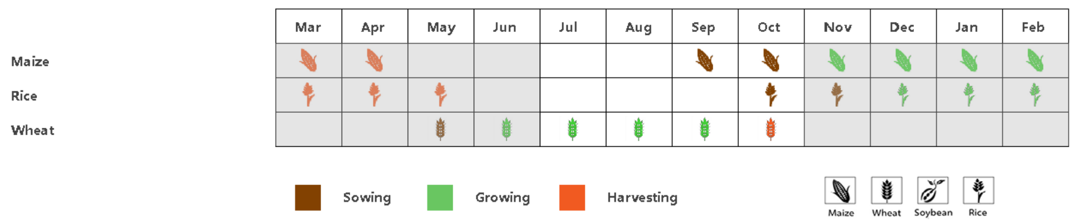
Regional analysis

Considering the cropping systems, climatic zones and topographic conditions, Angola is divided into five agro – ecological zones (AEZs): The Arid Zone, Central Plateau, Humid zone, Semi-Arid zone, and Sub-humid zone.

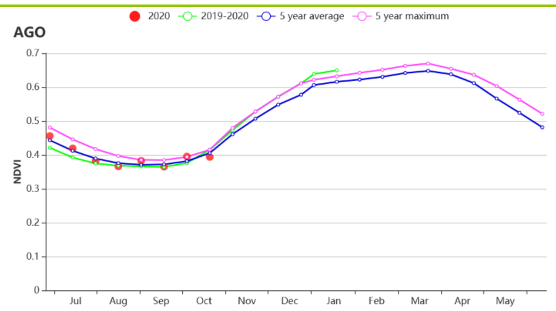
Recorded rainfall was below average in all agroecological zones. The highest departure was observed for in the Central Plateau and Semi-arid zone (about -39% and -32%), respectively. In other zones such as the Arid, Humid and Sub-humid zones, the recorded decreases in rainfall were about 8%, 5% and 6% respectively. The temperature recorded a slight decrease of 0.2 ºC in Central plateau and Humid zone. Except for the Humid zone (RADPAR +1%), all agro-ecological regions recorded decreases in the radiation by about 2%. Even though rainfall was below average, the Central plateau and Semi-arid zones stood out with a higher estimated increase in biomass by about 18% and 13%, respectively. A decrease of about 3% in biomass was recorded for the Humid zone.

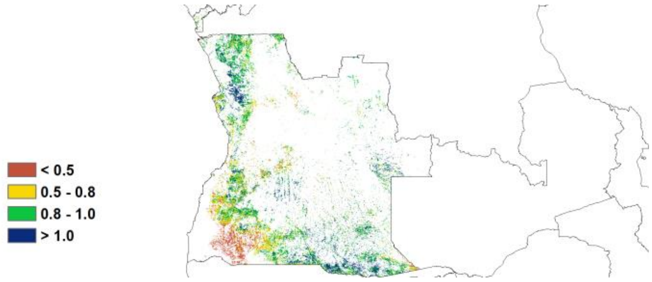
The crop conditions development graph based on NDVI reveals below-average crop conditions in the arid zone and sub-humid zone during most of the monitoring period. Above crop conditions were recorded in the Central plateau and Semi-arid zone. The Humid zone presented mixed crop conditions: Crops were in below-average conditions from July to mid-August and recovered in early September. CALF increased by about 58% in Semi-arid zone, while the Arid zone recorded a decrease by about 19% and maximum VCIx was 0.58. In the remaining zones, the recorded maximum VCIx ranged from 0.80 to 0.90.

Figure 3.6 Angola's crop condition, July-October 2020

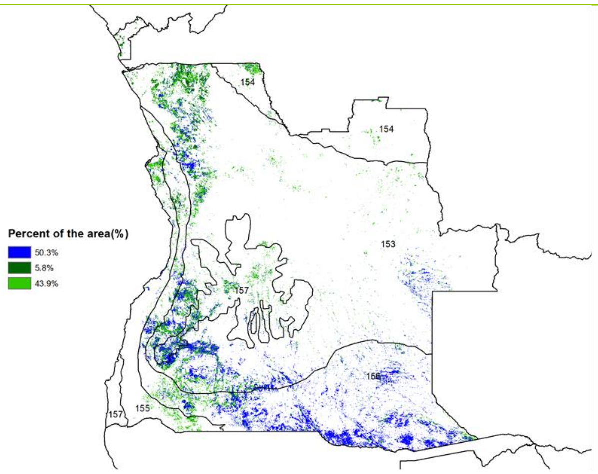


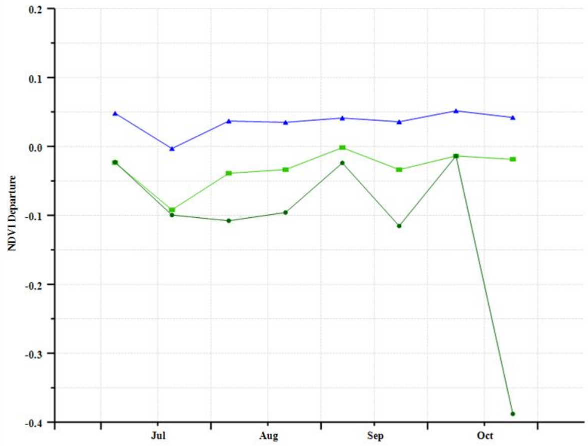
(a). Phenology of major crops



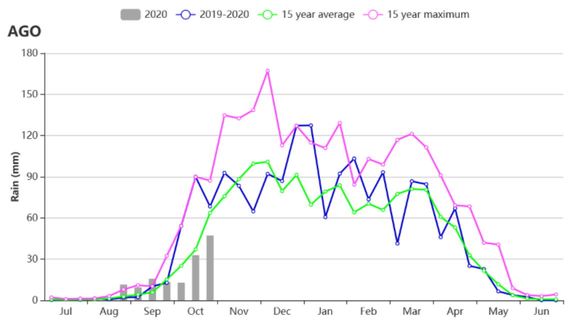


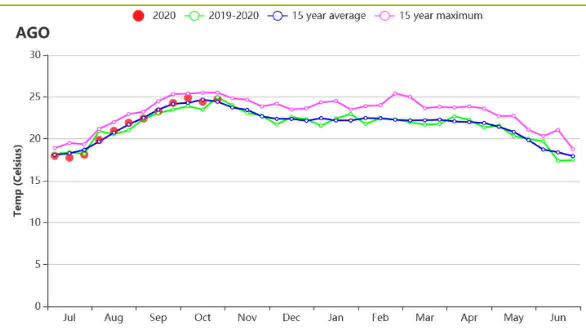
(b) Crop condition development graph based on NDVI (c) Maximum VCI



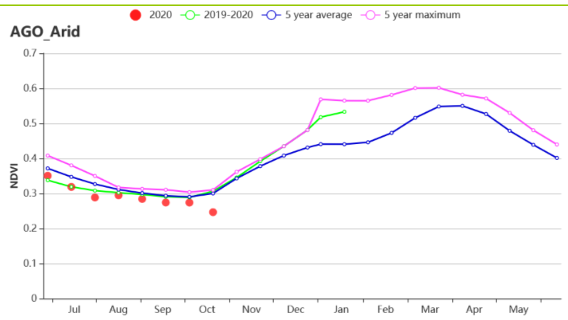


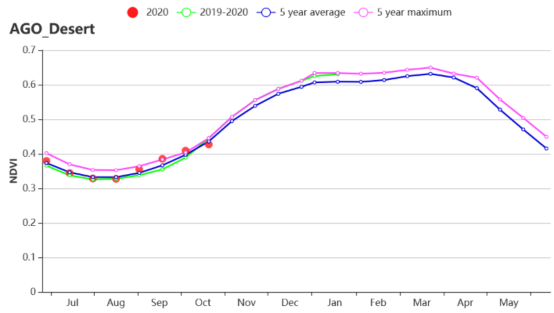
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



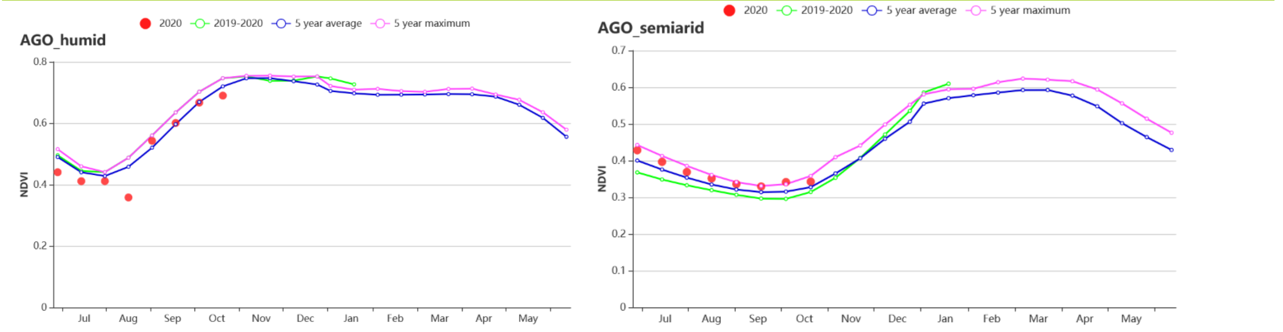


(f) Rainfall profiles (g) Temperature profiles

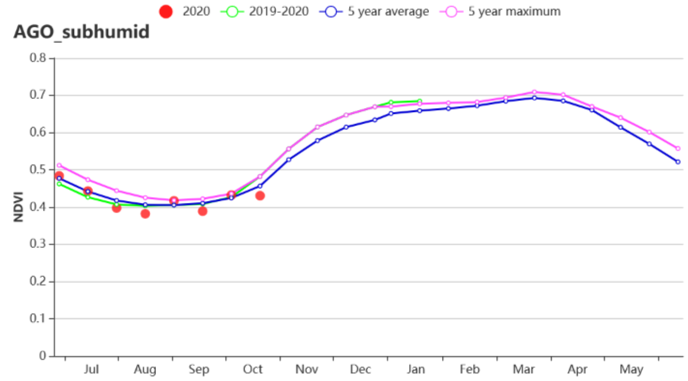




(h) Crop condition development graph based on NDVI-Arid zone (left), and Central Plateau (right)



(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 3.4 Angola's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2020

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Arid Zone	145	-8	21.7	0.0	1305	-2	448	
Central Plateau	93	-39	19.0	-0.2	1335	-2	387	
Humid Zone	508	-5	23.9	-0.2	1266	1	646	
Semi-Arid Zone	28	-32	21.3	0.0	1359	-2	373	
Sub-humid Zone	185	-6	21.8	0.0	1278	-2	490	

Table 3.5 Angola's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2020

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure (%)	Current (%)	Departure (%)	Current
Arid Zone	19	-19	102	-3	0.58
Central Plateau	42	-3	100	0	0.85
Humid Zone	100	0	108	-15	0.9
Semi-Arid Zone	42	58	100	-2	0.87
Sub-humid Zone	63	5	101	-3	0.86

[ARG] Argentina

The reporting period covers the main growing stage for wheat and the beginning of planting for maize, soybean and rice. For the whole country, rainfall showed a -20 % negative anomaly, TEMP showed a slight negative anomaly of -0.1°C, RADPAR showed a positive anomaly of +2 %, while BIOMSS showed no anomaly. CALF showed a 12% reduction and maximum VCI value was 0.62. Low rainfall was the cause for the poor performances of several agronomic indices.

The reporting period covers the main growing stage for wheat and the beginning of planting for maize, soybean and rice. For the whole country, rainfall showed a -20 % negative anomaly, TEMP showed a slight negative anomaly of -0.1°C, RADPAR showed a positive anomaly of +2 %, while BIOMSS showed no anomaly. CALF showed a 12% reduction and maximum VCI value was 0.62. Low rainfall was the cause for the poor performances of several agronomic indices.

The rainfall temporal profile showed in general lower-than-average values, except for late October, when it was above average. The NDVI profile showed quite lower-than-average values during the entire period. This could be a result of delayed planting and emergence of summer crops. TEMP profile showed variations between positive and negative anomalies following a near-average trend.

Spatial distribution of NDVI profiles showed negative anomalies in most of the Argentine agricultural areas. Stronger negative anomalies (blue and red areas) were observed in the main agricultural belt in Pampas as well as in Chaco and Subtropical Highlands. Profiles with positive anomalies (yellow and dark green areas) were much less representative and were observed in South Pampas. At the beginning more than 24 % of the area experienced average or above-average conditions. However, crops condition over 16% of the cropland deteriorated to below-average conditions at the end of the period mainly due to the water deficit. The weekly proportions of different drought categories showed better conditions at the beginning than at the end, changing from near 20 % of area with minor to severe drought conditions, to near 40 % of area with minor to severe drought conditions mainly due to the below average rainfall.

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.

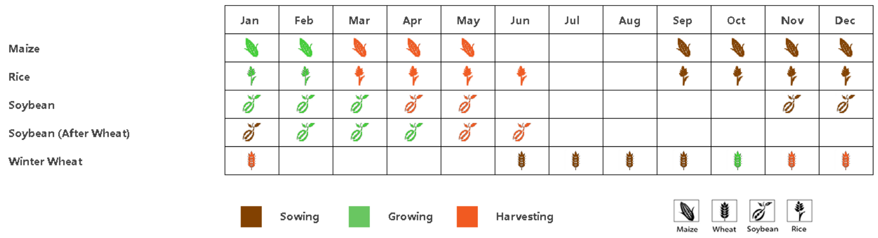
Mean values of rainfall showed negative anomalies for Chaco (-19 %), Mesopotamia (-29 %) and Pampas (-20 %), while Subtropical highlands showed a positive anomaly of +9 %. TEMP showed positive anomalies in Chaco (+0.7° C), Mesopotamia (+0.4° C) and Subtropical highlands (+0.5° C). Pampas showed a negative TEMP anomaly of -0.2° C. RADPAR showed slight positive anomalies in the four zones: Chaco (+1 %), Mesopotamia (+2 %), Subtropical highlands (+2 %) and Humid Pampas (+2 %). BIOMSS showed positive anomalies in Chaco (+6 %), Mesopotamia (+2 %) and Subtropical highlands (+8 %) and negative anomaly in Humid Pampas (-5 %). CALF was far from complete showing negative anomalies in Chaco (-18 %), Humid Pampas (-12 %) and Subtropical highlands (-24 %). In contrast, Mesopotamia showed no anomaly with almost complete CALF. VCIx showed quite low values for all of these regions: Chaco (0.45), followed by Mesopotamia (0.67), Pampas (0.64) and the Subtropical highlands (0.57).

NDVI profiles for Chaco and Subtropical highlands showed lower-than-average values during all the reporting period. Pampas showed slight negative anomalies during August and September, with no or positive anomalies at the beginning and end of this period. Mesopotamia showed lower-than-average NDVI values, except for early July.

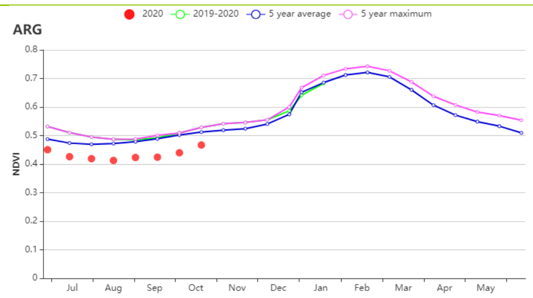
VCIx showed also a poor generalized pattern with values lower than 0.5 in Pampas agricultural belt, Chaco and Subtropical Highlands. Better conditions were observed in Mesopotamia and South Pampas.

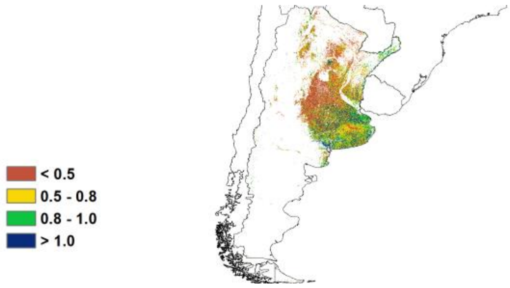
In summary, several indices showed poor growing and planting conditions in relevant agricultural areas, like rainfall and NDVI anomalies and very low VCIx values in northwestern Pampas agricultural belt and Chaco. In addition, quite low CALF values were observed in these regions. They reflect poor conditions also for the planting of summer crops.

Figure 3.7 Argentina´s crop condition, July - October 2020.

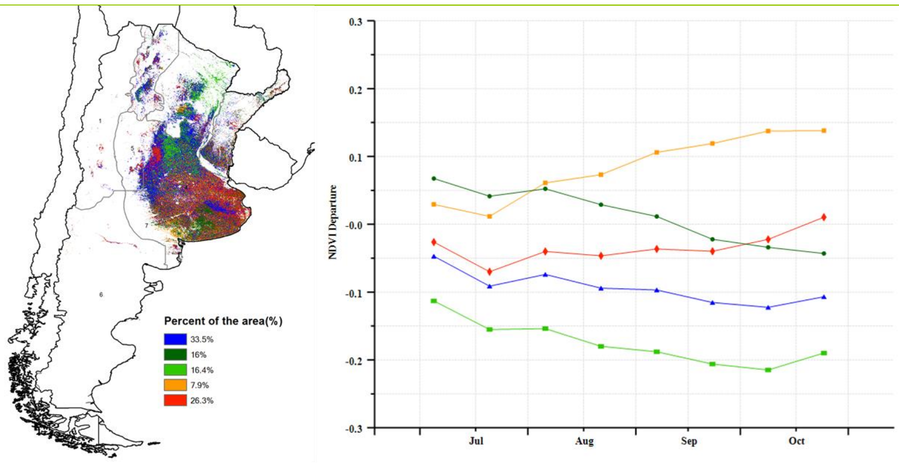


(a) Phenology of major crops

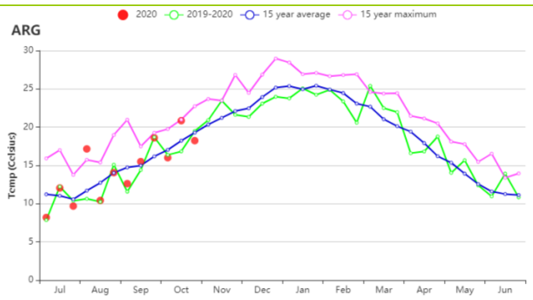


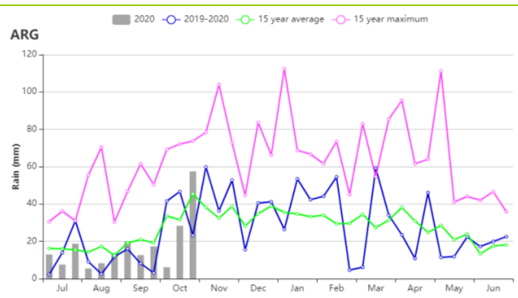


(b) Crop condition development graph based on NDVI (c) Maximum VCI

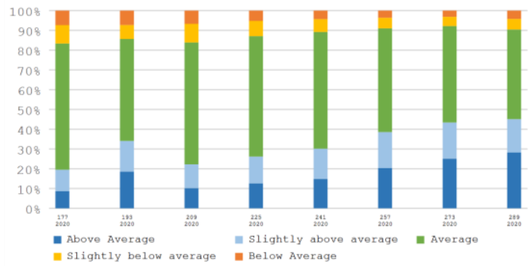


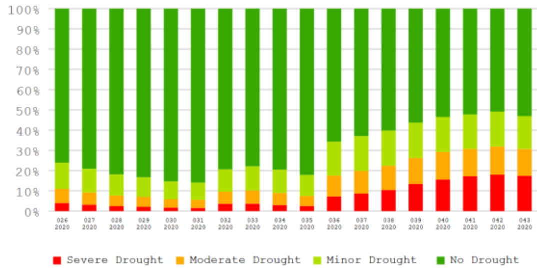
(d) Spatial NDVI patterns compared to 5YA (left) and NDVI profiles (right)



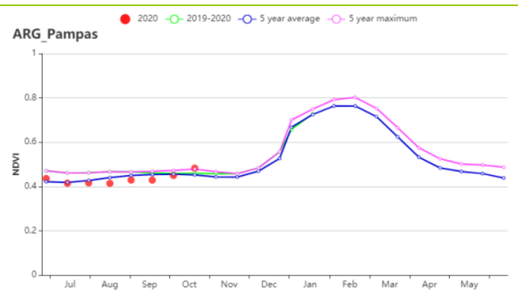


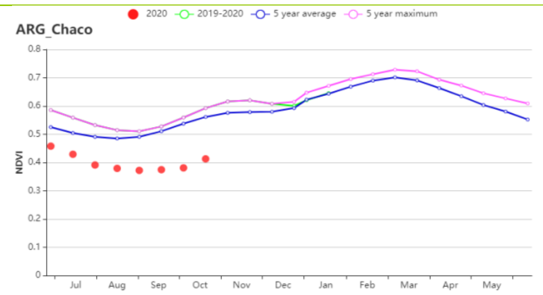
(e) Time series of rainfall profile (f) Time series of temperature profile



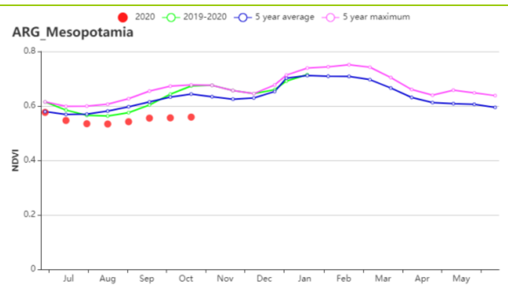


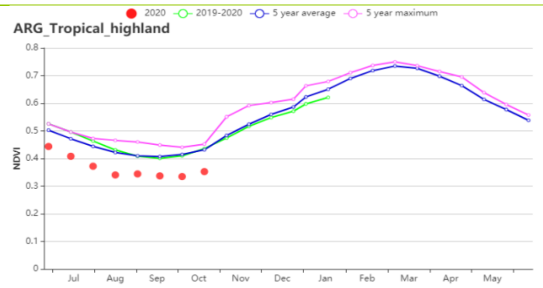
(g) Proportion of NDVI anomaly categories compared with 5YA (h) Proportion of VHIm categories compared with 5YA





(i) Crop condition development graph based on NDVI in Humid Pampas (left) and Chaco (right)





(j) Crop condition development graph based on NDVI in Mesopotamia (left) and Subtropical highlands (right)

Table 3.6 Argentina's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2020

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Chaco	196	-19	18.5	0.7	949	1	453	6
Mesopotamia	320	-29	16.2	0.4	880	2	371	2
Humid Pampas	176	-20	12.4	-0.3	903	2	291	-5
Subtropical highlands	143	9	16.3	0.5	1145	2	441	8

Table 3.7 Argentina's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2020

Region	CALF		Cropping Intensity		Maximum VCI
	Current (%)	Departure (%)	Current (%)	Departure (%)	Current
Chaco	74	-18	105	-4	0.45
Mesopotamia	98	0	106	-8	0.67
Humid Pampas	71	-12	104	-6	0.64
Subtropical highlands	57	-24	103	-1	0.57

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 current period covers the main growth period and the early harvest of wheat and barley, the main cereal crops of Australia. The national NDVI profiles are much better than the average of the last 5 years, nearly reaching the peak.

In the JASO period, Australia experienced above-average rainfall (RAIN +12%). The average temperature was 12°C, which was slightly above the 15YA (+0.2°C). The rainy weather led to below average sunshine (-5%). Though the higher rain was beneficial for crop growth, below-average solar radiation led to a decrease of the potential biomass estimate (-1%). The agronomic indicators were positive, with a VCIx of 0.86, an increased CALF (+4%) and an average CI (-1%).

Spatially, the conditions in three (New South Wales, South Australia, and Victoria) out of four main wheat production states were similar. They featured above-average rain, cool temperatures and slightly less sunshine, which led to a below average estimate of potential biomass. In the remaining state, Western Australia, an increase in biomass production was estimated. The VCIx map shows that the overall conditions in Australia were favorable considering the generally water limiting conditions for cereal production in Australia. The highest and lowest VCI were both found in New South Wales. The spatial NDVI profiles show above-average conditions in 45.2% of the cropland, below-average conditions on 20.6%, while the remaining 34.2% were near average. Overall, the crop conditions for Australia were very favorable.

Regional analysis

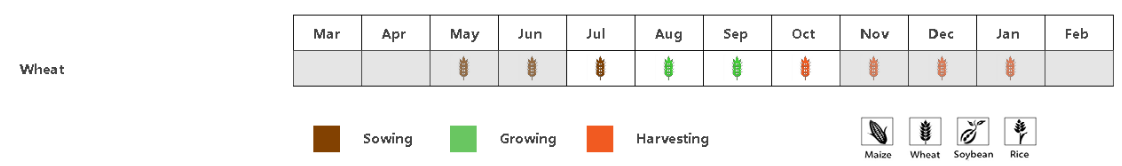
This analysis adopts five agro-ecological regions for Australia, namely the Arid and Semi-arid Zone, Southeastern Wheat Zone, Subhumid Subtropical Zone, Southwestern Wheat Zone, Wet Temperate and Subtropical Zone. The Arid and Semi-arid Zone, in which hardly any crop production takes place, was not analyzed.

The NDVI profiles in the three southeast zones, including the Southeastern Wheat Zone, Subhumid Subtropical Zone, Wet Temperate and Subtropical Zone, show that the crop conditions were good, reaching the 5-year maximum. Rainfall in these zones was above average (Southeast wheat area +28%, Subhumid subtropical zone +15%, Wet temperate and subtropical zone +16%). The temperatures were around the average (-0.1°C, 0.2°C, 0.1°C), while the solar radiation was below (-8%, -5%, -6%). The potential biomass was below average in the Southeast wheat area (-7%) and Wet Temperate and Subtropical Zone (-3%), but above average in the Subhumid subtropical zone (+3%). CALF departures were as follows: Southeast wheat area +3%, Subhumid subtropical zone +17%, Wet temperate and subtropical zone -2%. The cropping intensities were nearly no changes. The production of wheat and barley in these zones is estimated as above average.

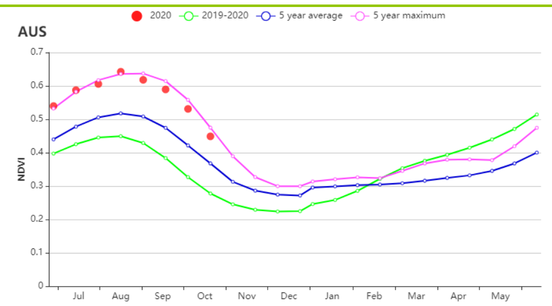
The Southwestern wheat area experienced below-average rainfall (-21%), warm temperatures (+0.5°C), and slightly above-average sunshine (+2%). With a CALF of 92%, the potential biomass increased by +8%, and cropping intensity was not change. As a result, the production of this zone is generally favorable.

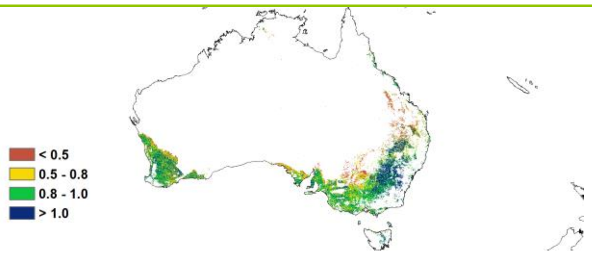
Overall, combining the agro-climatic and agronomic indicators, the crop conditions in the JASO period were favorable, and an above-average production is estimated.

Figure 3.8 Australia's crop condition, July - October 2020

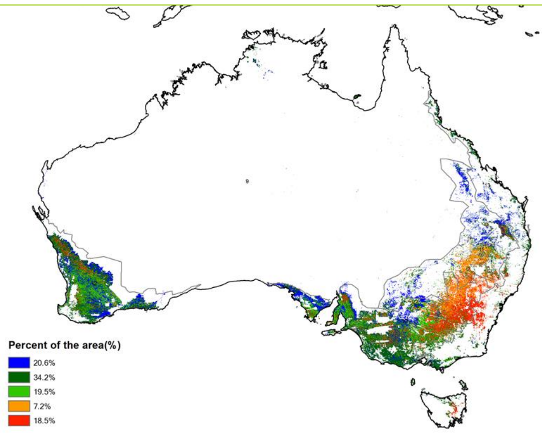


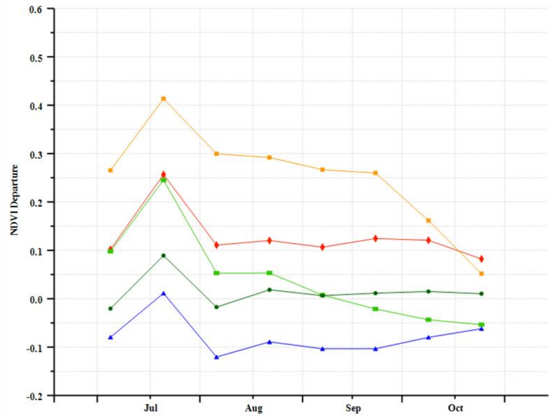
(a). Phenology of major crops



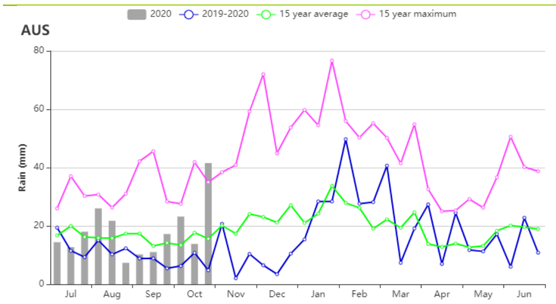


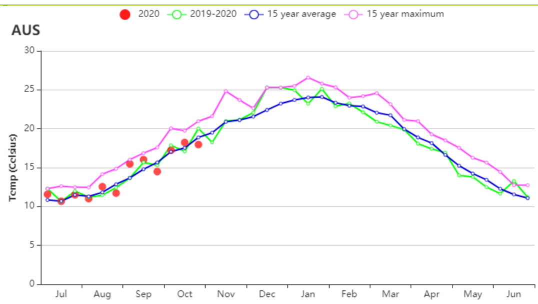
(b) Crop condition development graph based on NDVI (c) Maximum VCI



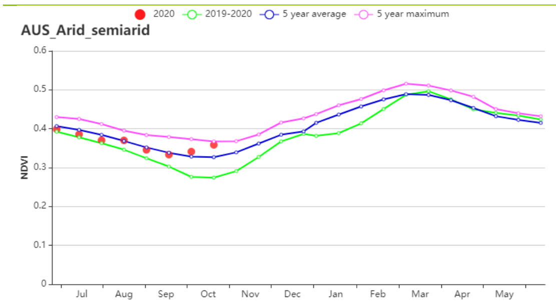


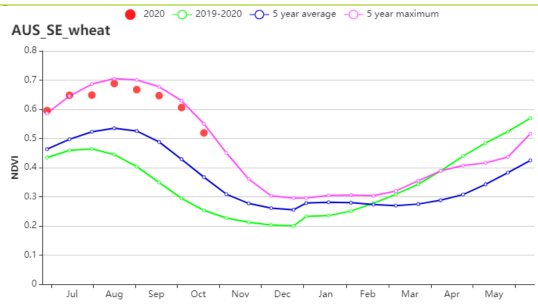
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



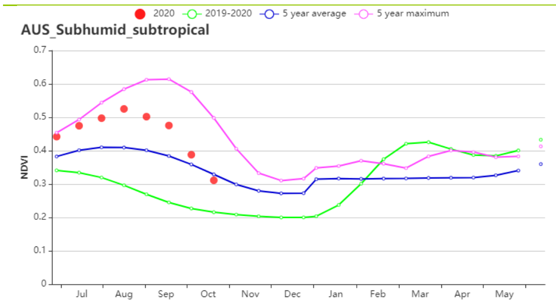


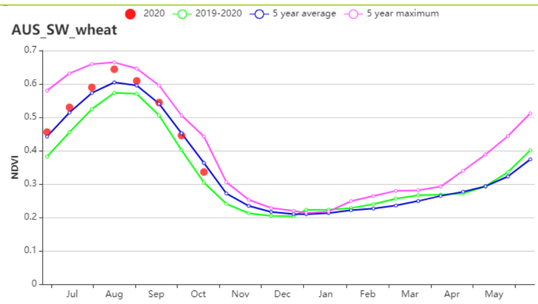
(f) Rainfall profiles (g) Temperature profiles



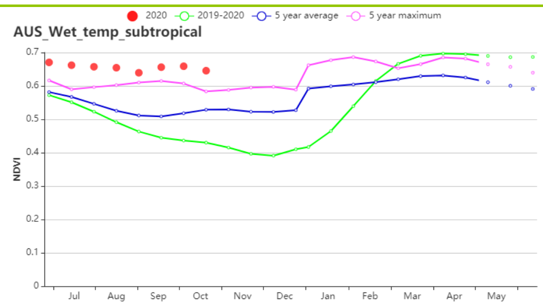


(h) Crop condition development graph based on NDVI (Arid and semiarid zone (left) and Southeastern wheat area (right))





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



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

Table 3.8 Australia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 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	87	32	22.9	0.5	1199	-3	362	-7
Southeastern wheat area	263	28	12.0	-0.1	780	-8	280	-7
Subhumid subtropical zone	167	15	15.5	0.2	1016	-5	418	3
Southwestern wheat area	186	-21	13.5	0.5	873	2	343	8
Wet temperate and subtropical zone	259	16	13.1	0.1	885	-6	329	-3

Table 3.9 Australia's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July-October 2020

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure (%)	Current (%)	Departure (%)	Current
Arid and semiarid zone	53	5	100	-1	0.76
Southeastern wheat area	95	3	100	-1	0.88
Subhumid subtropical zone	66	17	103	-2	0.76
Southwestern wheat area	92	3	100	0	0.86
Wet temperate and subtropical zone	93	-2	102	-5	0.93

[BGD] Bangladesh

This monitoring period covers the planting and growth of Aman rice and the harvest of Aus rice. Rainfall was above average by 5%. The average temperature was a bit higher (+0.5°C) and the photosynthetically active radiation was 1055 MJ/m2 (3% lower than average). BIOMSS was below average by 2%. The national NDVI development curve shows that crop conditions across the country were significantly lower than the 5-year average from July to September, due to floods, and reached average levels by October. The spatial NDVI pattern shows that 33.1% of the crops were above the 5-year average throughout the season, mainly dispersed in Coastal region and Hills. 22.3% of the crops were below average during the whole monitoring period. The best Vegetation Condition Index (VCIx) ranged from 0.8 to 1 and the national VCIx value was 0.91, with most areas higher than 0.8. However, the flood in July and August caused wide-spread crop damage and made it difficult to harvest Aus rice, which also delayed the planting of the Aman rice. According to the last report, the NDVI curve was close to average from April to May and then rapidly dropped to below average in June, and returned to normal levels by the end of October, which was consistent with the flood events. They caused local crop damage and a general delay of the Aman rice production. The fact that the crops recovered to close to normal crop conditions in October indicates that production prospects are only slightly below average.

Regional analysis

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

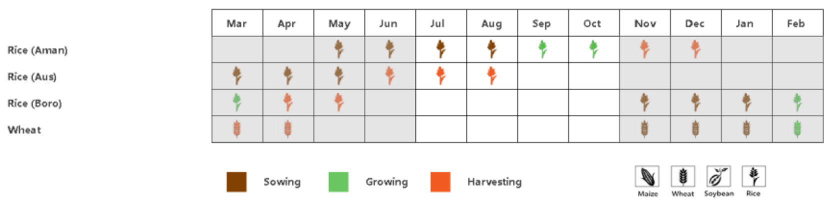
In the Coastal region, both RAIN and TEMP were above average (+15% and +0.6°C, respectively). BIOMSS and RADPAR were below average (-1% and -2%). The crop condition development graph based on NDVI shows that crop conditions were significantly lower than the 5-year average from July to September, and then reached average levels. CALF was at 92% and VCIx at 0.95 and BIOMSS was -1%. These parameters indicate average conditions.

The Gangetic plains received the largest precipitation amount (+18% above average). Temperature was above average (+0.5°C) and RADPAR was 3% below. The crop condition development graph based on NDVI shows that crop conditions were significantly lower than the 5-year average during the whole monitoring period, and BIOMSS decreased by 3%. CALF (95%) and VCIx at 0.92 indicate unsatisfactory prospects.

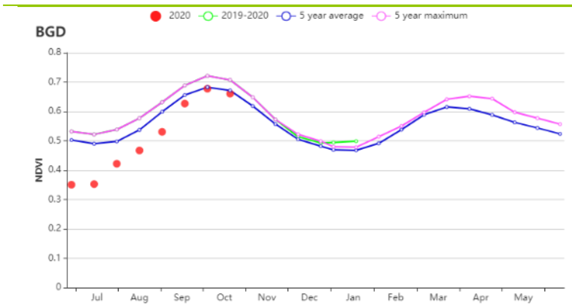
In the Hills, rainfall was 2% below the average, TEMP was above average (+0.5°C) but with poor sunshine (RADPAR -5%). The crop condition development graph based on NDVI shows that crop conditions were close to average in August and October, but slightly below average in the other months. BIOMSS was below average (-3%), CALF was 98% and VCIx was 0.99, indicating satisfactory crop conditions.

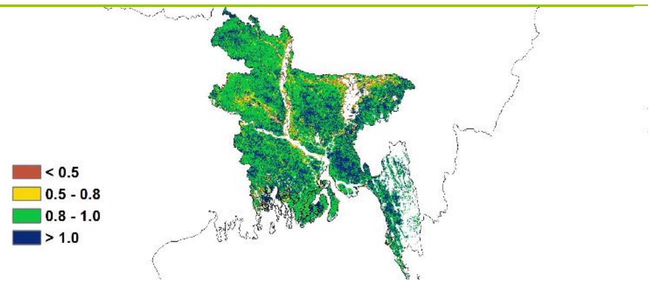
In the Sylhet Basin, rainfall was close to average. TEMP was 0.6°C above the average and RADPAR was 4% below. The NDVI development was similar to the Coastal region, starting below average and exceeding the average in October. The BIOMSS potential of 699 gDM/m^2 (the lowest for all regions) was also 4% below the 5YA, with low CALF at 86% and VCIx of 0.87. Widespread flooding in August caused unfavorable crop conditions.

Figure 3.9 Bangladesh's crop condition, July - October 2020

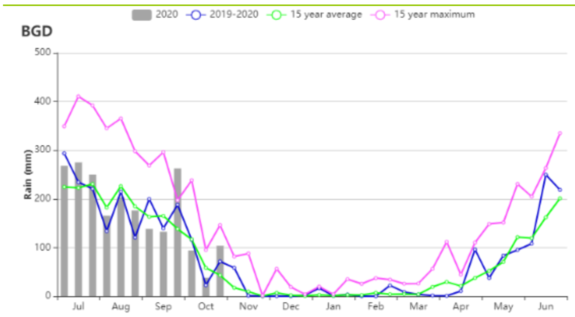


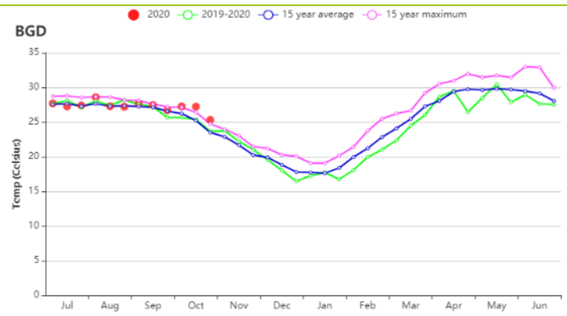
(a). Phenology of major crops



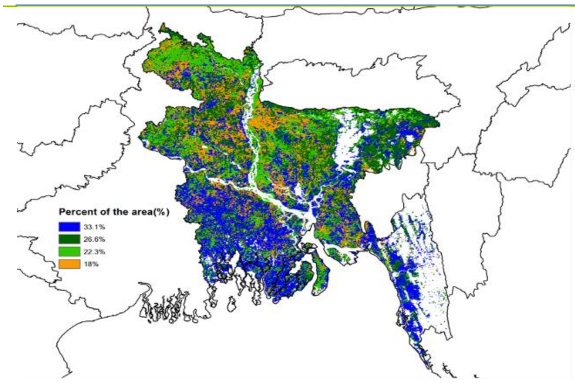


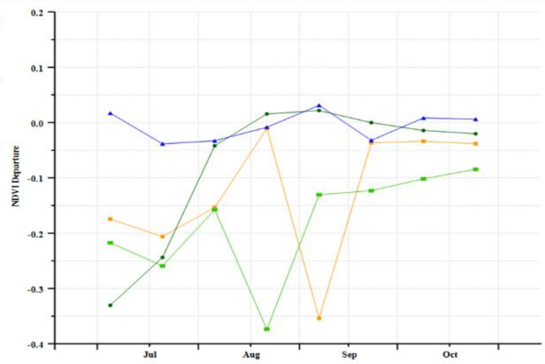
(b) Crop condition development graph based on NDVI (c) Maximum VCI



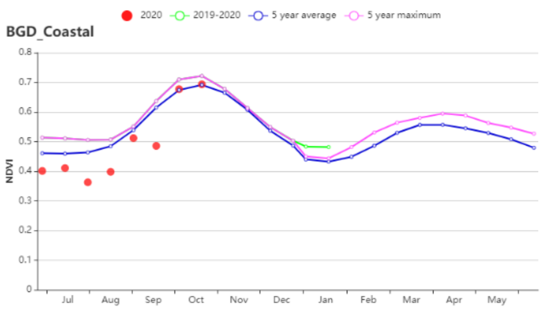


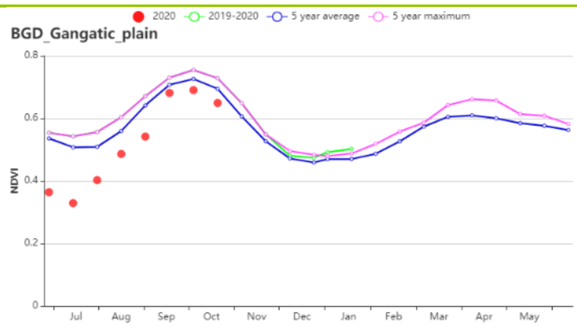
(d) Rainfall Index (e) Temperature Index



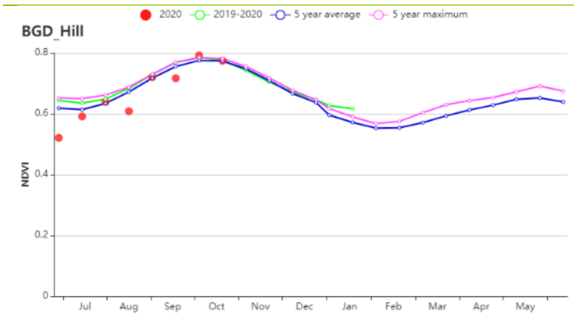


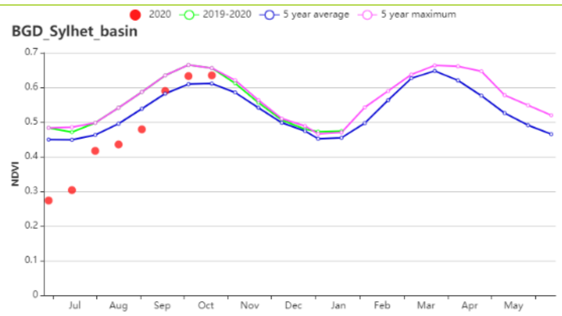
(f) Spatial NDVI patterns compared to 5YA (g) NDVI profiles





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





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

Table 3.10 Bangladesh's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July-October 2020

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure from 15YA (%)	Current (gDM/m^2)	Departure from 15YA (%)
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 3.11 Bangladesh's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July-October 2020

Region	CALF		Cropping intensity		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current(%)	Departure from 5YA(%)	Current
Coastal region	90	6	159	1	0.97
Gangetic plain	98	1	181	-3	0.97
Hills	97	1	109	-21	0.95
Sylhet basin	99	2	160	-5	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

The reporting period includes the harvesting of spring wheat from August to September and the planting of winter wheat from August to October. The nationwide rainfall amount was 254 mm, 6% below the 15YA average. Temperature increased slightly (16°C, 1.0°C) while radiation was somewhat below average (RADPAR, 780MJ/m², -3%). The potential biomass was below average (-2%). Agronomic conditions were generally favorable: very good values of VCIx (0.97) and cropped arable land fraction (CALF, 100%) were observed. However, due to the decrease of rainfall in center and north Belarus during the period of winter wheat sowing, crop prospects for the 2020/21 season in these areas could be affected.

The NDVI development graph indicates that crop condition had gradually recovered to the level of the 5-year average starting in August. Crop condition in about 71.2% cropped area was close to or above the 5-year average, in agreement with the national VCIx map. There was an apparent drop in NDVI profiles in most of the areas from July to August, the reason for this might be the gradual decrease of rainfall during this period. According to the VCIx distribution map, VCIx was satisfactory in most cropped areas of the country (above 0.8), indicating fair crop prospects, while most low values were scattered in the southern area.

Although agronomic indicators were generally favorable starting in August, below average rainfall in the central and northern area caused low soil moisture conditions and may have negatively impacted germination of winter wheat. Crop conditions in most areas of the country during the past months were generally close to the 5-year average, indicating favorable crop prospects.

Regional analysis

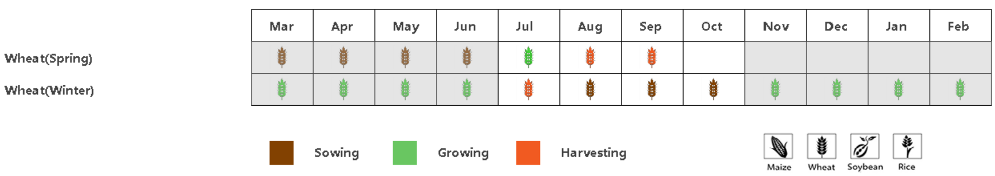
Regional analyses are provided for three agro-ecological zones (AEZ) defined by their cropping systems, climatic zones, and topographic conditions, including Northern Belarus (028, Vitebsk, the northern area of Grodno, Minsk and Mogilev), Central Belarus (027, Grodno, Minsk and Mogilev and Southern Belarus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

North Belarus recorded a minor radiation deficit (-4%) combined with lower rainfall (-9%) and slightly higher temperatures (+0.8°C). Potential biomass decreased by 6% below average. The VCIx had reached 0.99, and CALF had reached 100%. The NDVI development curve was generally above average. Winter wheat may grow normally based on agro-climatic indicators in this area but the impact of lower soil mositure in this period on winter wheat germination and early establishment requires close attention.

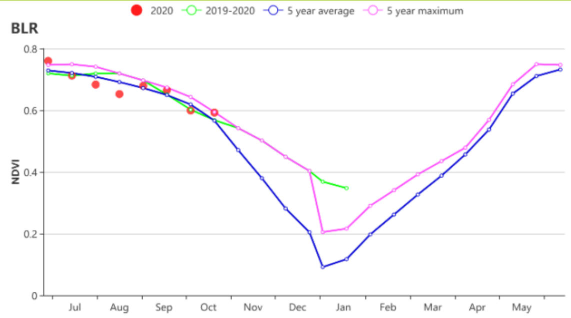
Central Belarus also experienced lower rainfall (-9%) and slightly higher temperature (1.0°C), and less sunshine (-3%). Similar to northern Belarus, high CALF (100%) and VCIx (0.97) were also recorded. The NDVI growth curve was generally above the average trend from July to October. But potential biomass decreased by about 2%, therefore winter wheat conditions in this area might also need close monitoring.

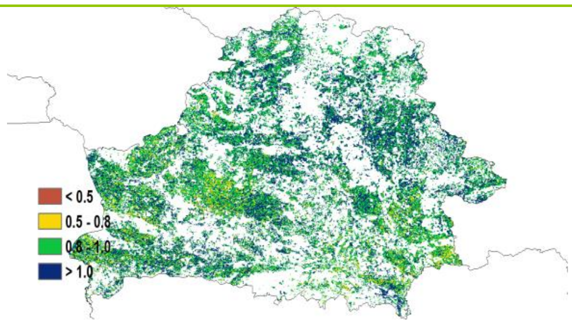
Precipitation in **Southern Belarus** was almost the same as the 15YA average level, while the temperature was slightly higher by 1.1°C and radiation was lower by 2%. Potential biomass was expected to increase by 1%. The CALF and the VCIx were 100% and 0.95 respectively. The water shortage in the previous period of spring did not cause a negative impact on the production of spring wheat. The sufficient soil moisture will be beneficial for the winter wheat.

Figure 3.10 Belarus's crop condition, July - October 2020.



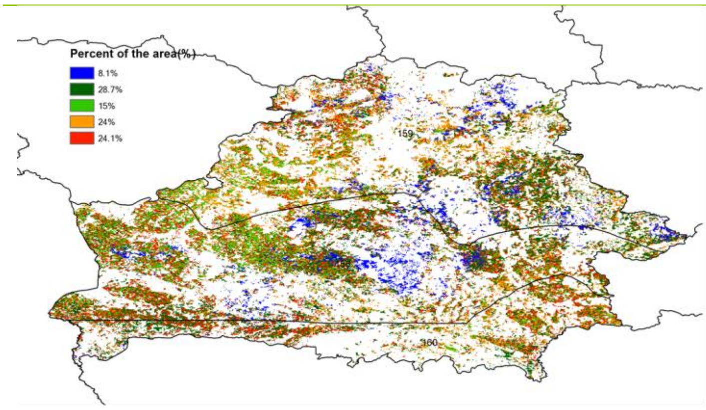
(a). Phenology of major crops

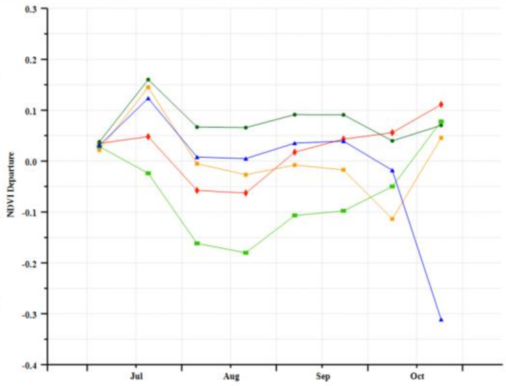




(b) Crop condition development graph based on NDVI

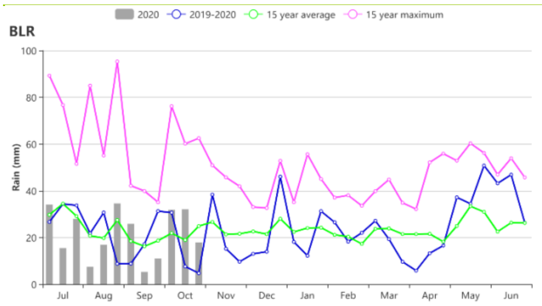
(c) Maximum VCI

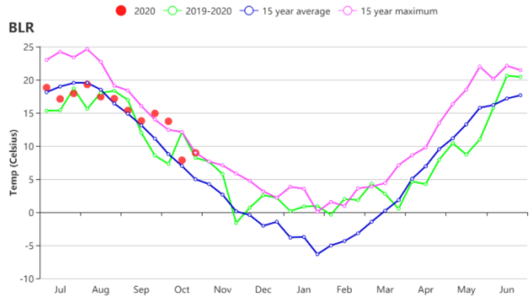




(d) Spatial NDVI patterns compared to 5YA

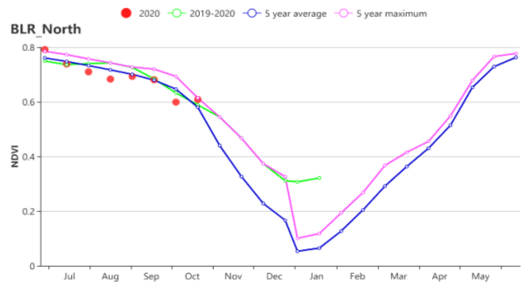
(e) NDVI profiles

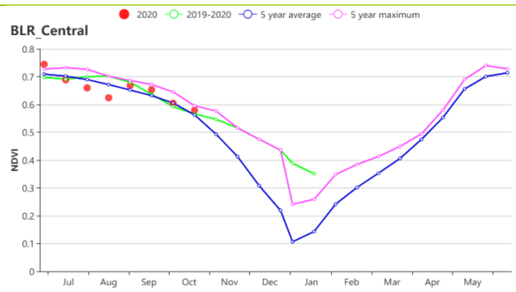




(f)Rainfall time series

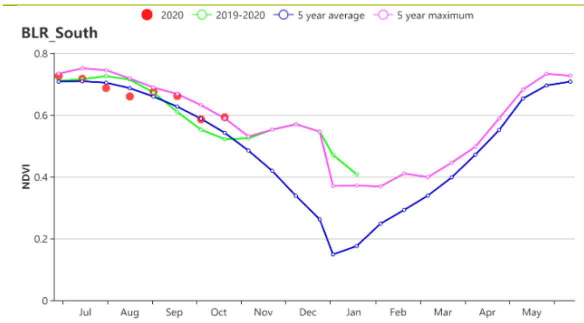
(g) Temperature time series





(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 3.12 Belarus's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2020.

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Center	254	-6	16	1.0	780	-3	350	-2
North	274	-9	14	0.8	728	-4	301	-6
South-west	245	0	16	1.1	824	-2	388	1

Table 3.13 Belarus's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2020.

Region	Cropped arable land fraction		Cropping Intensity		Maximum VCI
	Current (%)	Departure (%)	Current (%)	Departure (%)	Current
Center	100	0	101	1	0.97
North	100	0	100	0	0.99
South-west	100	0	102	2	0.95

[BRA] Brazil

This reporting period covers the main growing period of wheat. Its harvest concluded by the end of October. The harvest of maize in North-east is also ongoing while the harvest of rice in north and northeast and second maize in central and southern Brazil has concluded. The sowing of summer crops (maize, soybean, and rice) in Central and Southern Brazil started in October and will last until the end of December.

Overall dry and warmer-than-usual weather dominated the reporting period which was unfavorable for crops in Brazil. CropWatch Agro-climatic Indicators (CWAIs) present below-average conditions with 21% lower rainfall, 0.7°C higher temperature and 2% above average radiation compared with the 15YA. Significant below-average rainfall resulted in a 7% reduction of potential biomass. Dry weather conditions were wide-spread across all of Brazil with only four states receiving an above-average rainfall, including Distrito Federal (+41%), Espirito Santo (+33%), Bahia (+18%), and Rio De Janeiro (+2%). Some major agricultural producing states such as Sao Paulo, Mato Grosso Do Sul, Parana, Santa Catarina, Rio Grande Do Sul, and Mato Grosso suffered from water shortages with negative anomalies ranging from 33% to 22%. Similarly, temperatures in all states presented above-average conditions except for Ceará where temperatures remained at the 15YA level. The largest temperature anomalies were observed in Sao Paulo, Mato Grosso Do Sul, Parana, and Rondonia where temperatures were more than 1.0 ºC above average. Negative and positive anomalies of radiation were observed in different states with the largest positive departure in Alagoas at 10% above average and the largest negative departure in Acre, 3% below average. Low rainfall and high temperature resulted in water stress in central Brazil as indicated by the below average BIOMSS on the BIOMSS departure map.

According to the national rainfall profiles, the main rainy season usually starts in late September. This year's start was in mid-October only. As indicated by the 10-day accumulations of rainfall, precipitation was significantly below average from mid-July to mid-October except for mid-August. The low rainfall might exacerbate the sowing, emergence, and early development of summer crops. For more detailed information, it is recommended to visit CropWatch Explore (http://cropwatch.com.cn/newcropwatch/main.htm).

The crop condition development graph based on NDVI for Brazil presents average values during July to August while it deteriorated to below average starting in September mainly due to the water stress. The chart showing proportions of different drought categories from July to October 2020 also indicates that the drought in Brazil got more severe as the proportion of drought affected areas increased from 17% in early September to 30% in late October. The adverse dry and hot weather hampered crop establishment as shown by the NDVI departure clustering maps and profiles. Most crops in Central Brazil stayed in below-average conditions throughout the growing season while southern Brazil presented close-to-average conditions. The drought condition in Mato Grosso, Parana, Sao Paulo, and northwestern Rio Grande Do Sul adversely affected the crops as shown by significant decreasing trends of the NDVI departures (Red color in figure e). Accordingly, the VCIx map also presents low values (< 0.5) in central Brazil covering vast areas from Mato Grosso, Goias, Minus Gerias, to Sao Paulo (figure f). It is also noteworthy that crops in northeastern coast showed above-average conditions during the monitoring period as they benefited from the normal or above-average rainfall. At the national level, VCIx was 0.87 and CALF was 2% above the 5YA. Cropping intensity increased by 1% indicating that the total cultivated crop area was at an above-average level.

All in all, crop conditions in Brazil were below average and the establishment of the summer crops was delayed due to the drought conditions. However, wheat production in Parana and Rio Grande do Sul benefitted from rather favorable conditions. The map depicting the spatial distribution of NDVI profiles shows an above-average departure for the wheat production zones in those two states and an above-average wheat production is estimated. The establishment of the summer crops will mainly depend on sufficient rainfall in the coming months, as the season is starting with a considerable soil moisture deficit.

Regional analysis

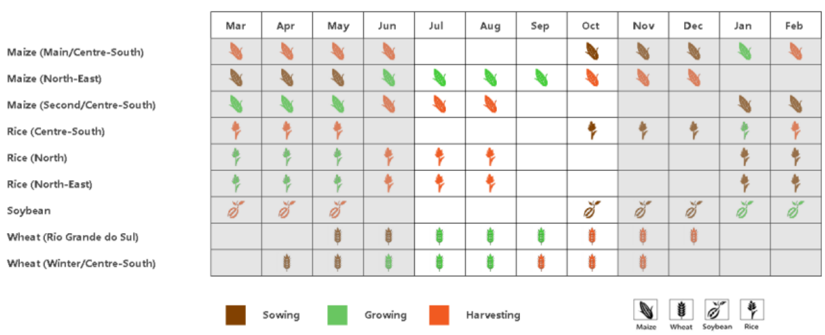
Considering the differences of cropping systems, climatic zones, and topographic conditions, eight agro-ecological zones (AEZ) are identified for Brazil. These include the Central Savanna, the east coast, Parana river, Amazon zone, Mato Grosso zone, Southern subtropical rangelands, mixed forest, and farmland, and the Nordeste. Similar to the dry weather pattern observed at the national level during the monitoring period, five zones including Amazonas, Northeastern mixed forest and farmland, Mato Grosso, Parana basin and Southern subtropical rangelands received significantly below-average rainfall (-19% to -37%). Temperature in each zone was higher than average with the largest temperature departure in Parana by 1.2 degree. Radiation in each zone was generally close to average ranging from average to 3% above average. As a result of the combined effects from rainfall, temperature, and radiation, below average BIOMSS was observed in most zones except for Coast zone (+5% above average) and southern subtropical rangelands (no change).

Diversified agro-climatic conditions together with the human activities (farm managements, irrigation, etc) resulted in great differences of crop condition among AEZs. As indicated by the NDVI development profiles, below-average crop growth conditions were observed in Amazonas, Northeastern mixed forest and farmland, Mato Grosso, and Parana basin. Among the four zones with below-average conditions, Mato Grosso, and Parana basin are the two zones which showed the worst crop conditions mainly due to the prolonged dry conditions which was identified since October of last year. Accordingly, CALF in the two zones also presented below-average values that were 4% and 1% lower than 5YA while cropping intensity was 4% and 2% above average. The lowest two values of Maximum Vegetation Condition Index (VCIx) were observed in the two zones, Mato Grosso, and Parana.

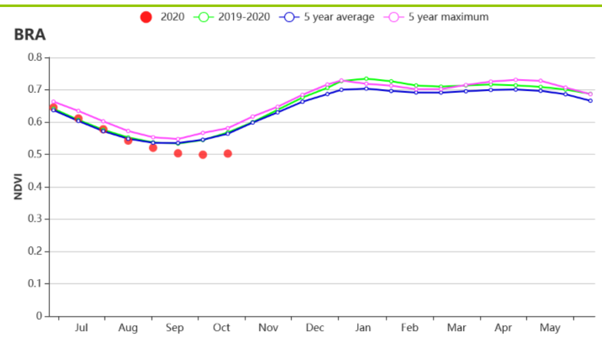
Favorable agro-climatic conditions in Nordeste benefitted crops and resulted in above-average crop conditions as indicated by the NDVI-based crop development profiles. The Nordeste is the only zone that presented above-average NDVI throughout the growing season. Similar to that in the previous bulletin, the VCIx of Nordeste was the highest among the zones. It reached 1.22 indicating that crop conditions were better than during the last five years. Maize yield in the region is expected to be at record levels compared with the last 5 years. Thanks to favorable climatic conditions, cropped arable land fraction (CALF) in this zone was 43% above the 5YA. Nordeste presented the lowest cropping intensity among all the AEZs at 103%, with 4% lower than 5YA.

Average or close-to-average crop conditions were observed in the Central Savanna, and southern subtropical rangelands. However, weather conditions in the two zones greatly differed from each other. Central Savanna experienced above-average rainfall and close-to-average temperature and radiation. The rainfall was beneficial for crops as indicated by the significantly above-average CALF and high VCIx at 1.02. The above average rainfall will also be favorable for the sowing and early development of summer crops. In Southern subtropical rangelands, crops remained at average levels although rainfall was 28% below the 15YA. The main reason is that the zone still received 440 mm water during the monitoring period while winter crops already reached maturity stage by September and the rainfall was sufficient for the crop demand. BIOMSS and CALF were close to average and VCIx was 0.90 confirming the average conditions in the zone. Also, cropping intensity for the two AEZs were 4% and 13% above average.

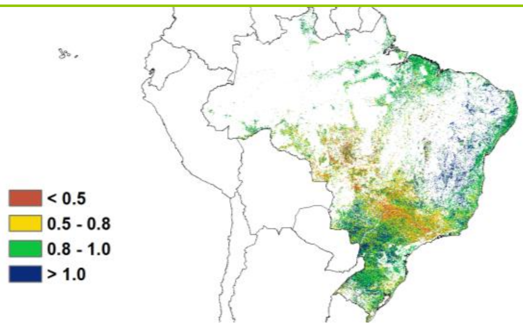
Figure 3.11 Brazil's crop condition, July - October 2020



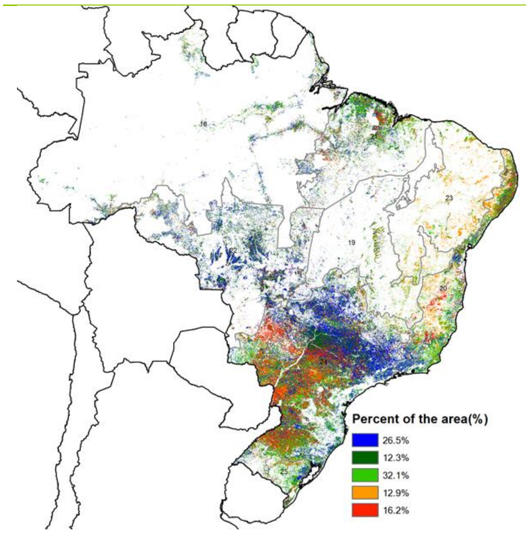
(a). Phenology of major crops



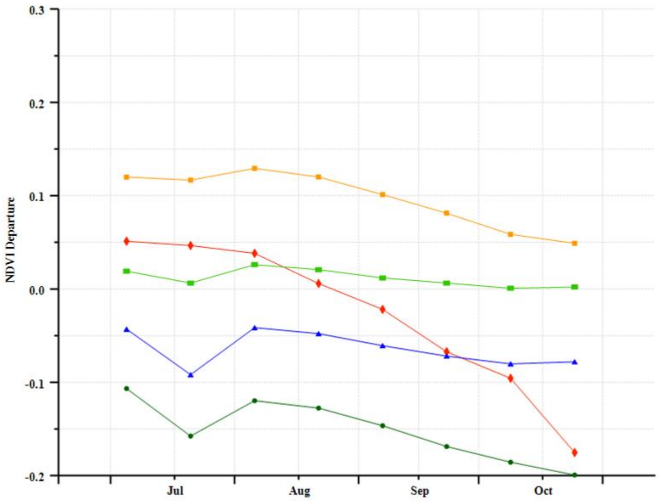
(b) Crop condition development graph based on NDVI



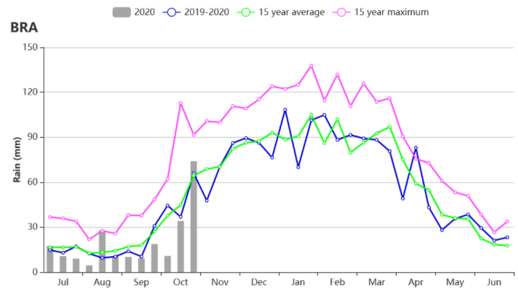
(c) Maximum VCI



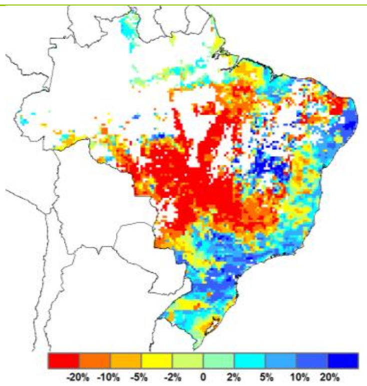
(d) Spatial NDVI patterns compared to 5YA



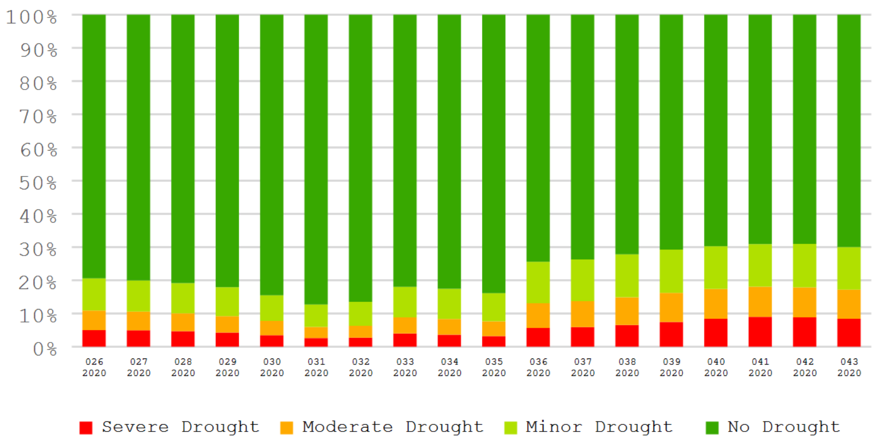
(e) NDVI profiles



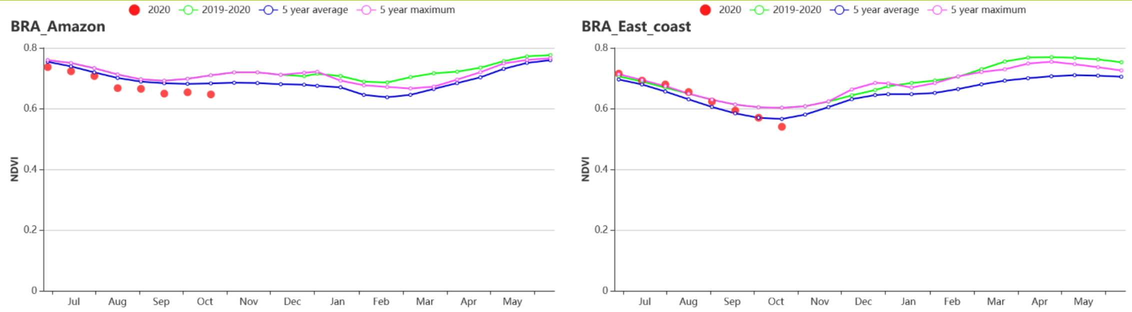
(f) Rainfall profiles



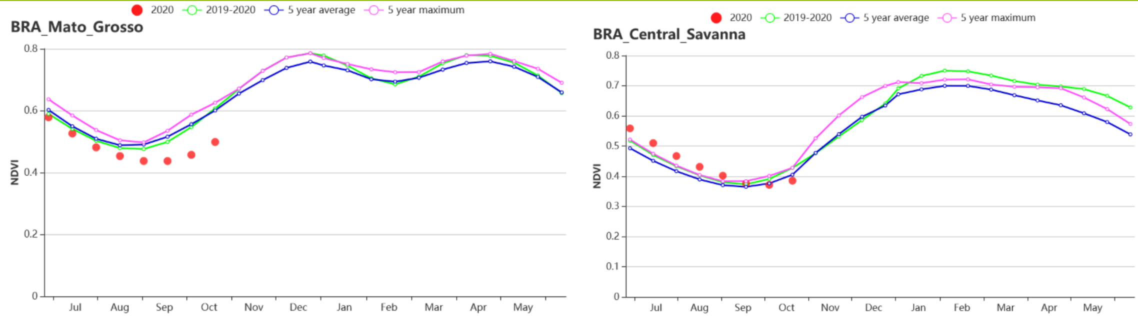
(g) Biomass departure map compared with 15YA



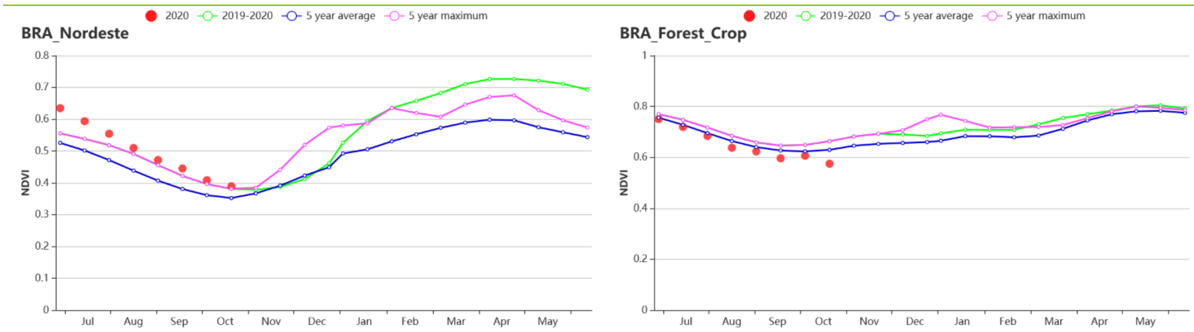
(h) Proportion of different drought categories from July to October 2020



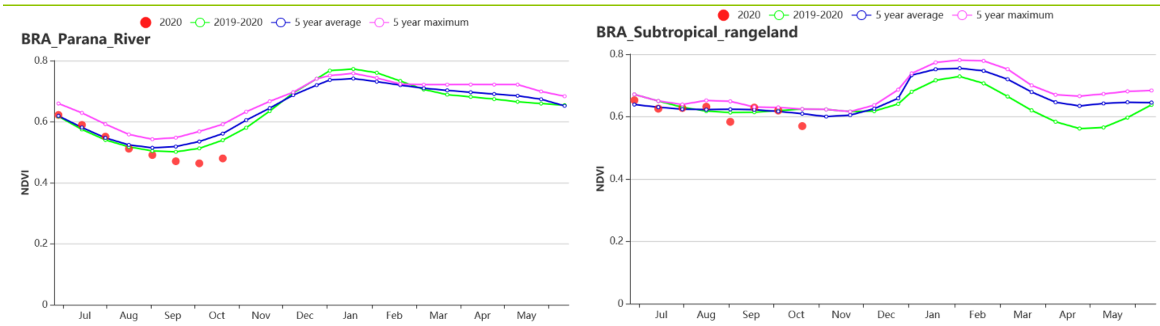
(i) Crop condition development graph based on NDVI (Amazon (left) and East Coast (right))



(j) Crop condition development graph based on NDVI (Mato Grosso zone (left) and Central Savanna (right))



(k) Crop condition development graph based on NDVI (Nordeste (left) and Northeastern mixed forest and farmland (right))



(L) Crop condition development graph based on NDVI (Parana Basin (left) and Southern subtropical rangelands (right))

Table 3.14 Brazil's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2020

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Amazonas	324	-19	27.2	0.5	1231	0	739	
Central Savanna	196	18	24.5	0.1	1232	0	442	
East Coast	286	3	21.2	0.5	1020	2	592	
Northeastern mixed forest and farmland	125	-37	27.7	0.6	1275	0	671	
Mato Grosso	183	-23	27.0	0.9	1178	2	410	
Nordeste	82	4	24.7	0.2	1259	1	633	
Parana basin	293	-26	21.4	1.2	1079	3	462	
Southern subtropical rangelands	440	-28	15.2	0.0	827	0	339	

Table 3.15 Brazil's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2020

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure (%)	Current (%)	Departure (%)	Current
Amazonas	100	0	121	2	0.92
Central Savanna	87	35	118	4	1.02
East Coast	100	2	109	-3	0.94
Northeastern mixed forest and farmland	99	0	110	-7	0.92
Mato Grosso	88	-4	154	4	0.69
Nordeste	90	43	103	-4	1.22
Parana basin	96	-1	130	2	0.82
Southern subtropical rangelands	98	1	136	13	0.90

[CAN] Canada

This reporting period covers the harvest of winter wheat in July, followed by spring wheat in August. The sowing of winter wheat takes places in September and October. This monitoring period also covers the main growing periods of maize and soybean. According to agroclimatic indicators, Canada experienced close-to-normal weather in this period. The overall conditions in this region were above average until the end of August. However, in the Saint Lawrence basin and Prairies, they dropped to below-average levels thereafter. Overall, crop conditions were favorable.

Compared with the 15-year average, the rainfall, temperature, and radiation were 4%, 0.6°C, and 1% below the average respectively, which resulted in a slight decrease in potential biomass (BIOMSS, -1%). The rainfall profile indicates that the precipitation was significantly below average between mid-August and mid-September, and the temperature were above average between early July and early October. The drier conditions in mid-August and September were favorable for harvest. The NDVI profile map shows that the crop conditions were above average until the end of August but deteriorated to below average after August. The crop condition in the Northeast of British Columbia and North of Alberta (accounted for 23.3% of cropped land) was always above average during this monitoring period. In the other regions, crop conditions were below average after August, which may be caused by the shortage of rainfall in August. The national maximum VCI value was 0.96, while CALF was slightly above average (CALF, +1%). The overall conditions of the summer crops in Canada are assessed as favorable.

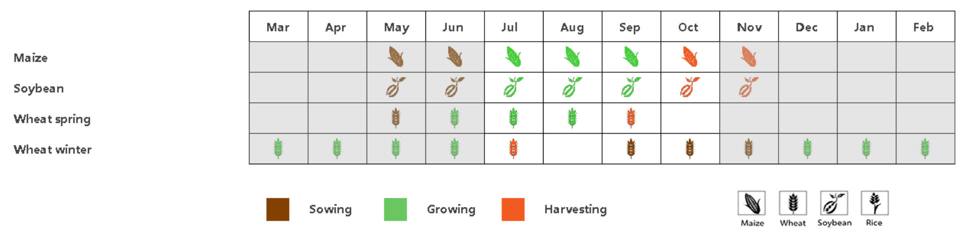
Regional analysis

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

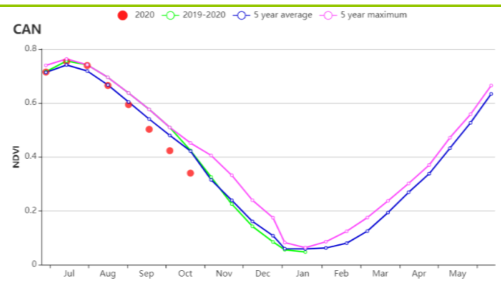
The Prairies is the main food production area in Canada. In this reporting period, the rainfall (RAIN 223mm -11%) and temperature (TEMP, -0.8℃) were below average, while the radiation was slightly above average (RADPAR, +1%), leading to an average potential production (BIOMSS, 0%). The major crops in this region are winter wheat and spring wheat. According to the NDVI development graph and NDVI profile, crop conditions were above average before September, however deteriorated to below average after September. The negative departures may have been caused by a rainfall deficit. However, they did not affect wheat yields, because wheat had reached maturity by then.

The condition in the Saint Lawrence basin was the same as the situation in the whole country, as rainfall (RAIN, -7%), temperature (TEMP, -0.3°C) and radiation (RADPAR, -2%) were below average. This had led to a slight decrease in potential biomass (BIOMSS, -1%). According to the NDVI development graph, crop conditions were above average before September and worsened to below-average subsequently. As in the Prairies, this was due to the shortage of rainfall. Crop conditions during the main growing season were favorable, as NDVI reached the 5-year maximum at its peak.

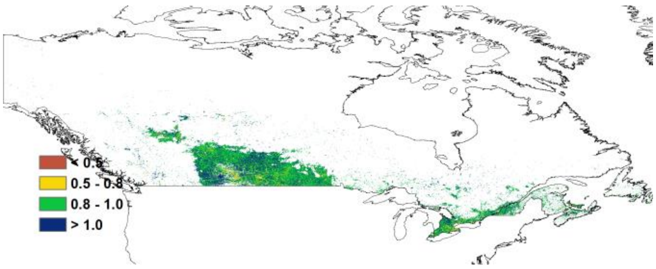
Figure 3.12 Canada's crop condition, July - October 2020



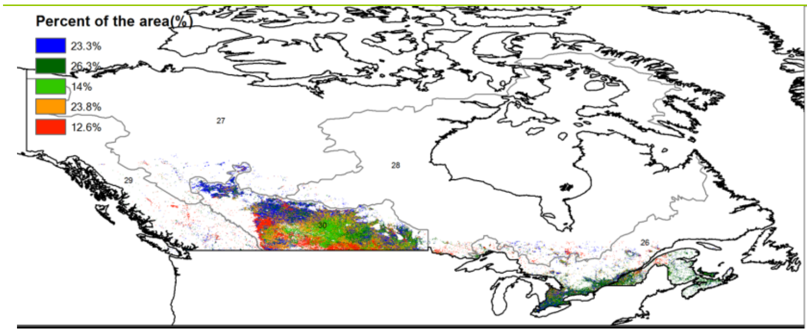
(a). Phenology of major crops



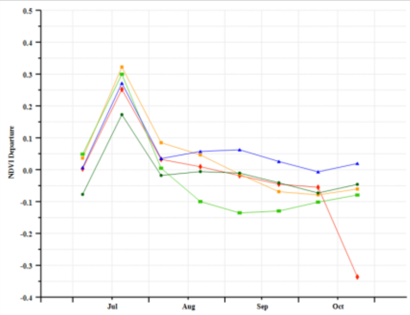
(b) Crop condition development graph based on NDVI



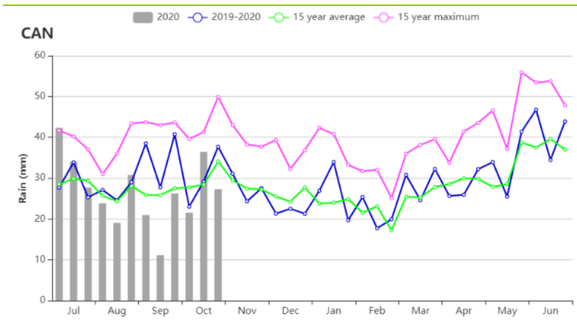
(c) Maximum VCI



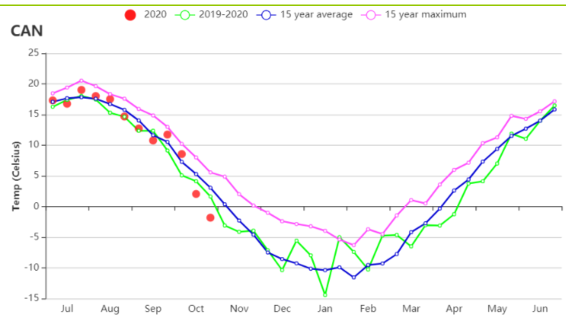
(d) Spatial NDVI patterns compared to 5YA



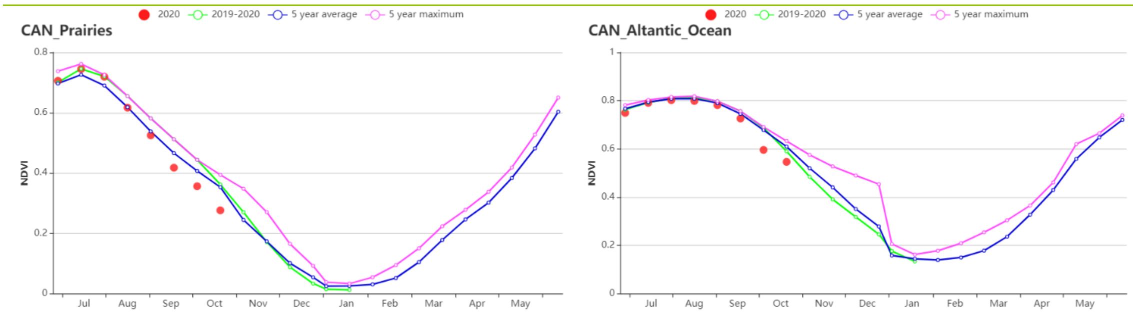
(e) NDVI profiles



(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 3.16 Canada's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 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	400	-7	14	-0.3	886	-2	371	-1
Prairies	223	-11	12.4	-0.8	973	1	402	0

Table 3.17 Canada's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2020

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

[DEU] Germany

The conditions of crops in Germany were generally worse than last year's and below the 5YA, mainly due to lingering effects of a drought that had started in the spring. Harvest of the summer crops was mostly completed by the end of October, whereas sowing of canola and winter wheat had started in September.
At the national level, total precipitation of the monitoring period was slightly below average (RAIN, -1%), temperature was slightly above average (TEMP, +0.4°C) and radiation was below average (RADPAR, -4%). It can be seen from the time series rainfall profile for Germany that precipitation was significantly below average from mid-July to mid-September. Rainfall in October was above average, which helped replenish soil moisture, which is critical for the establishment of the winter crops. Germany experienced warmer-than-usual conditions during this reporting period, except in early July, mid-July, and mid-October. Due to cloudier conditions, the biomass production potential (BIOMSS) decreased by 4% as compared to the 15YA.
As shown by the NDVI development graph at the national scale, NDVI values were below average during most of the monitoring period, except in July and early September when they were close to the average. These observations are confirmed by the spatial NDVI profiles. Crop conditions were below average on 78.7% of the cropland during the entire monitoring period due to a persistent rainfall deficit coupled with cooler-than-usual conditions in July. The most favorable conditions were observed for Schleswig-Holstein and the North of Lower Saxony as well as in Baden-Württemberg and Bavaria in the south. Overall, the above-mentioned pattern of crop growth is also reflected by VCIx, the value of which reached 0.95 country-wide. CALF was at the same level as the recent five-year average.
Generally, the values of agronomic indicators show unfavorable conditions for most summer crops; above-average precipitation in October helped with the establishment of the winter 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 beets zone of the North-west, 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.

Schleswig-Holstein and the Baltic coast is among the major winter wheat zones of Germany. It recorded significantly below-average rainfall (RAIN, -14%), slightly above-average temperature (TEMP, 0.3°C), and below-average radiation (RADPAR, -2%). BIOMSS is expected to decrease by 4% compared to the average. A heat wave affected this region in late July and early August, and the average for that period was above the historical maximum. As shown in the crop condition development graph based on NDVI, the values were close to or below average during the whole reporting period. Cropping Intensity (CI) was below the 5YA (-4%). The area had a high CALF (100%) as well as a favorable VCIx (0.95), indicating a high cropping intensity.

The **Mixed wheat and sugar-beets zone of the North-west** experienced a precipitation deficit (RAIN -8%), somewhat above-average temperature (TEMP, +0.5°C) and below-average radiation (RADPAR, -6%), which led to a decrease (-6%) of BIOMSS. Due to the persistent rainfall deficit during the wheat growing period, the NDVI values and crop condition were close to or below average during the monitoring period. The area had a high CALF (100%) and a high VCIx (0.95). Cropping Intensity (CI) was slightly below the 5YA (-1%).

The **Central wheat zone of Saxony and Thuringia** is another major winter wheat zone. Compared to the average, the rainfall (+10%) and temperature (+0.4°C) for this area were above average, but the radiation was below average (RADPAR, -3%). Due to the persistent rainfall deficit in July monitoring period, the biomass potential (BIOMSS) fell 3% below average. NDVI values were below average during this monitoring period except in late August based on the crop condition development graph. Cropping Intensity (CI) was below the 5YA (-3%). The area had a high CALF (100%) and VCIx was at 0.95.

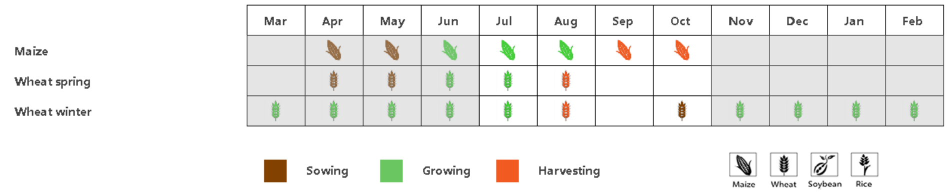
The **East-German lake and Heathland sparse crop area** experienced above-average rainfall (RAIN, +7%) with above-average temperature (TEMP, +0.5°C), but low radiation (RADPAR, -3%) and below-average

BIOMSS (-5%). NDVI values were below average during the early monitoring period and close to average towards the end. Cropping Intensity (CI) was below the 5YA (-6%). The area had a high CALF (100%) and a high VCIx (0.92).

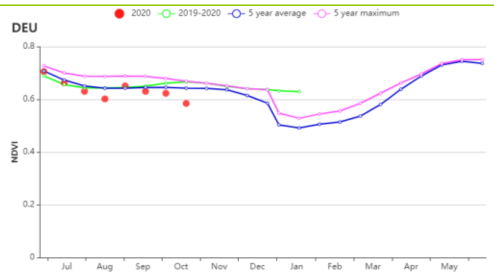
In the **Western sparse crop area of the Rhenish massif** agro-climatic indicators showed a precipitation deficit (RAIN, -13%) and below-average RADPAR (-5%) and BIOMSS (-3%), but above-average TEMP (+0.7°C). Significant precipitation deficit affected this region from early July to early August. NDVI values were below average during the whole monitoring period except for early July. Cropping Intensity (CI) was slightly above the 5YA (+1%). The area had a high CALF (100%) and a high VCIx (0.92).

Next to wheat, two summer crops (maize and potato), are the major crops on the **Bavarian Plateau**. The CropWatch agro-climatic indicators showed a rainfall increase (RAIN, +6%) with above-average temperature (TEMP, +0.3°C), but low radiation (RADPAR, -2%). BIOMSS is expected to slightly increase by 2%. NDVI fluctuated around the 5YA. Cropping Intensity (CI) was slightly above the 5YA (+1%). The area had a high CALF (100%) as well as a favorable VCIx (0.97) with equally favorable crop prospects for the two crops.

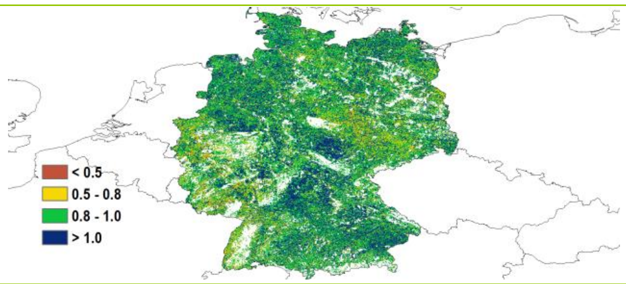
Figure 3.13 Germany's crop condition, July-October 2020



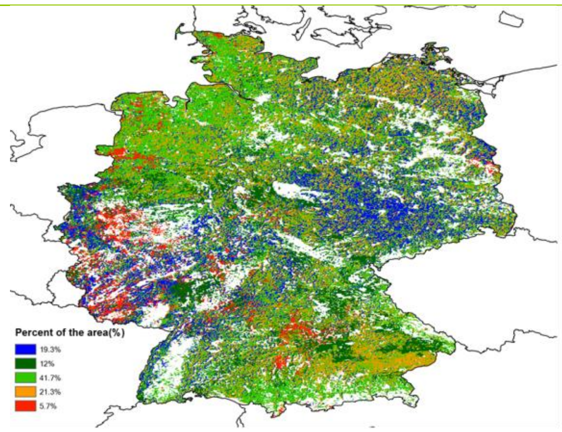
(a). Phenology of major crops



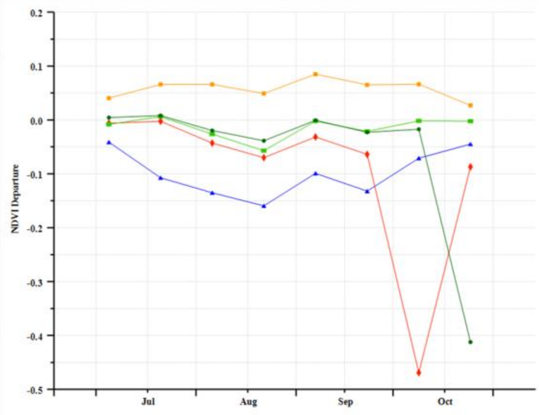
(b) Crop condition development graph based on NDVI



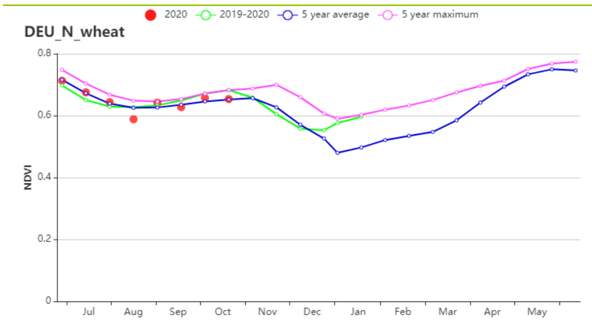
(c) Maximum VCI

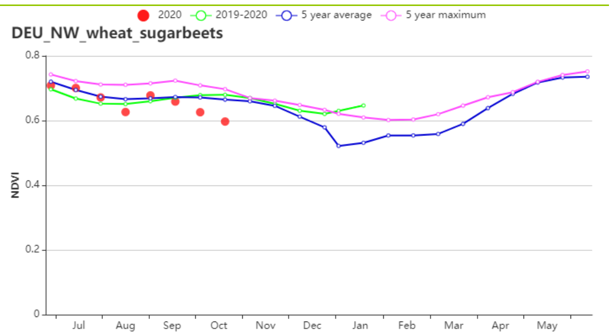


(d) Spatial NDVI patterns compared to 5YA

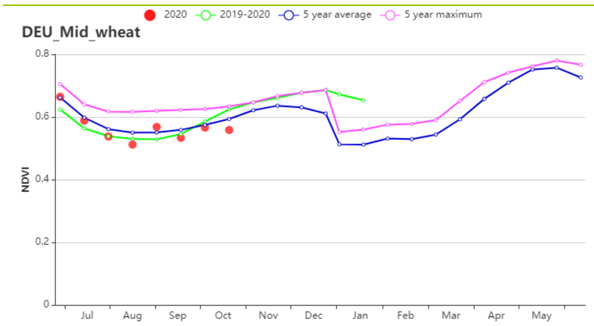


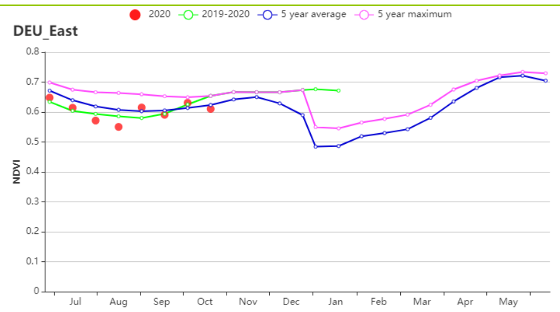
(e) NDVI profiles



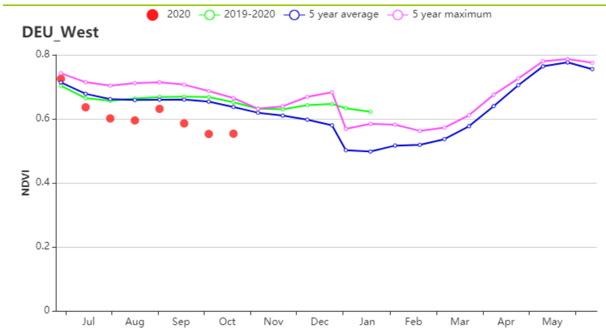


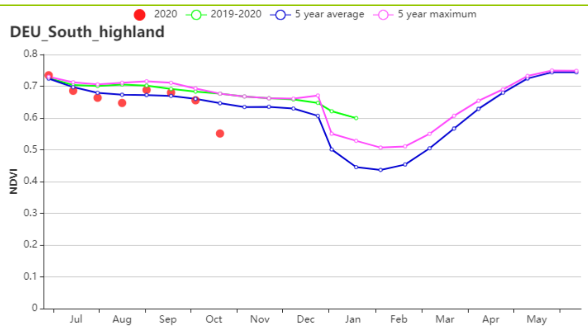
(f) Crop condition development graph based on NDVI (Wheat zone of Schleswig-Holstein and the Baltic coast (left) and Mixed wheat and sugar beets zone of the north-west(right))



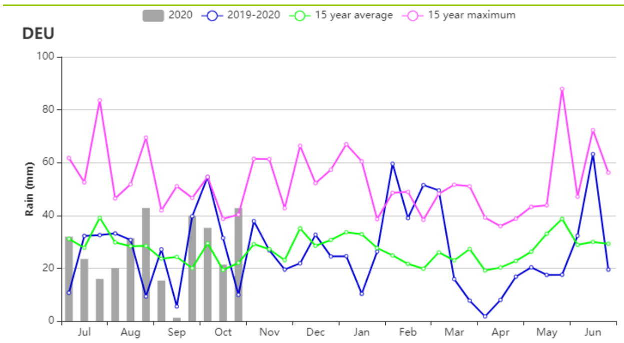


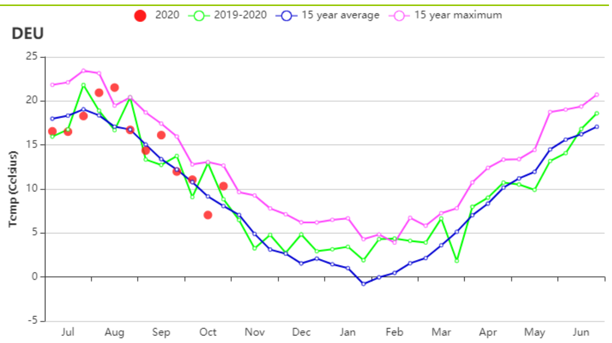
(g) Crop condition development graph based on NDVI (Central wheat zone of Saxony and Thuringia(left) and Sparse crop area of the east-German lake and Heathland (right))





(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 3.18 Germany agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July-October 2020

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)	Current (gDM/m^2)	Departure from 15YA (%)
Wheat zone of Schleswig-Holstein and the Baltic coast	284	-14	15.6	0.3	765	-4	345	-4
Mixed wheat and sugarbeets zone of the north-west	274	-8	15.4	0.5	768	-6	334	-6
Central wheat zone of Saxony and Thuringia	293	10	15.3	0.4	837	-3	366	-3
East-German lake and Heathland sparse crop area	308	7	15.7	0.5	833	-3	366	-5
Western sparse crop area of the Rhenish massif	231	-13	15.1	0.7	838	-5	359	-3
Bavarian Plateau	408	6	14.3	0.3	920	-2	388	2

Table 3.19 Germany's agronomic indicators by sub-national regions, current season's value and departure from 5YA, July-October 2020

Region	Cropped arable land fraction		Maximum VCI	Cropping Intensity	
	Current (%)	Departure from 5YA (%)	Current	Current	Departure from 5YA (%)
Wheat zone of Schleswig-Holstein and the Baltic coast	100	0	0.95	104	-4
Mixed wheat and sugarbeets zone of the north-west	100	0	0.95	109	-1
Central wheat zone of Saxony and Thuringia	100	0	0.95	108	-3
East-German lake and Heathland sparse crop area	100	0	0.92	107	-6
Western sparse crop area of the Rhenish massif	100	0	0.92	105	1
Bavarian Plateau	100	0	0.97	107	1

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

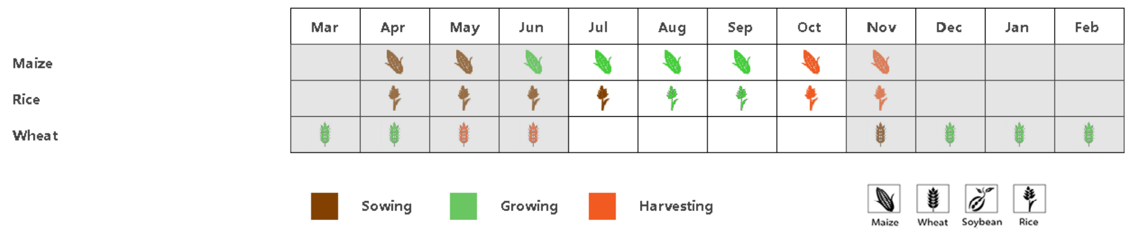
[EGY] Egypt

This monitoring period covers the growth and harvest of the main summer crops, which are maize, rice and cotton. Winter wheat sowing is about to start in early November. The current monitoring period is the dry season in Egypt and the average rainfall was just 3 mm, lower than the 15-years average (15YA) by 62%. However, the rainfall profile showed an unusually high amount that fell late in the reporting period in the Nile Delta and the southern coast of the Mediterranean. The average temperature was 26.3 °C (+0.8 °C). The temperature profile fluctuated around the 15YA. Both RADPAR (-1.8%) and BIOMSS (-19%) were below the 15YA. The regional analysis revealed that the decrease in BIOMSS was mainly in the Nile Delta and the southern coast of the Mediterranean. The nationwide NDVI profile started below the 5-years average (5YA) then it rose above the 5YA until the end of September, and subsequently dropped below the 5YA by the end of this monitoring period. The NDVI spatial pattern shows that 49.9% of the cultivated area was above the 5YA, 20.5 % fluctuated around the 5YA, and 29.7% was below. The Vegetation Condition Index (VCIx) map shows that the condition of the current crops is satisfactory where the dominant VCIx values range between 0.80 and 1. This finding agrees with the whole country VCIx value at 0.79. CALF exceeded the 5YA by 7%. In general, the crop conditions were favourable.

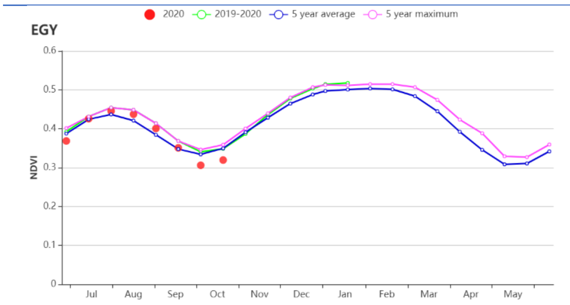
Regional Analysis

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 3 mm, while the **Nile Valley** recorded zero rainfall. Consequently, the rainfall in both zones was below the 15YA by 63% and 96% respectively. Since virtually all crops in Egypt are irrigated, the impact of precipitation on crop yield is limited, but additional precipitation is nevertheless always useful. In both regions, the temperature was higher than the 15YA by just 1 °C while the RADPAR was lower than the 15YA by 2%. BIOMSS fell by 21% in the Nile Delta, while it increased by only 1% for the Nile Valley. The NDVI development graph shows that crop conditions fluctuated around the average in both zones, with below-average values in October when the harvesting stage was reached. In both zones, CALF exceeded the 5YA by 7%. They also registered good VCIx values at 0.78 and 0.88 for the **Nile Delta** and **Nile Valley** respectively, confirming favourable crop conditions. Cropping Intensity estimates indicate that both of the two regions had a mixture of single and double-cropping during the investigation period.

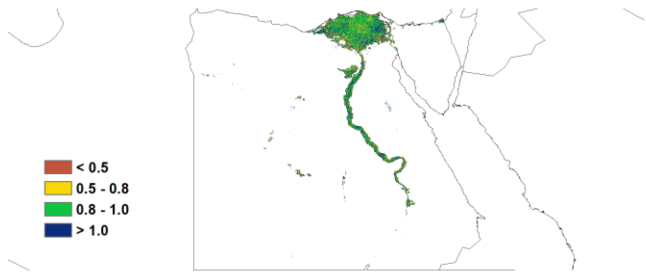
Figure 3.14 Egypt's crop condition, July- October 2020



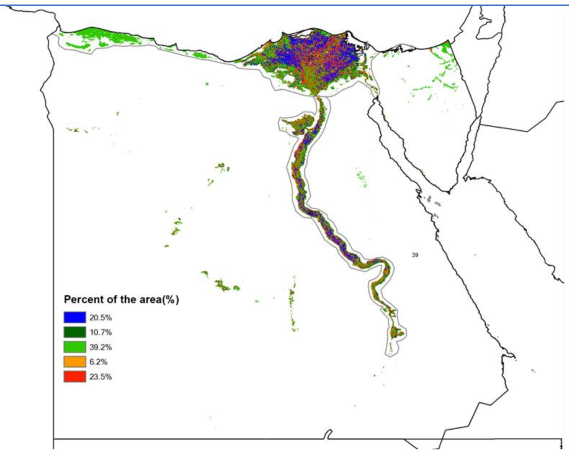
(a). Phenology of major crops



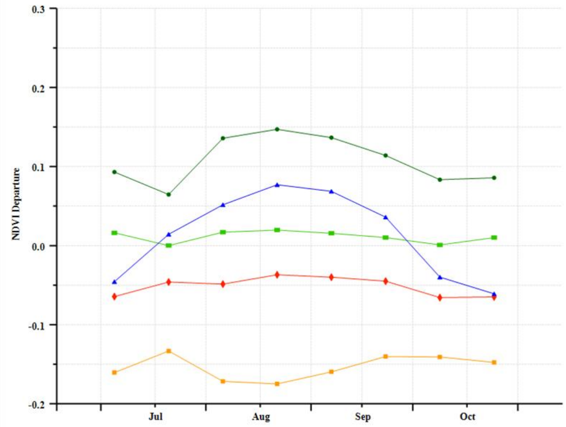
(b) Crop condition development graph based on NDVI



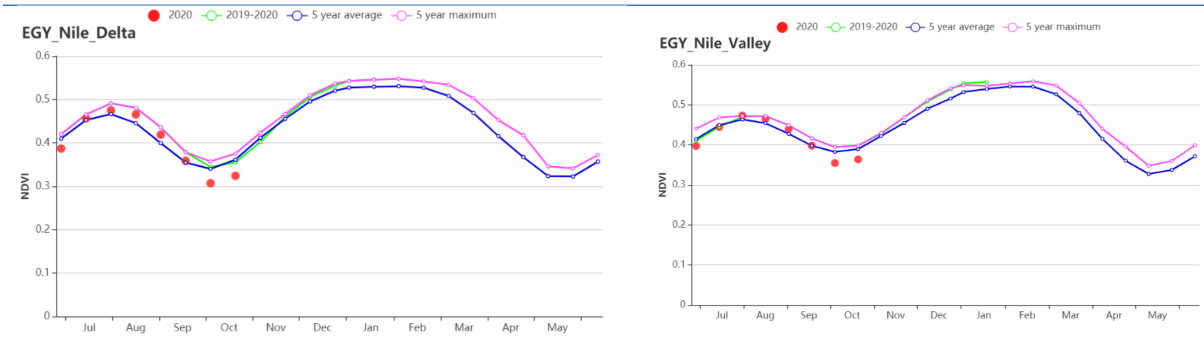
(c) Maximum VCI



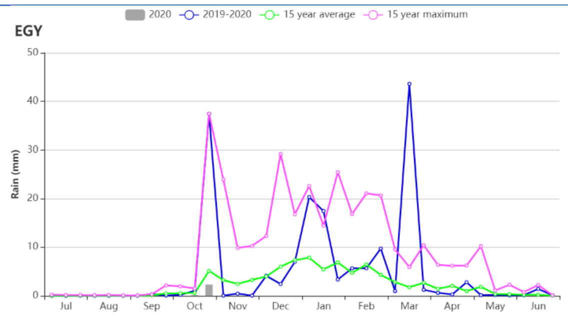
(d) Spatial NDVI patterns compared to 5YA



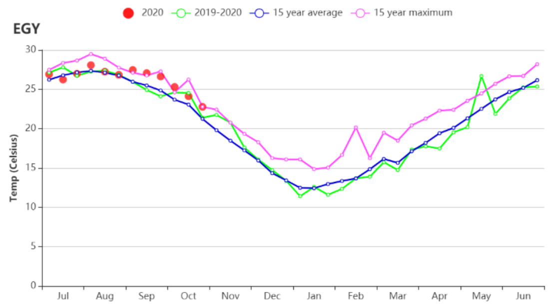
(e) NDVI profiles



(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 3.20 Egypt's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July- October 2020

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Nile Delta and Mediterranean coastal strip	3	-63	26	1	1363	-2	210	-21
Nile Valley	0	-96	29	1	1406	-2	60	1

Table 3.21 Egypt's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July-October 2020

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure (%)	Current (%)	Departure (%)	Current
Nile Delta and Mediterranean coastal strip	66	7	157	2	0.78
Nile Valley	72	7	148	6	0.88

[ETH] Ethiopia

This report for the July to October period covers a large proportion of the Meher rainy season (June to September). Rains decrease in October, when the harvesting period starts for maize, wheat, barley and teff. At the national scale, slightly more humid and cooler weather was observed in this monitoring period with rainfall 6% above average, temperature 0.5℃ below average and RADPAR 7% lower as compared to the 15YA. Due to lower RADPAR, biomass was calculated to be 9% lower than the 5YA. The NDVI crop condition development graph indicates a slow crop development in July and August. However, it recovered in September and reached average levels by October. The NDVI cluster map indicates that NDVI was slightly above average on 44.5% of the arable land, mainly in the central northern and eastern regions. In the southwestern Oromia and Southern nations region, NDVI was initially below average, probably due to excessive rainfall causing local flooding. But its values had fully recovered by October. This variation was in accordance with maximum VCI graph which shows VCIx in most zones between 0.8-1.0. At the end of October, 99% of arable land was cropped, which was 1% above the 5YA.

Although some regions' agroclimatic indicators initially were unsatisfactory, crop conditions in most major crop producing areas in Ethiopia were favorable and CropWatch estimates average to above-average production levels for the major cereal crops.

Regional analysis

Based on agroclimatic 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-arid pastoral areas

In the Semi-arid pastoral areas, a typical livestock production zone, precipitation was above average (+17%). The temperature and sunshine were slightly lower than average (TEMP -0.1℃, RADPAR -4%), resulting in a BIOMSS drop by -4%. However, NDVI values were higher than average and the VCI value of 0.94 also indicates favorable crop growth in this region. CALF increased greatly by 44% compared to the 5YA. Cropping intensity increased 18% compared to the average. The outlook for livestock production is favorable.

South-eastern Mendebo highlands

The southeastern Mendebo highlands are a major maize and teff producing area. During the reported period, it received above-average rainfall (+25%). Temperature (-0.5 ºC) , RADPAR (-5%) and BIOMSS (-8%) were below the 15YA. The cropped arable land fraction (CALF) remained unchanged and the maximum VCIx was at 0.95. The NDVI crop condition development curve remained below the 5YA. Cropping intensity was close to the average. The production of maize and teff will be slightly down in the southeastern Mendebo highlands.

South-eastern mixed maize zone

In this zone, the average rainfall was 538 mm, which was 54% above average. Slightly lower temperatures (-0.3℃) and RADPAR (-3%) resulted in below-average BIOMSS (-7%) as compared to the 15YA. The NDVI-based Crop condition development curve was close to the 5YA. The maximum VCI value was 0.95 and the CALF increased by 4%. Cropping intensity increased 11% compares to the average. The crop conditions in this zone are favorable and slightly above average yields are expected.

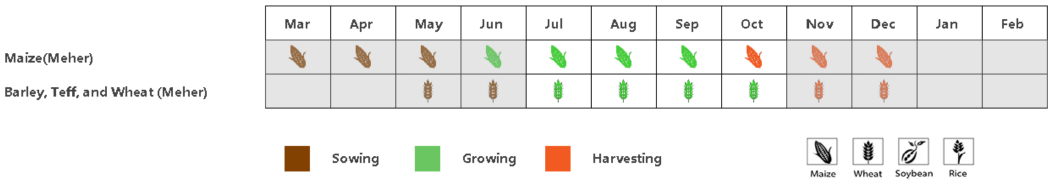
Western mixed maize zone

In the western mixed maize zone, maize is the most important crop grown during the Meher season. Rainfall (+6%) was slightly above the 15YA, whereas lower temperature (TEMP -0.7℃) and sunshine (RADPAR- 8%) resulted in a BIOMSS estimate that was 12% below the 15YA. NDVI recovered to average levels by September. VCIx was at 1.00 and the cropped arable land fraction (CALF) stayed unchanged. Cropping intensity increased 12% compares to the average. According to the CorpWatch indicators, conditions were rather favorable.

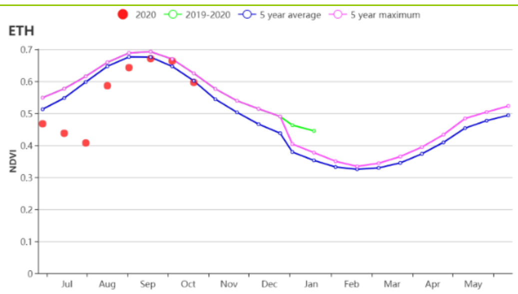
Central-northern maize-teff highlands

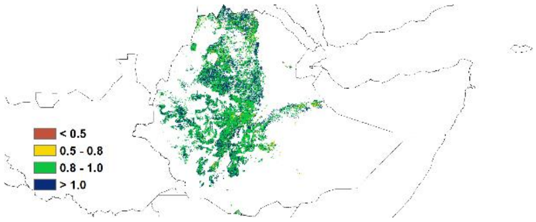
This is an important corn and teff producing area in Ethiopia. Precipitation was close to the 15YA, while temperature and PAR were 0.4 ºC and 7% below average respectively. The crops developed more slowly than usual, which explains the slightly below-average NDVI values in July. However, they recovered to average levels by August. The BIOMSS was down by 10% and VCIx was at 0.97. Cropping intensity increased 9% compares to the average. All in all, the outlook for the teff and maize crops is near average.

Figure 3.15 Ethiopia's crop condition, July-October 2020

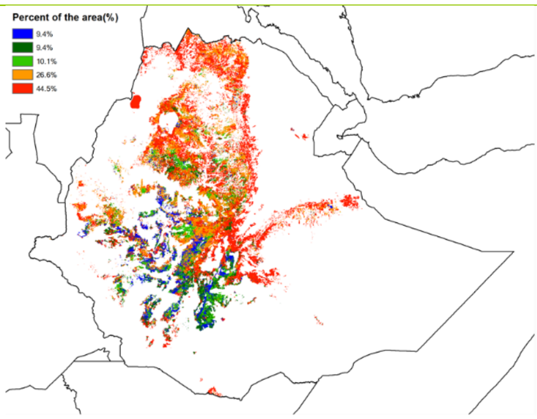


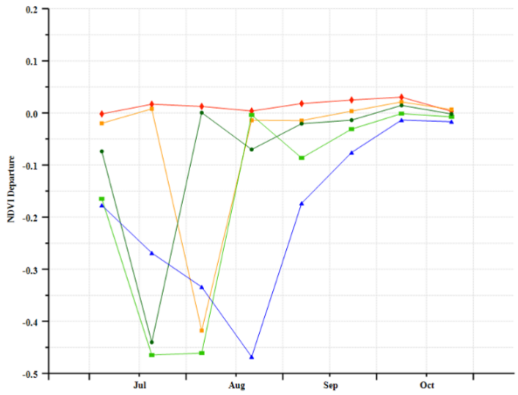
(a) Phenology of major crops



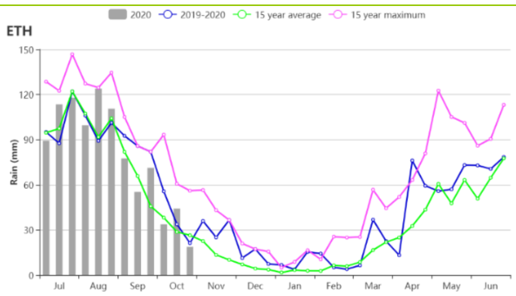


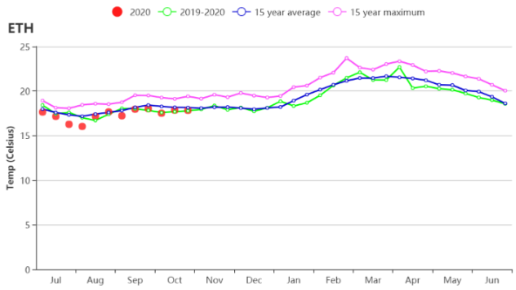
(b) Crop condition development graph based on NDVI (c) Maximum VCI



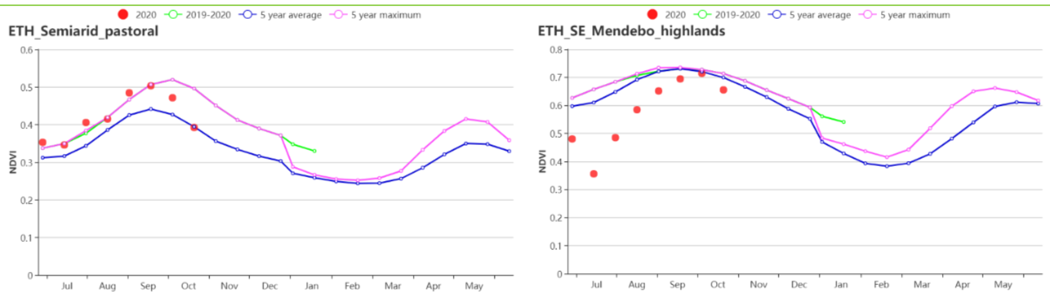


(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles

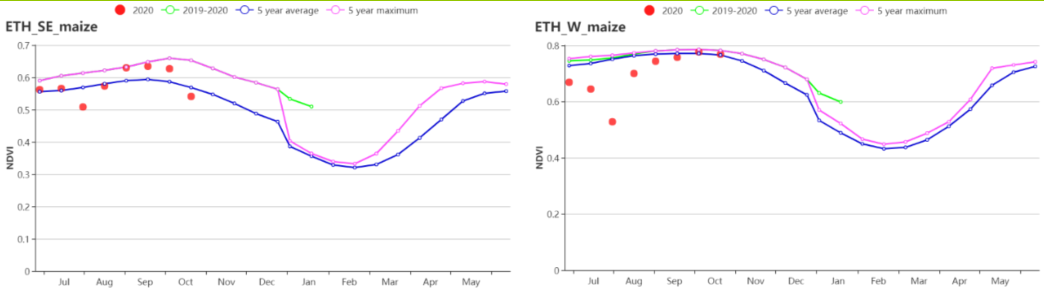




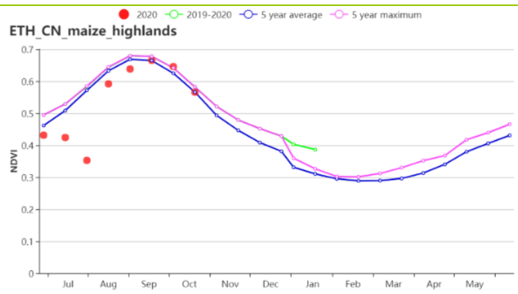
(f) Time series rainfall (g) Time series temperature



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



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



(j) Crop condition development graph based on NDVI (Central-northern maize-teff highlands

Table 3.22 Ethiopia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July- October 2020

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m2)	Departure (%)	Current (gDM/m2)	Departure (%)
Semi-arid pastoral areas	**195**	**17**	**23.0**	**0.1**	**1301**	**-4**	**599**	
South-eastern Mendebo highlands	**593**	**25**	**14.5**	**-0.5**	**1075**	**-5**	**393**	
South-eastern mixed maize zone	**538**	**54**	**18.1**	**-0.3**	**1153**	**-3**	**519**	
Western mixed maize zone	**1376**	**6**	**19.2**	**-0.7**	**1012**	**-8**	**511**	
Central-northern maize-teff	**966**	**-1**	**16.7**	**-0.4**	**1157**	**-7**	**429**	

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m2)	Departure (%)	Current (gDM/m2)	Departure (%)
highlands								

Table 3.23 Ethiopia's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July- October 2020

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure (%)	Current (%)	Departure (%)	Current
Semi-arid pastoral areas	84	44	127	18	0.94
South-eastern Mendebo highlands	100	0	126	1	0.95
South-eastern mixed maize zone	99	4	131	11	0.97
Western mixed maize zone	100	0	128	12	1.00
Central-northern maize-teff highlands	99	1	116	9	0.97

[FRA] France

This monitoring period covers the final stages of maize and spring wheat cultivation and their harvest, as well as the sowing of winter wheat in October, expected to be completed in November.

CropWatch agro-climatic indicators show slightly above-average temperatures over the period (TEMP, +0.3°C). During the summer months, the temperatures nearly reached the maximum values of the past 15 years. RAIN was significantly higher than the average (RAIN, +7%), especially in late September and October. Sunshine was lower than the average (RADPAR, -3%). Due to the generally favorable temperature, rainfall and sunshine conditions, the biomass accumulation was slightly above the 15-year average (BIOMSS, +1%). Cropping intensity was at the average level.

Overall, the national-scale NDVI development graph shows that NDVI trended below last year's and the 5-year average, due to below-average rainfall from July to early September. However, NDVI recovered to close to average in October. All regions were similarly affected, with the exception of the Mediterranean zone. This pattern is confirmed by VCIx, ranging from 0.85 to 0.95 across the regions. Overall, dry weather during the summer months caused unfavorable growth conditions for most of France.

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, slightly warmer weather was observed (TEMP, +0.8°C) while RAIN and RADPAR were below the average (both -5%) over the monitoring period. The BIOMSS increased by 3% when compared to the past 15-year average. The CALF was lower than the average (-1%), and VCIx was 0.85. Cropping intensity decreased by 1%. Crop condition development based on NDVI for this region was below the past 5-year average.

In the Mixed maize/barley and rapeseed zone from the Center to the Atlantic Ocean, slightly warmer (TEMP +0.5°C) and wetter (RAIN, +9%) conditions were observed and RADPAR was about 2% below the average. BIOMSS was near average while the regional crop conditions were at average levels except for a drop in September and early October. Cropping intensity was at the average level. The CALF was lower than the average by 2%, and VCIx was 0.91.

In the Maize-barley and livestock zone along the English Channel, RAIN and TEMP were above average by 20% and 0.3°C. RADPAR was lower than the average (-1%). BIOMSS increased by 2%. Cropping intensity increased by 3%. CALF was average and VCIx was recorded relatively high at 0.95, all indicating normal crop conditions.

Overall, in the Rapeseed zone of eastern France, RAIN in this period was 12% lower than the 15-year average, while TEMP increased by 0.9°C and RADPAR was reduced by 2%, indicating relatively dry conditions. Cropping intensity was lower than average level 6%. BIOMSS was about 3% higher than average with a moderate VCIx level (0.86). However, the NDVI profile indicated that the crop conditions were significantly below the 5-year average after July.

In the Massif Central dry zone, RAIN and RADPAR were 2% and 3% lower than the average, respectively, while TEMP increased slightly by 0.2 °C. The VCIx was 0.86 and BIOMSS decreased by 4% which is indicating a below-average cropping season in the region. Cropping intensity also decreased by 6%. Crop conditions based on the NDVI profile were also showing below-average levels after July.

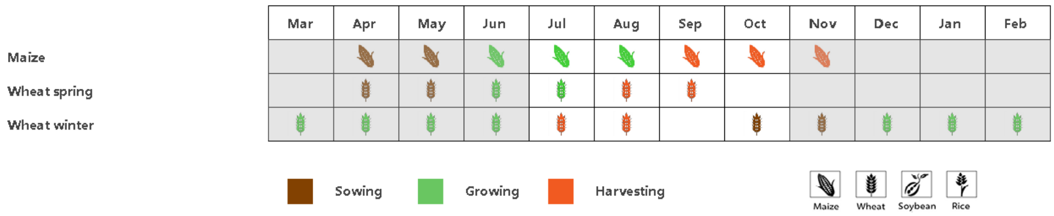
The Southwestern maize zone is one of the major irrigated regions in France. The regional NDVI profile presented a below-average trend, the VCIx was recorded at a moderate level (0.87) and BIOMASS was 1% lower than average, all indicating below-average crop conditions. Cropping intensity was below the average 1%. RAIN in the period was 24% higher than average, while TEMP was 0.1°C higher. RADPAR dropped by 3%.

In the Eastern Alpes region, crop conditions also presented an overall below-average trend. RAIN and

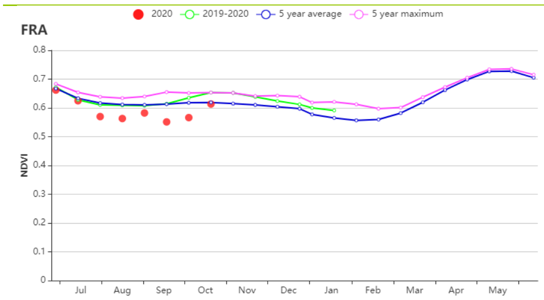
TEMP in the region were 17% and 0.1°C higher than average, while RADPAR was 1% lower than the averages. BIOMSS was slightly higher than the 15-year average (+1%). Cropping intensity was higher than average 3%. VCIx for the region was recorded at 0.87.

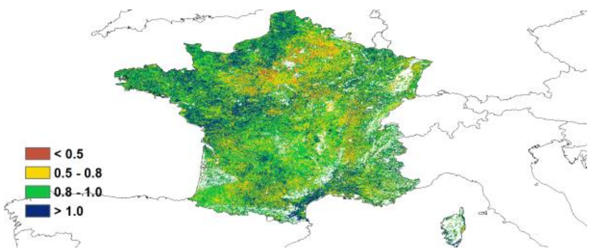
The Mediterranean zone is the only region which recorded overall close to average levels. The region also recorded a high VCIx level (0.92). RAIN was 4% higher than average, while TEMP and RADPAR were slightly lower than average (-0.3°C and -2%, respectively). Cropping intensity and BIOMSS increased by 5% and 3%. This region is showing average crop conditions.

Figure 3.16 France's crop condition, July - October 2020



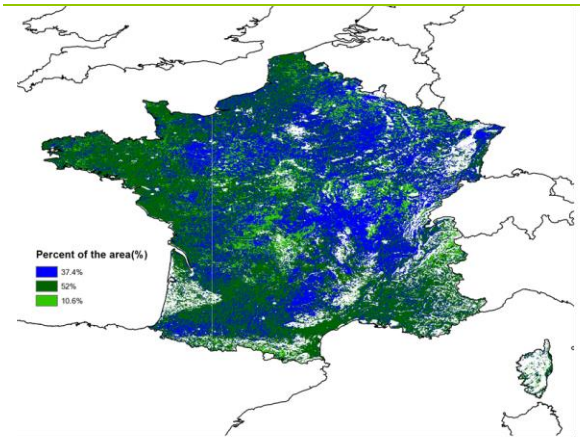
(a). Phenology of major crops

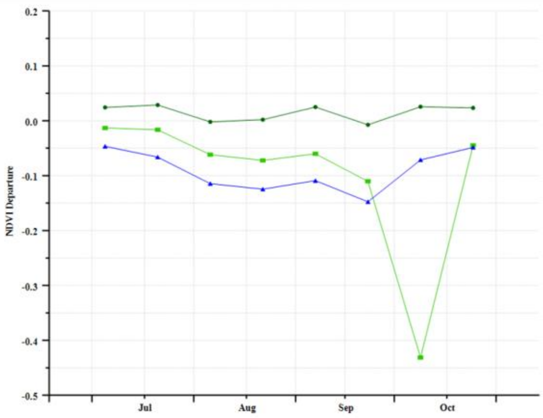




(b) Crop condition development graph based on NDVI

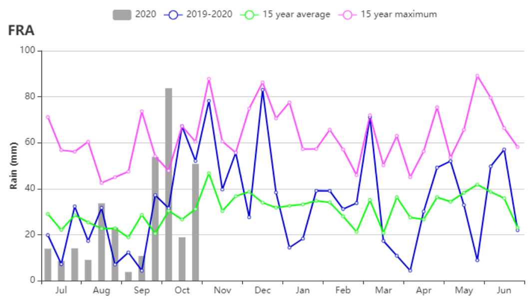
(c) Maximum VCI

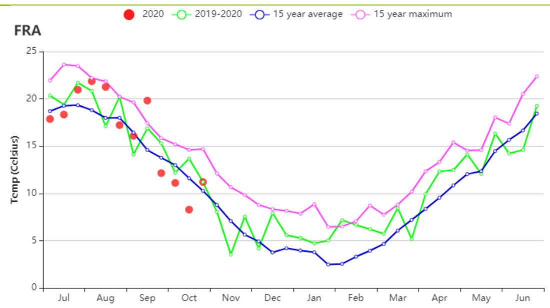




(d) Spatial NDVI patterns compared to 5YA

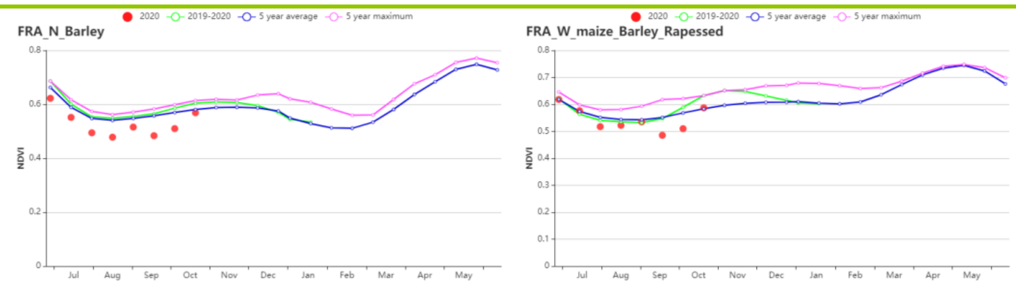
(e) NDVI profiles



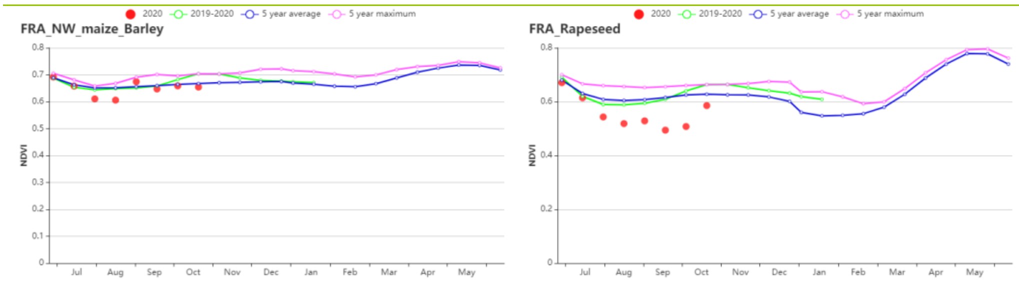


(f) Rainfall profiles

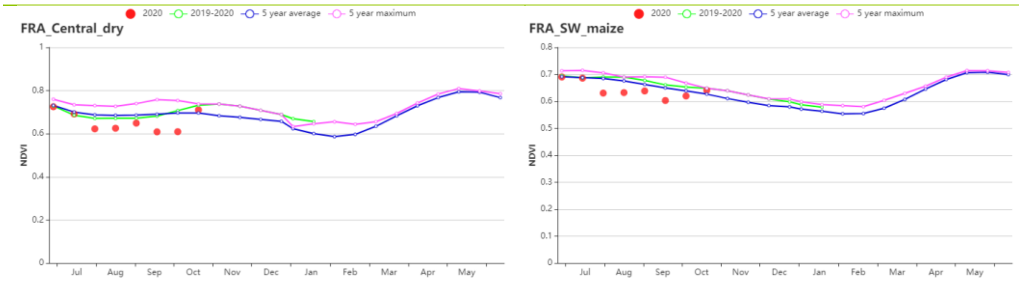
(g) Temperature profiles



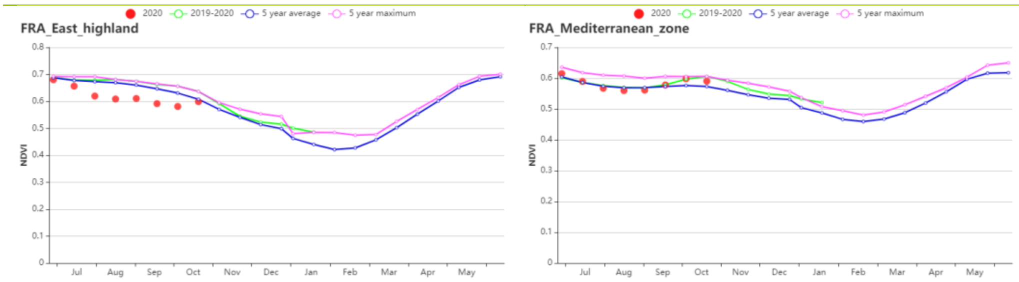
(h) Crop condition development graph based on NDVI (Northern barley region (left) and Mixed maize, Barley and Rapeseed zone (right))



(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 3.24 France's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July- October 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 zone	271	-5	16.5	0.8	811	-5	385	3
Mixed maize/barley and rapessed zone from the Centre to the Atlantic Ocean	275	9	17.3	0.5	928	-2	440	0
Maize barley and livestock zone along the English Channel	319	20	15.8	0.3	849	-1	377	2

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Rapeseed zone of eastern France	313	-12	16.2	0.9	910	-2	419	3
Massif Central Dry zone	308	-2	15.4	0.2	993	-3	423	-4
Southwest maize zone	366	24	17.0	0.1	1037	-3	496	-1
Alpes region	483	17	14.7	0.1	1062	-1	444	1
Mediterranean zone	306	4	16.4	-0.3	1142	-2	539	3

Table 3.25 France's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July-October 2020

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure (%)	Current (%)	Departure (%)	Current
Northern Barley zone	99	-1	109	-1	0.85
Mixed maize/barley and rapessed zone from the Centre to the Atlantic Ocean	97	-2	105	0	0.91
Maize barley and livestock zone along the English Channel	100	0	115	3	0.95
Rapeseed zone of eastern France	99	-1	104	-6	0.86
Massif Central Dry zone	100	0	110	-6	0.86
Southwest maize zone	100	0	107	-1	0.87
Alpes region	98	1	108	3	0.87
Mediterranean zone	97	4	117	5	0.92

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[GBR] Kingdom

By the end of this monitoring period, summer crops had been harvested and winter wheat sowing was completed as well. According to the crop condition development graph, crops experienced slighly unfavorable conditions. NDVI values were close to average from July to September, and below average in October. Agro-climatic indicators show that rainfall was above average (RAIN, +12%), temperature and radiation were below average (TEMP -0.4℃, RADPAR -12%). The below-average radiation and temperature resulted in below-average BIOMSS. The seasonal RAIN profile shows that the rainfall in early July, mid-August, late August, early October, late October were above average, and above the 15 year maximum in October. The temperature was close to the 15YA.

The national average VCIx was 0.95. CALF (100%) was unchanged compared to its five-year average. The NDVI departure cluster profiles indicate that: (1) 46% of arable land experienced slightly above-average crop conditions, mainly in East Midlands, West Midlands, East of England, South West England and East of Scotland. (2) 33.2% of arable land experienced slightly below-average or average crop conditions, mainly in South East England. (3) 5.8% of arable land， scattered around Northern Ireland, Scotland and North West England, had slightly below-average crop conditions before a marked drop in mid-July, and recovered to average crop conditions from late July to mid-October. (4) 7.1% of arable land experienced average crop conditions from July to September before a marked drop in early October, and subsequently recovered to slighly below-average in late October, mainly in East of England. (5) 8% of arable land, scattered around East of England, East Midlands and Wales, experienced average crop conditions from July to September. Most likely, the large drops can be attributed to cloud cover in the satellite images. Altogether, the conditions for winter wheat in the UK are assessed as below average, mainly because the crops had suffered from drought conditions in spring and early summer.

Regional analysis

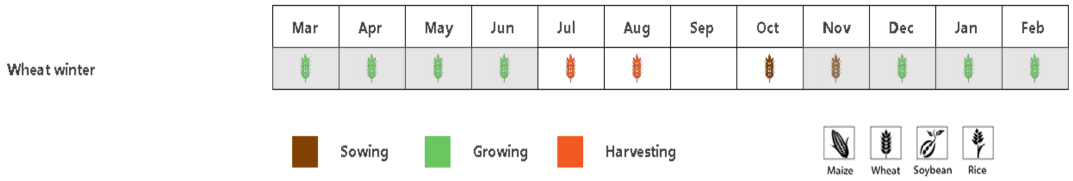
Based on cropping systems, climatic zones, and topographic conditions, three sub-national regions are described below: **Northern barley region**, **Central sparse crop region** and **Southern mixed wheat and barley region**. All three sub-regions are characterized by an unchanged fraction of arable land (CALF) compared to the 5YA.

In the **northern barley region**, NDVI was below average or close to average. Rainfall was above average (RAIN +4%), radiation (RADPAR -12%) and temperature (TEMP -0.6℃) were below average. Biomass was down 16% compared to average. This region is cultivated with a single system, and the CI (+1%) was slightly above average, while the VCIx was at 0.96.

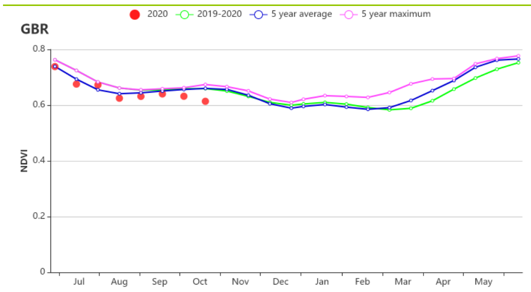
The **Central sparse crop region** is one of the country's major agricultural regions in terms of crop production. Crop condition development graph based on NDVI is similar to northern barley region. Rainfall was above average (RAIN +16%), radiation (RADPAR -15%) and temperature (TEMP -0.5℃) were below average. Biomass（BIOMSS -18%）was below average. This region is cultivated with a mixture of single and double cropping systems, and the CI (+1%) was slightly above average, while the VCIx was at 0.97.

In the **Southern mixed wheat and barley zone**, NDVI was below average or close to average. This region experienced the largest rainfall excess (RAIN +16%), while radiation (RADPAR -10%) and temperature (TEMP -0.3°C) were below average. The below-average radiation and temperature resulted in the below-average biomass (BIOMSS -10%). This region is cultivated with a mixture of single and double cropping systems, and the CI (+1%) was slightly above average. The region had an above-average VCIx (0.94).

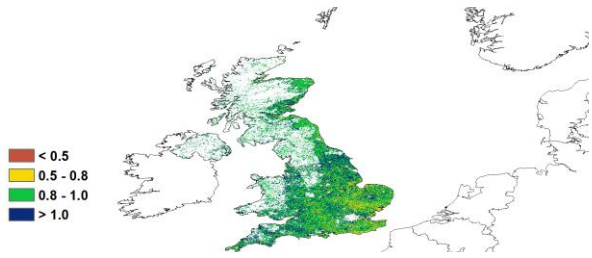
Figure 3.17 United Kingdom's crop condition, July - October 2020



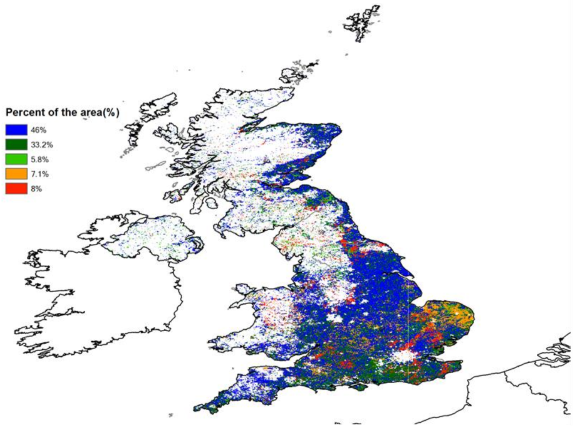
(a). Phenology of major crops



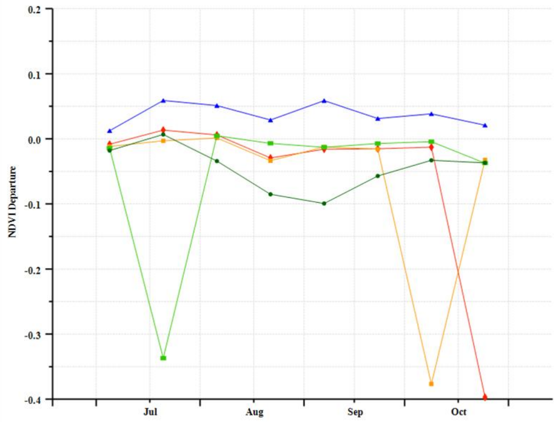
b) Crop condition development graph based on NDVI



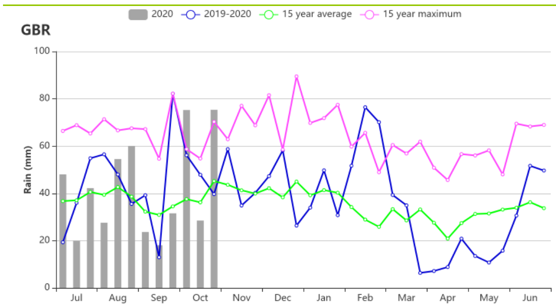
(c) Maximum VCI



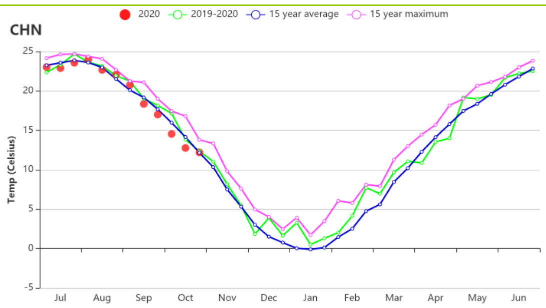
(d) Spatial NDVI patterns compared to 5YA



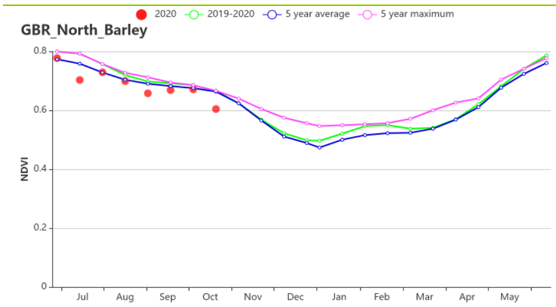
(e) NDVI profiles

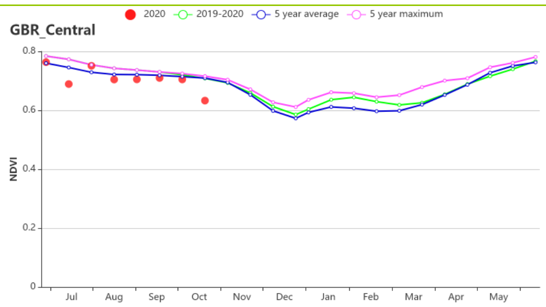


(f) Rainfall profiles

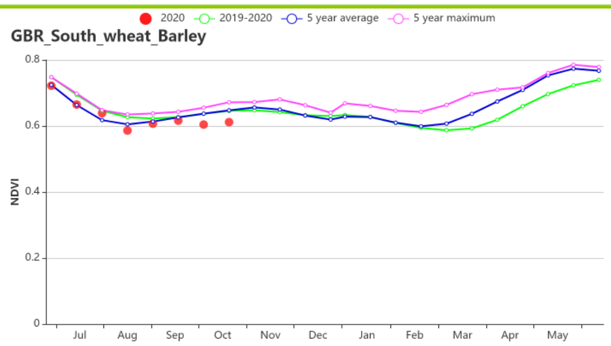


(g) Temperature profiles





(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 3.26 United Kingdom's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July- October 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)	595	4	11	-0.6	512	-12	166	-16
Central sparse crop region (UK)	552	16	12	-0.5	540	-15	190	-18
Southern mixed wheat and Barley zone (UK)	399	16	14	-0.3	649	-10	261	-10

Table 3.27 United Kingdom's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July- October 2020

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure (%)	Current (%)	Departure (%)	Current
Northern Barley region(UK)	100	0	106	1	0.96
Central sparse crop region (UK)	100	0	101	1	0.97
Southern mixed wheat and Barley zone (UK)	100	0	113	1	0.94

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

In Hungary, summer crops were harvested in September and October. Winter cereals, mainly wheat and barley, were sown in September and October.

At the national level, accumulated rainfall was above average (RAIN +39%), temperature increased by 0.3°C, and radiation decreased by 2%, which resulted in slightly above-average BIOMSS (BIOMSS +1%). According to the national NDVI development graphs, crop conditions were above average from July to mid-September but below average from late September to October.

Some spatial and temporal detail is provided by NDVI clusters: There were two main remarkable areas where the NDVI departure across the period was significant: As shown in Figure 3.20d, the green area has excellent crop conditions (24.2% of the area). It is mainly located in far western and eastern Hungary, where the NDVI departure was above average. The blue color region (12.0%), mainly located in central Hungary, represents poor crop conditions. About 27.6% of the area extending from west to east of Hungry, NDVI was above average from July to August, but below average from September to October. For about 17.9% of the area, located in mid-east region of Hungary, NDVI was above average from July to mid-September, but below average from late September to October. For about 18.4% of the area, located in northeastern Hungary, NDVI was below average from July to early August, but above average from September to October.

With the maximum VCI value reaching 0.95 at the national level and the cropped arable land fraction (CALF) at 100%, cropping intensity was 102%, crop conditions are estimated as favorable.

Regional analysis

Based on cropping systems, climatic zones and topographic conditions, Hungary is divided into four sub-regions: Northern 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 the 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. According to the NDVI development graphs, NDVI was above average from July to August, below average from September to October. Agro-climatic conditions include above-average rainfall (RAIN, +25%) and temperature (TEMP +0.3°C), and below-average radiation (RADPAR -2%), which resulted in above-average biomass (BIOMASS +2%). The VCIx was 0.93. Cropping Intensity was 102%. The crop production in this region is expected to be favorable.

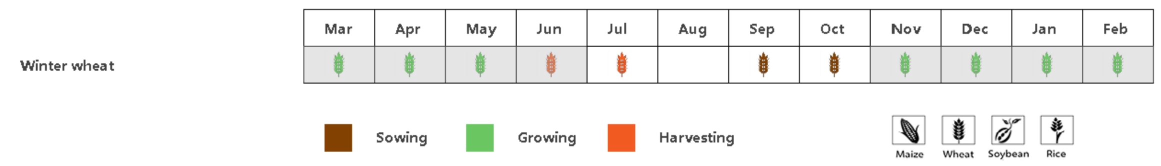
Northern Hungary is another important winter wheat region. During this reporting period crops showed favorable conditions according to the NDVI development curve. They were above average from July to mid-September and below average from late September to October. The rainfall was above average (RAIN +54%). Temperature was slightly above average (TEMP +0.1°C), and radiation was below average (RADPAR -3%). Estimated biomass decreased slightly (BIOMASS -3%). The maximum VCI was 0.96. Cropping Intensity was 106%. The crop production in this region is expected to be close to average.

The Puszta region mainly grows winter wheat, maize and sunflower especially in the counties of Jaz-Nagykum-Szolnok and Bekes. According to the NDVI development graph, crop conditions were above average from July to mid-September and below average after then. The rainfall was above average (+46%). Temperature was also above average (TEMP +0.2°C), whereas radiation was below (RADPAR -2%), which resulted in average biomass. The maximum VCI was 0.97. Cropping Intensity was 103%. The crop production in this region is expected to be close to average.

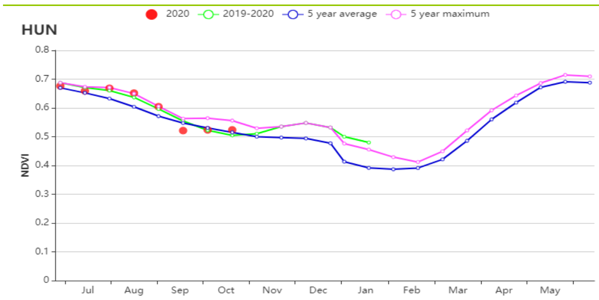
Southern Transdanubia cultivates winter wheat, maize, and sunflower, mostly in Somogy and Tolna counties. Crop condition was close to average in July and October, above average from August to early September, and below average in mid-September. Rainfall and temperature were above average (RAIN +26%; TEMP +0.5°C) , whereas solar radiation was below average (RADPAR -2%) and biomass was slightly above (BIOMSS +3%). The maximum VCI was favorable at 0.91. Cropping Intensity was 101%. The crop production in this region is expected to be favorable.

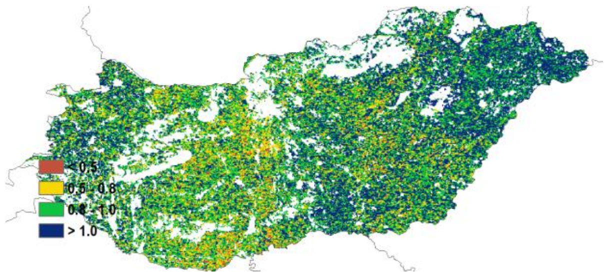
Summer crops production is expected to be slightly above average and the prospects for the winter wheat are favorable as well.

Figure 3.18 Hungary's crop condition, July-October 2020

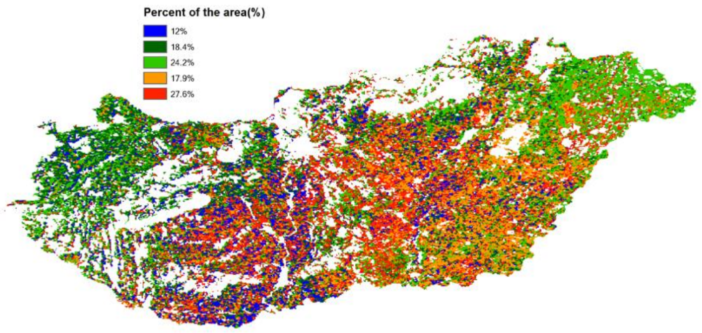


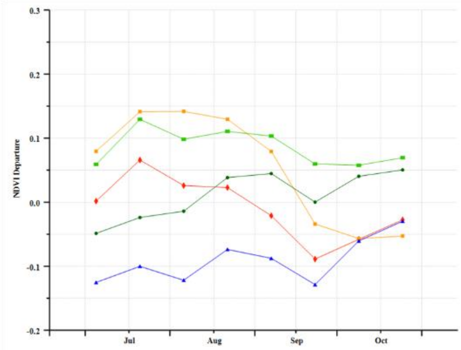
(a). Phenology of major crops



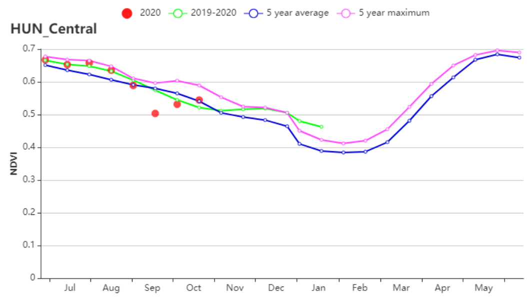


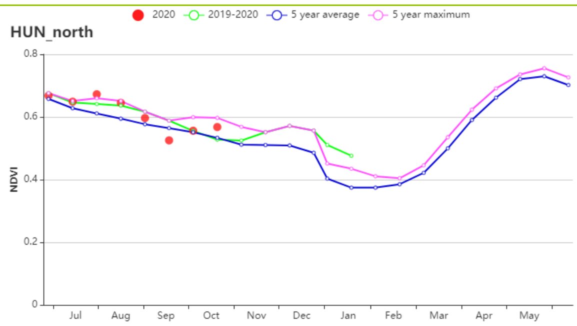
(b) Crop condition development graph based on NDVI (c)Maximum VCI



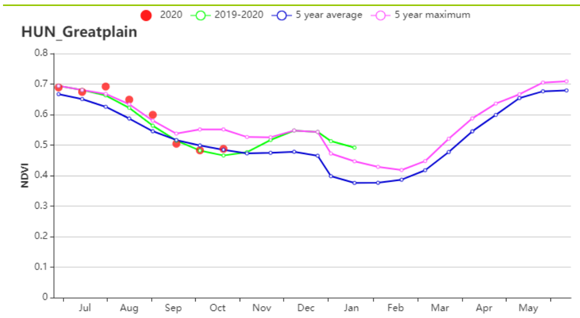


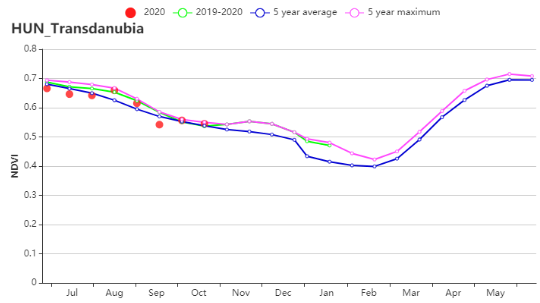
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles





(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 3.28 Hungary's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July- October 2020

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Central Hungary	242	25	19	0.3	1008	-2	538	2
North Hungary	316	54	18	0.1	966	-3	486	-3
The Puszta	303	46	19	0.2	1010	-2	531	0
Transdanubia	277	26	18	0.5	1013	-2	526	3

Table 3.29 Hungary's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July- October 2020

Region	Cropped arable land fraction		Cropping Intensity		Maximum VCI
	Current (%)	Departure (%)	Current (%)	Departure (%)	Current (%)
Central Hungary	100	0	102	0	0.93
North Hungary	100	0	106	2	0.96
The Puszta	100	0	103	1	0.97
Transdanubia	100	0	101	-2	0.91

[IDN] Indonesia

During this monitoring period, the dry season maize and the second rice crop reached the mature stage and harvest began in October. Planting of the main rice crop started in October.

At the national scale, sunshine was below average (RADPAR -2%), whereas temperature (TEMP +0.2℃) and precipitation (RAIN +10%) were above the 15YA. The potential cumulative biomass (BIOMSS) was 1% below average as a result of reduced radiation.

According to the crop condition development graph based on NDVI, crop growth conditions were below the 5YA over the reporting period. NDVI clusters and profiles show that 43.9% of the cropland over Eastern Indonesia was in below-average conditions before September and recovered to average during October.

Considering that the area of cropped arable land (CALF 99%) in the country was close to the 5YA and the VCIx value reached 0.96, the national production is anticipated to be average or slightly below.

Regional analysis

CropWatch divides Indonesia in to four agro-ecological zones, namely **Sumatra** (92), **Java** (90), **Kalimantan and Sulawesi** (91) and **West Papua** (93), among which the first three regions are the most relevant for crop production. Java is the country's main agricultural region.

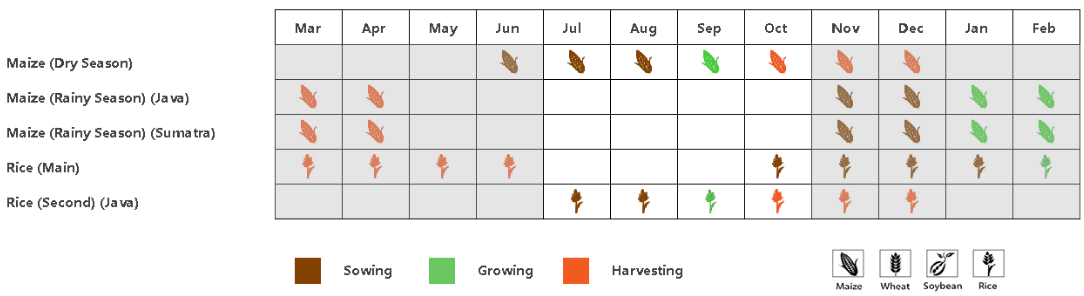
The cropped arable land fraction (CALF) reached 100% in all the regions except for **Java** (98%), but CALF in **Java** had increased by 1% over the 5YA.

The **Java** region received abundant precipitation (356 mm, +14%) during the monitoring period. The temperature was 25℃ as usual, and RADPAR was 1176 MJ/m² (+3%). BIOMSS (739 gDM/m2) did not change. The VCIx was just fair at 0.93. According to the NDVI development graph and average cropping intensity, the crop condition was close to the 5YA average. Overall, the crop conditions in Java were similar to those in previous years.

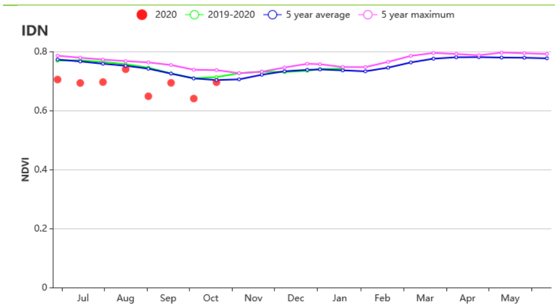
In the **Kalimantan and Sulawesi** area, precipitation was 23 % higher than the 15YA average, at 1128 mm, the largest increase in the four regions. The reduced temperature (-0.1℃) and RADPAR (-4%) brought a decrease in biomass production potential (BIOMSS -3%). According to the NDVI development graph and the VCIx (0.96), crop condition in Kalimantan and Sulawesi are assessed as close to or slightly below average.

During the reporting period, the **Sumatra** region recorded 1590 mm of RAIN (+6%). TEMP (+0.2℃) and RADPAR (-1%) as well as BIOMSS (774 gDM/m2) remained close the 15YA. VCIx was favorable at 0.97. Hence, the crop conditions were normal for this monitoring period.

Figure 3.19 Indonesia's crop condition, July – October 2020

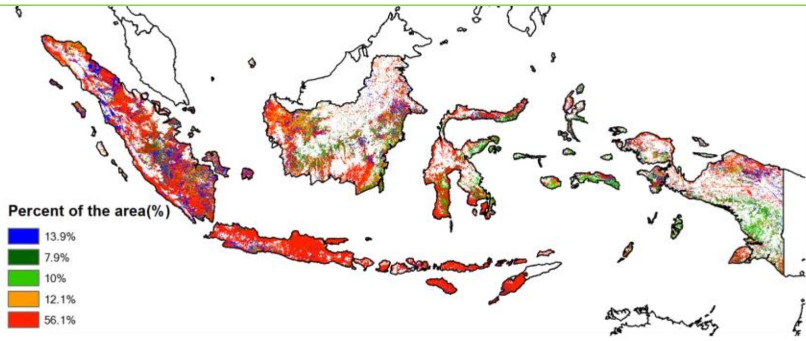


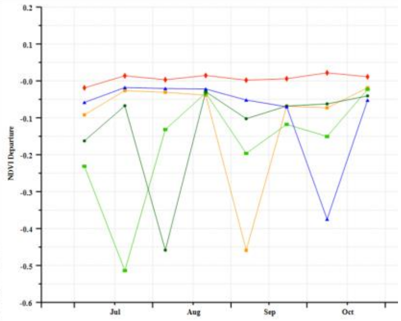
(a). Phenology of major crops



(b) Crop condition development graph based on NDVI

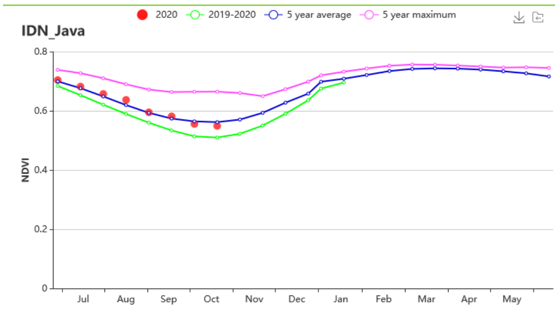
(c) Maximum VCI

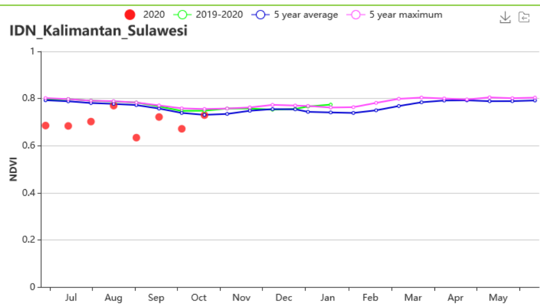




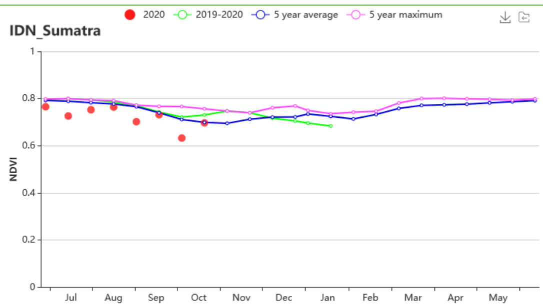
(d) Spatial NDVI patterns compared to 5YA

(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 3.30 Indonesia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July – October 2020

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Java	356	14	25.2	0.4	1249	-2	739	0
Kalimantan and Sulawesi	1128	23	24.4	-0.1	1155	-4	754	-3
Sumatra	855	-8	24.7	0.2	1179	-1	774	0

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
West Papua	1590	6	23.1	0.3	949	-1	609	-1

Table 3.31 Indonesia's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2020

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure from 5YA(%)	Current	Depature from 5YA(%)	Current
Java	98	1	118	-4	0.93
Kalimantan and Sulawesi	100	0	130	-3	0.96
Sumatra	100	0	121	-8	0.96
West Papua	100	0	132	-1	0.97

[IND] India

The current monitoring period covers the monsoon season, during which the main rice crop (Kharif) is grown. It is planted at the beginning of monsoon in June and harvested in October. Other major crops grown during this monitoring period are maize and soybean. Rabi wheat sowing started in October. The graph of NDVI development shows that the crop conditions were close to or above the average in general, except in mid-August, indicating that the crop conditions for Kharif rice, maize and soybean were favorable at the national level.

The CropWatch agroclimatic indicators show that nationwide TEMP (+0.3 °C) was close to average, wheras RADPAR was at the same level as the 15YA. India recorded abundant RAIN (+5%) after July, which exceeded the 15-year average for the same monitoring period. The increased rainfall and temperature resulted in a BIOMSS increase by 1% compared with the 15YA. Moreover, the overall VCIx was high, with a value of 0.97. As can be seen from the spatial distribution, only the South, Northeast and Northwest recorded values below 0.80. Most of India had high VCIx values. These spatial patterns of VCIx were thus generally consistent with those of NDVI. Almost all areas experienced continuously above-average crop conditions until September. The spatial distribution of NDVI profiles shows that in August, 28.9% of the areas recorded below-average crop conditions in the West and Northeast regions. CALF increased by 3% compared to the 5YA.

With the exception of a few areas, the crop conditions in all parts of India were favorable. During the last monitoring period, the crops in some areas were affected by excessive rainfall and flooding, but the general situation has turned favorable. Crop production for this season is estimated to be above average at the national level.

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 two agro-ecological zones of the Deccan Plateau and the Agriculture areas in Rajasthan and Gujarat show similar trends in agricultural indices. Compared to the same period of previous years, RAIN had increased, especially in the Agriculture areas in Rajasthan and Gujarat (+21%). Aided by slightly higher TEMP and RADPAR, abundant rainfall caused BIOMSS to be much higher than the 15-year average. CALF showed the same trends. In Rajasthan and Gujarat, it was 4% above the 5YA. The graph of NDVI development shows that the crop growth of these two 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.

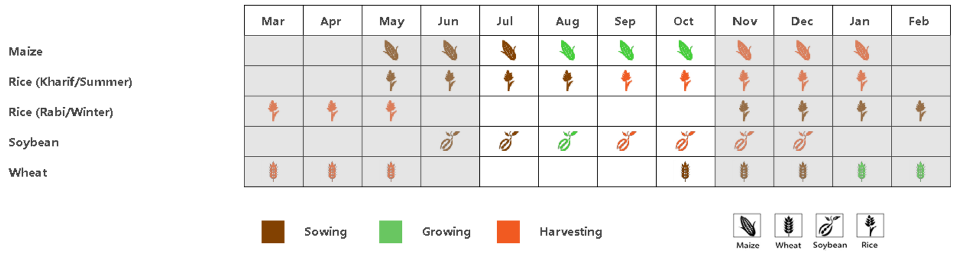
The Eastern coastal region and the Western coastal region recorded similar trends of agricultural indices in this monitoring period. Compared to the same period of the previous years, RAIN had increased by more than 10%. TEMP was slightly below average (-0.1°C) in the Eastern coastal region and slightly above average (+0.1°C) in the Western coastal region. Below average RADPAR caused a decrease in BIOMSS. Both regions recorded increases of CALF (+3% and +6%, respectively). VCIx was above 0.95. 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 North-western dry region recorded 512 mm of RAIN, which was 54% above average. TEMP was at 31.1°C (+0.3°C), and RADPAR was slightly below the 15YA at 1188 MJ/m² (-2%). BIOMSS was above the 5YA (+7%) due to the heavy rainfall. CALF reached 56% which was a significant increase by 44% over the 5-year average, and VCIx was 0.90. The graph of NDVI development shows that the crop growth of this region during this monitoring period exceeded the 5-year average in most months. Generally, the crop production is expected to be above average.

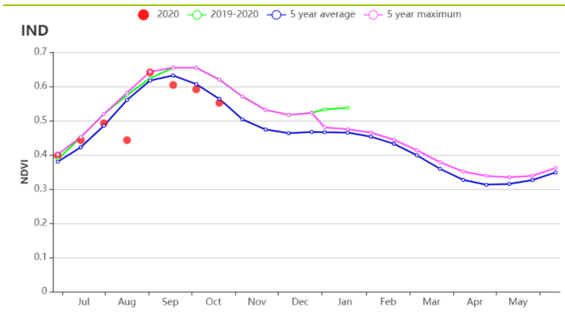
The Assam and Northeastern region recorded 2429 mm of RAIN, which was slightly above average (+4%). TEMP was at 24.3°C (+0.3°C) and RADPAR was at 863 MJ/m² (-9%). BIOMSS was below the 5YA (-7%) due to less solar radiation. CALF reached 95% which was near average, and VCIx was 0.94. The outlook of crop production in this region is slightly unfavorable due to the low radiation and high rainfall.

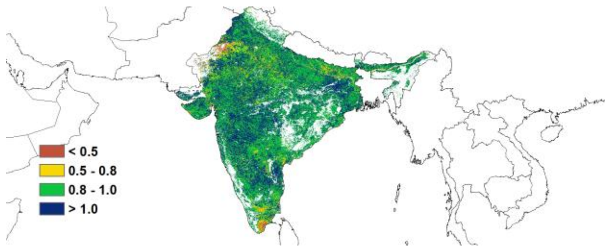
The Western Himalayan region and the Gangetic plain recorded similar trends of agricultural indices in this monitoring period. Compared to the same period of the previous years, RAIN had decreased significantly, especially in the Western Himalayan region (-53%). TEMP and RADPAR were slightly higher. Lack of rainfall caused BIOMSS estimates to be below the 15-year average. CALF was close to the 5-year average in both regions. The VCIx was higher than 0.94. The graph of NDVI development shows that crop growth for the two regions was below the 5-year average during the monitoring period. Therefore, crop production conditions were slightly unfavorable.

Figure 3.20 India's crop condition, July-October 2020

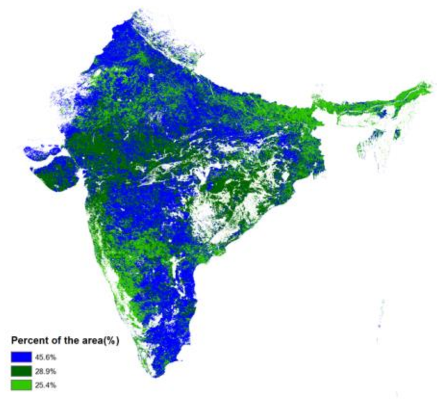


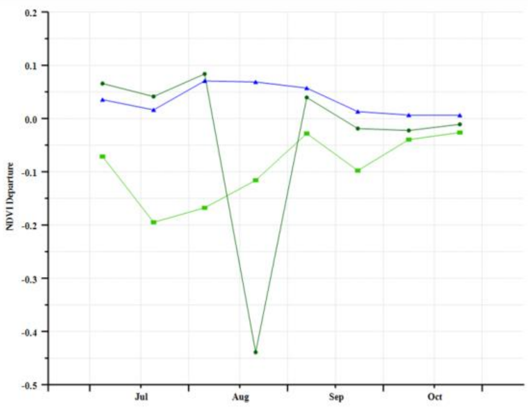
(a). Phenology of major crops



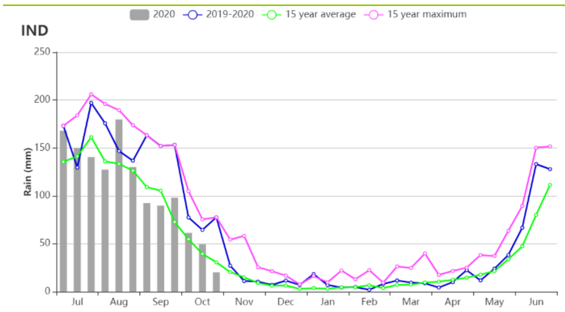


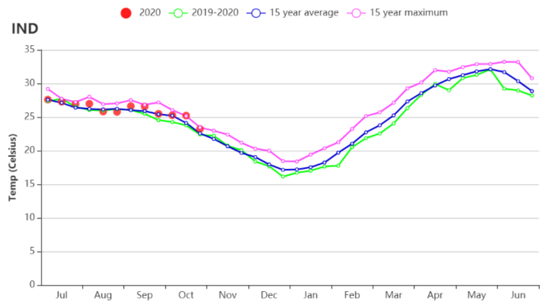
(b) Crop condition development graph based on NDVI (c) Maximum VCI



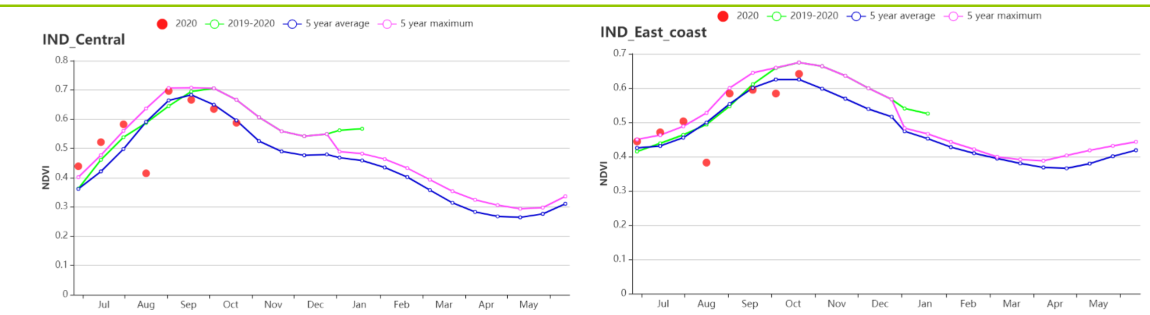


(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles

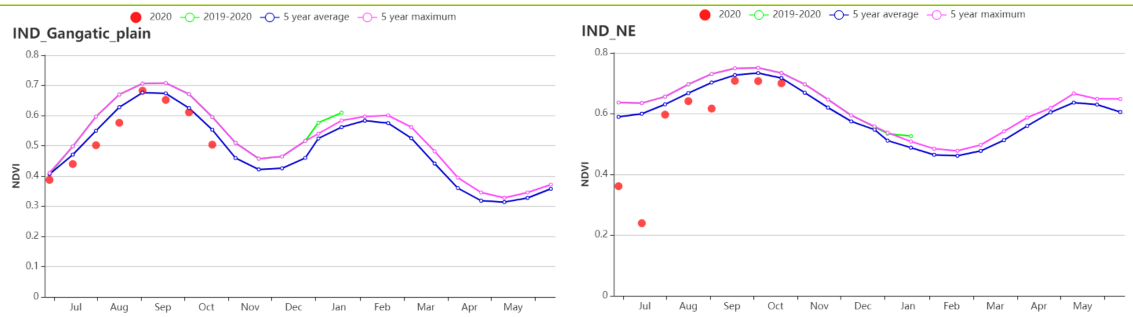




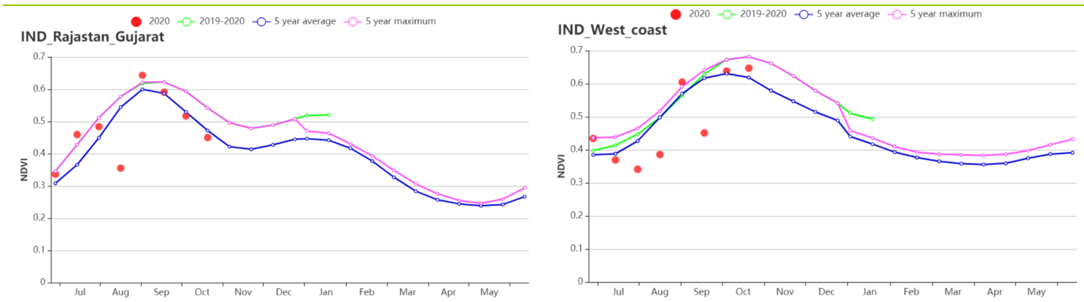
(f) Rainfall profiles (g) Temperature profiles



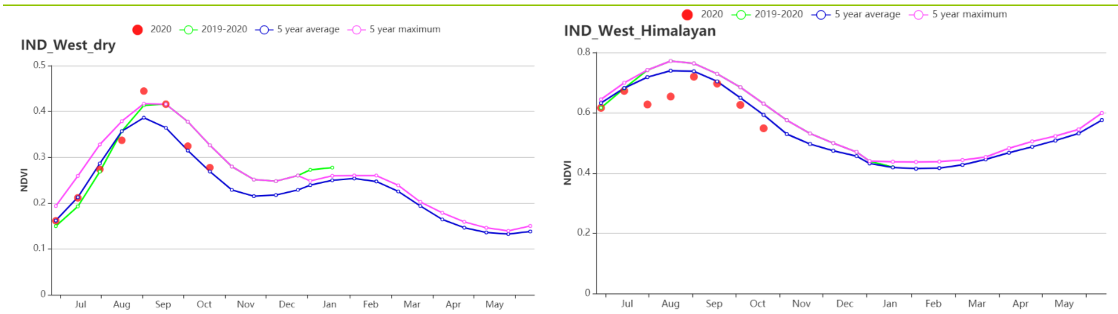
(h) Crop condition development graph based on NDVI (Deccan Plateau (left) and Eastern Coastal Region (right))



(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 3.32 India's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July-October 2020

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Deccan Plateau	1144	7	26.0	0.6	1079	3	662	
Eastern coastal region	1179	11	26.3	-0.1	1080	-2	710	
Gangetic plain	1048	-6	27.9	0.5	1148	2	667	

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Assam and north-eastern regions	2430	4	24.3	0.4	864	-9	538	
Agriculture areas in Rajasthan and Gujarat	1103	21	27.9	0.4	1077	0	648	
Western coastal region	1603	12	24.0	0.0	932	-4	608	
North-western dry region	512	54	31.1	0.3	1188	-2	604	
Western Himalayan region	436	-53	19.2	0.5	1280	7	431	

Table 3.33 India's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July-October 2020

Region	Cropped arable land fraction		Croping Intensity		Maximum VCI
	Current (%)	Departure (%)	Current (%)	Departure (%)	Current
Deccan Plateau	99	1	126	6	0.99
Eastern coastal region	95	3	114	2	0.96
Gangatic plain	98	0	169	2	0.97
Assam and north-eastern regions	95	-1	137	-4	0.94
Agriculture areas in Rajasthan and Gujarat	97	4	130	3	0.97
Western coastal region	99	6	107	1	0.99
North-western dry region	56	44	129	3	0.9
Western Himalayan region	99	0	112	0	0.94

[IRN] Iran

The harvest of summer crops (potatoes and rice) was almost over by the end of August, while winter crops (wheat and barley) started to be sown in September. 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. The cumulative rainfall was 13% below average. The average temperature was 0.7 ℃ below average, whereas the photosynthetically active radiation was down 4%. The potential biomass was 18% higher than the 15-year average. The national maximum vegetation condition index (VCIx) was 0.84, while the cropped arable land fraction (CALF) was 26% higher than the average of the past 5-years.

The NDVI spatial patterns show that from July to October, crop conditions in 44.3% of the cropped area were average or slightly above the 5-year average (marked in red). 16.7% of the cropped areas (marked in dark and light green) experienced above-average crop conditions until the end of the monitoring period, mainly located in the provinces of West and East Azarbaijan, Ardebil, Khuzestan, and Qazvin. 5.6% of the cultivated area experienced below-average crop conditions until the end of the monitoring period, mainly located in northern and southwestern parts of Iran, including the northern parts of the provinces of Gilan, Mazadaran, Golestan, and some parts of Khuzestan. The spatial pattern of maximum Vegetation Condition Index (VCIx) was in accord with the spatial distribution of the NDVI profiles.

When comparing the proportion of NDVI anomaly categories with their 5-year averages, all of the 16-day phases had less than 10% of the cropped areas with below-average crop conditions. As for the proportion of VHIn categories compared with 5-year average, the proportion of the cultivated areas with moderate to severe droughts increased to more than 20% for the last four phases.

In general, crop growth conditions were normal.

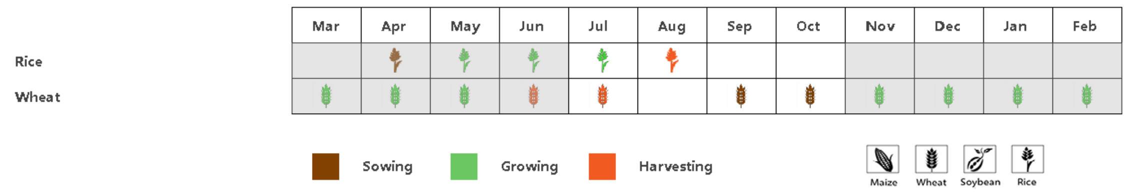
Regional Analysis

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**.

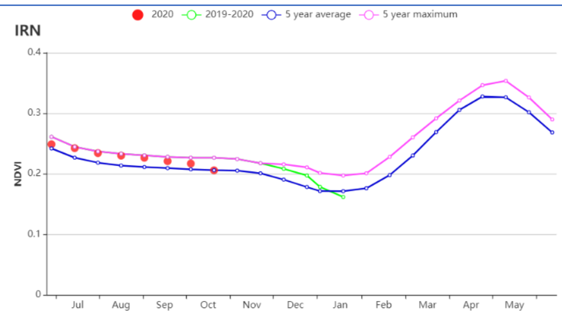
In the **Western and northern semi-arid subtropical hilly areas**, the cumulative precipitation during the monitoring period was 56 mm, 13% lower than average. Both temperature (-0.7 ℃) and photosynthetically active radiation (-5%) were below the 15YA. The potential biomass was 8% higher than average. Crop conditions were better than the 5-year average. The proportion of cultivated land was 14%, which was 22% higher than the 5YA. Cropping Intensity (CI) was slightly below the 5YA (-1%). The average VCIx for this region was 0.87, indicating a favorable crop prospect.

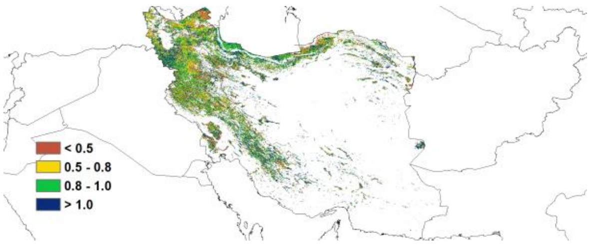
In the **Coastal lowland and plain areas of the arid Red Sea**, the temperature was 0.1℃ above average, while the accumulated precipitation was 48% below average and the photosynthetically active radiation was 2% below average. The potential biomass was 23% higher than the 15-year average. Crop conditions were generally better than the 5-year average. During the monitoring period, although CALF and CI was 60% and 2% higher than the average of the last 5-years, and the VCIx was 0.63, indicating below-average crop conditions.

Figure 3.21 Iran's crop condition, July - October 2020



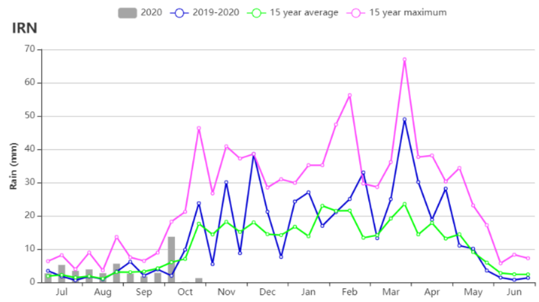
(a) Phenology of major crops

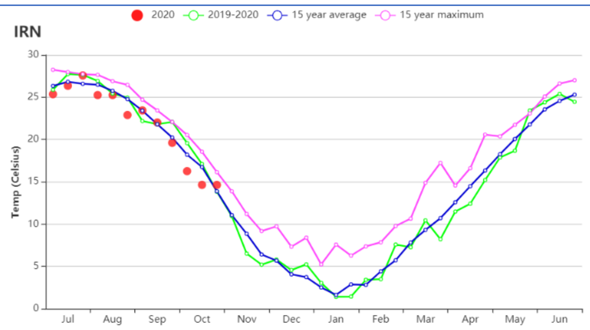




(b) Crop condition development graph based on NDVI

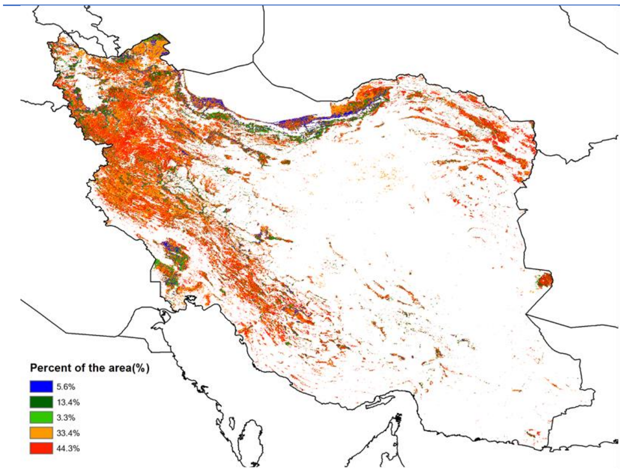
(c) Maximum VCI

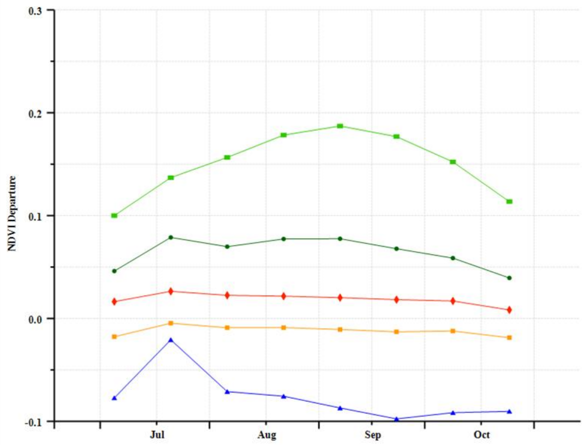




(d) Rainfall time series profile

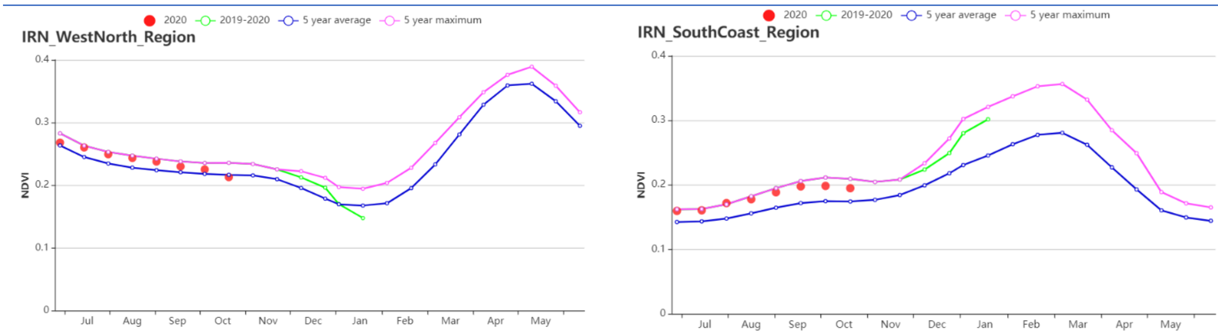
(e) Temperature time series profile



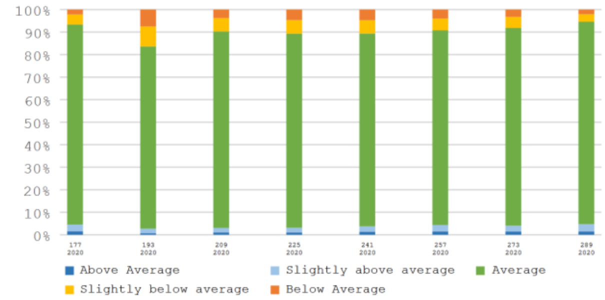


(f) Spatial NDVI patterns compared to 5YA

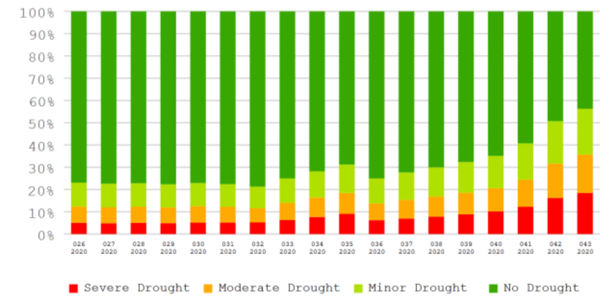
(g) NDVI profiles



(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 3.34 Iran's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2020

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m²)	Departure from 15YA (%)	Current (gDM/m²)	Departure from 15YA (%)
Semi-arid to sub-tropical hills of the west and north	56	-13	20.3	-0.7	1347	-5	301	8
Arid Red Sea coastal low hills and plains	6	-48	33.0	0.1	1436	-2	161	23

Table 3.35 Iran's agronomic indicators by sub-national regions, current season's value and departure from 5YA, July - October 2020

Region	Cropped arable land fraction		Cropping Intensity		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Semi-arid to sub-tropical hills of the west and north	10	60	102	-1	0.63
Arid Red Sea coastal low hills and plains	14	22	107	2	0.87

[ITA] Italy

During this reporting period, winter wheat harvest was completed in July and the 2020-21 crop was sown in October.

Based on the agroclimatic and agronomic indicators, the crop conditions in Italy were generally close to the 5-year average during this reporting period. At the national level, total precipitation was significantly above average (RAIN, +14%), temperature was close to average and radiation below average (RADPAR, -1%). This resulted in a 2% reduction of potential biomass production(BIOMSS -2%).

CALF was 87%. Cropping Intensity was 109%. VCIx nationwide reached 0.86 and it varied greatly within the regions.

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: the dark green areas have excellent crop conditions (14.4% of the cropland). They were mainly located in the Po Valley. The red and blue color regions (42.8%), stretching from the north to the south along the center of the peninsula, represent poor crop conditions. On about 26.3% of the cropland, located in northern Italy, NDVI was above average from July to late September, and close to average thereafter.

Overall, Crop production is expected to be near average.

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 and RADPAR were below average (RAIN -19%, RADPAR -1%), TEMP was above average (TEMP +0.1°C), resulting in an increase of biomass (BIOMSS +4%) compared to the 15YA.VCIx was 0.75 and low CALF (64%) indicated low crop cultivation. Cropping Intensity was 102%. According to the NDVI development graph, crop conditions were close to the 5YA average from July to August but below average in September and October. Crop production is expected to be near average.

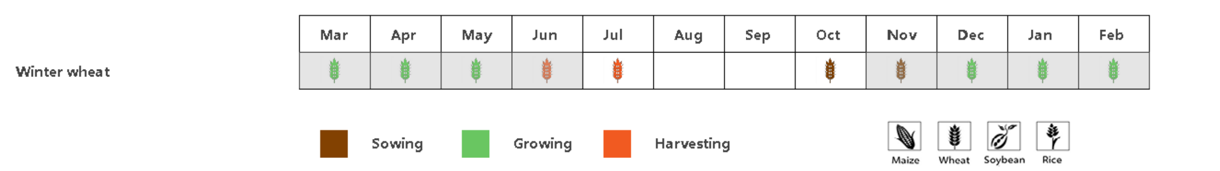
Crop production in the **Po Valley** was mainly affected by high rainfall (RAIN +26%). TEMP and RADPAR were the same as the 15YA average, which resulted in a slight BIOMSS increase (+3%). The area has a high CALF (100%) and the VCIx was 0.94 for this region. Cropping Intensity was 102%. The output for wheat is expected to be near average.

For the **Islands**, less rainfall (RAIN -17%) was observed. RADPAR was lower (-2%) and TEMP remained the same as the 15YA. Biomass was estimated at below-average level (BIOMSS -6%). NDVI was close to average during this reporting period except in mid-September. The VCIx was 0.74 and CALF reached 62%. Cropping Intensity was 101%. Hence, the output for wheat is expected to be close to average.

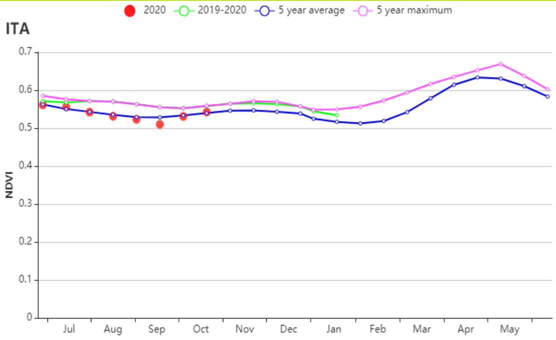
The situation in **Western Italy** is as follows: higher rainfall (RAIN +5%), normal temperatures (no departure from the 15YA) and lower radiation (RADPAR -2%). Accordingly, biomass was below average (BIOMSS -5%). The NDVI curve followed the average trend in July and October, and was below average in August and September. The VCIx was 0.88 and CALF reached 0.95. Cropping Intensity was 121%. The area has a high CALF (95%) and VCIx was 0.88. Crop conditions were normal.

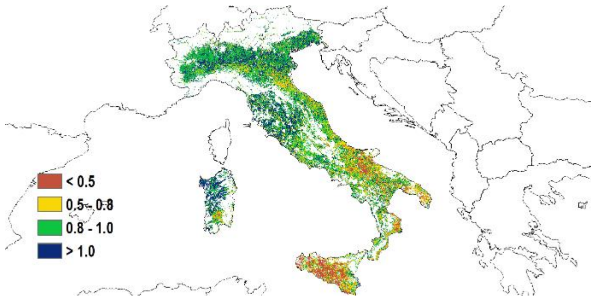
Summer crops production can be expected to be near average and the prospects for the winter wheat also follow the long-term average.

Figure 3.22 Italy's crop condition, July-October2020



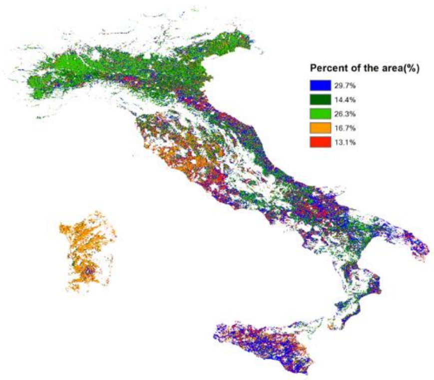
(a). Phenology of major crops

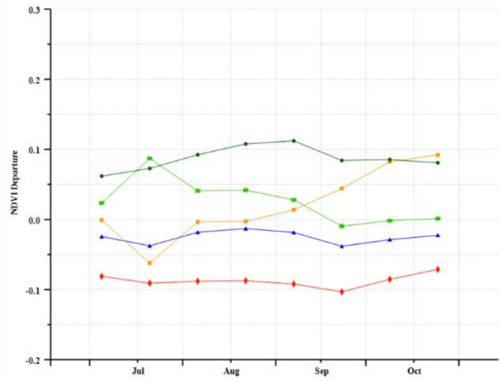




(b) Crop condition development graph based on NDVI

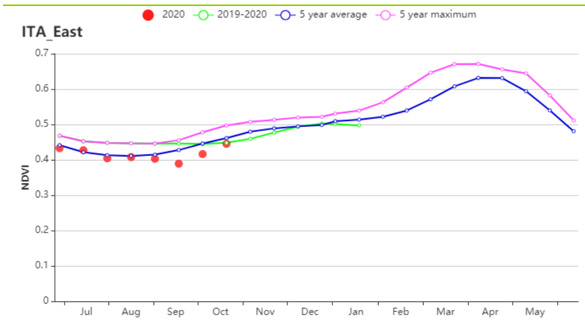
(c) Maximum VCI

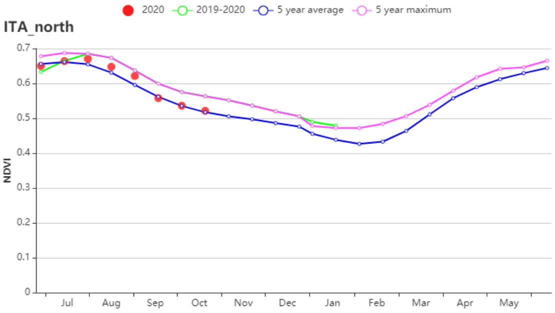




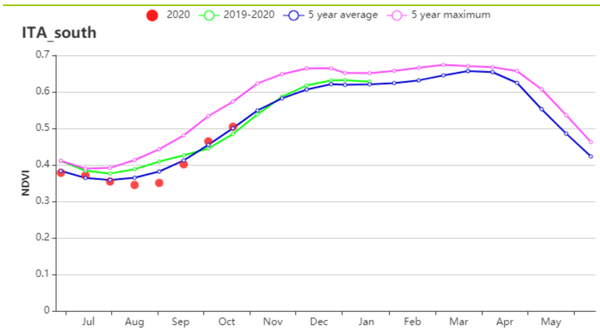
(d) Spatial NDVI patterns compared to 5YA

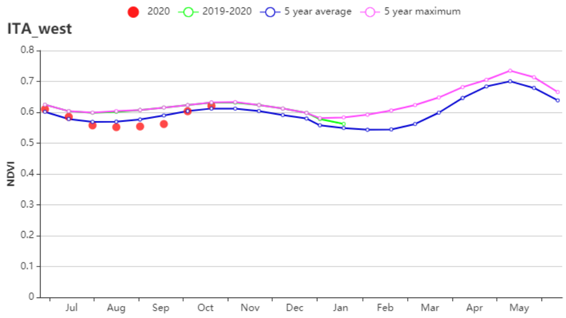
(e) NDVI profiles





(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 3.36 Italy's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July-October 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	199	-19	20	0.1	1149	-1	633	4
Po Valley	604	26	17	0.0	1070	0	507	3
Islands	131	-17	22	0.0	1262	-2	550	-6
Western Italy	298	5	19	0.0	1143	-2	549	-5

Table 3.37 Italy's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July-October 2020

Region	Cropped arable land fraction		Cropping Intensity		Maximum VCI
	Current (%)	Departure (%)	Current (%)	Departure (%)	Current (%)
East Coast	64	-4	102	-4	0.75
Po Valley	100	0	102	-2	0.94
Islands	62	-3	101	-2	0.74
Western Italy	95	0	121	1	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

[KAZ] Kazakhstan

This report covers the growth and harvest of spring wheat In Kazakhstan. In October, winter rye and winter wheat, which are minor crops, were planted in the southern regions of the country. The crop conditions were generally below or close to average from July to October.

Compared to the 15-year average, accumulated rainfall was above average (RAIN +23%), while radiation and temperature were below average (RADPAR -4%, TEMP -0.7°C). Precipitation reached 10 mm above the 15-year average in early and late July, and mid-August. The temperature fluctuated along the average level during this reporting period. The agro-climatic conditions resulted in a normal level for the potential biomass (BIOMSS).

The national average maximum VCI index was 0.72. The Cropped Arable Land Fraction (CALF) was down by 7% over the recent five-year average, and the Cropping intensity (CI) was close to average. The spatial VCIx map matched well with the national crop condition development graphs in July. Crop conditions on about 21.5% of croplands were above average during the reporting period, mainly in southeastern areas of Akmola State and northeastern areas of Shyghys Kazakstan State. About 66.9% of croplands, which were distributed across the southern region, and most of Soltustik Kazakstan, Pavlodar, and Batysdy Kazakstan States, experienced poor crop conditions during the whole monitoring period except for mid-July. Remaining croplands (about 11.6%) experienced unfavorable crop conditions from July to mid-August, and then recovered to above average till end of October, mainly in the northern parts of Kostanay Sate.

Overall, due to below-average CALF and crop conditions, spring wheat production is estimated to be below average.

Regional analysis

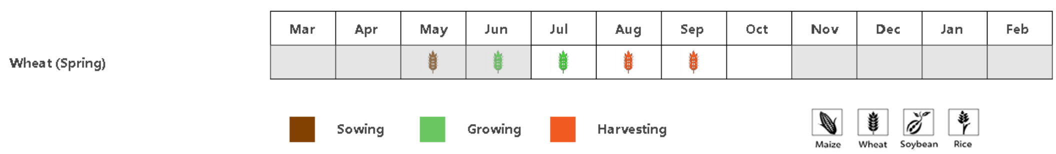
Based on cropping systems, climatic zones and topographic conditions, four sub-national agro-ecological regions can be distinguished for Kazakhstan, among which three are relevant for crop cultivation: the Northern region (112), the Eastern plateau and southeastern region (111) and the South region (110).

The **Northern region** is the main spring wheat production area. Accumulated rainfall was above average (RAIN +20%), but RADPAR and temperature were below average. According to NDVI profiles, crop conditions were below average from July to September. The average VCIx for this region was 0.71, and the proportion of cultivated land was 8% lower than the average. Production is estimated to be below average.

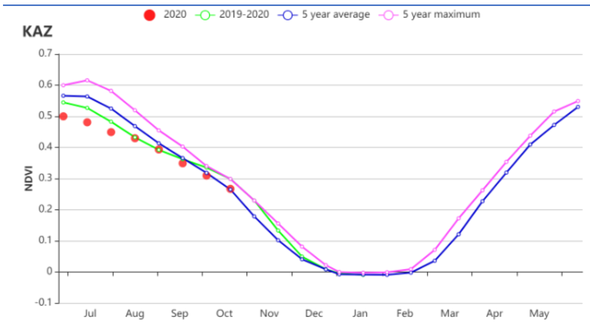
Crop conditions in the **Eastern plateau and Southeastern region** were mostly below average from July to August, and close to average from September to October. The accumulated rainfall in the region was above average (+31%), while radiation and temperature were below average (RADPAR -6%, TEMP -1.5°C). The average VCIx for this region was 0.76, and CALF was below average by 6%. Production of spring wheat is unfavorable.

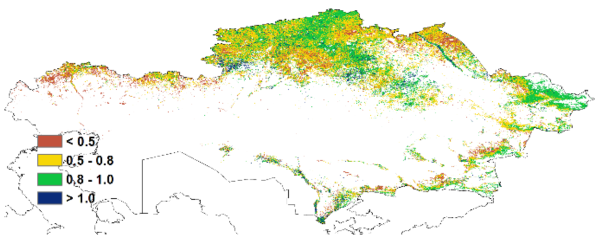
The South region received 40 mm of rainfall only, which was far below average (down 24%). The average VCIx for this region was 0.77. CALF was above average by 4%. NDVI profiles show the poor crop condition from July to October.

Figure 3.23 Kazakhstan's crop condition, July-October 2020

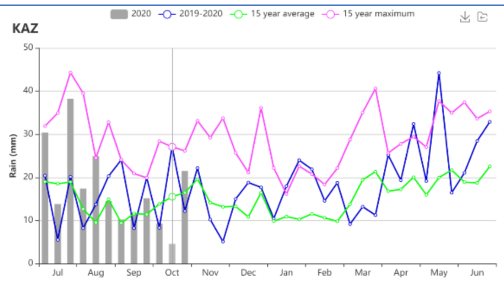


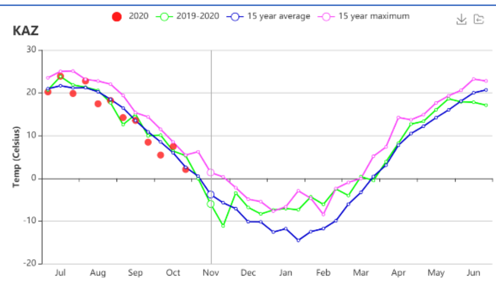
(a). Phenology of major crops



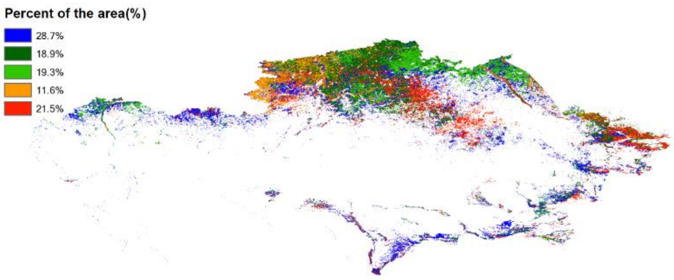


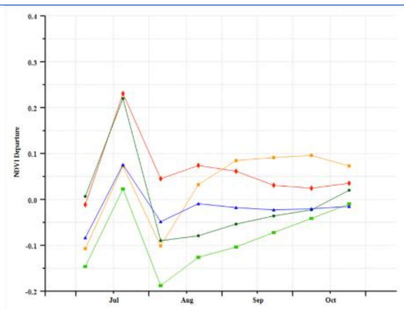
(b) Crop condition development graph based on NDVI (c) Maximum VCI



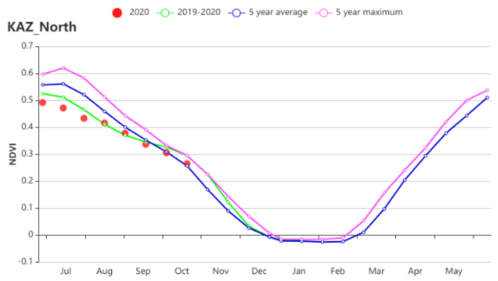


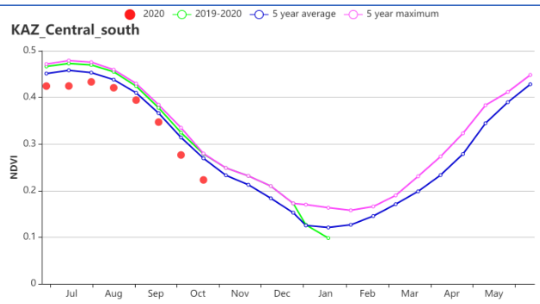
(d) Rainfall Index (e) Temperature Index



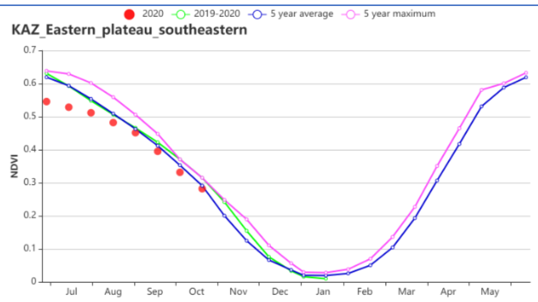


(f) Spatial NDVI patterns compared to 5YA (g) NDVI profiles





(h) Crop condition development graph based on NDVI (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 3.38 Kazakhstan agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July-October2020

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)	Current (gDM/m^2)	Departure from 15YA (%)
Northern region	197	20	14.3	-0.3	900	-3	419	0
Eastern plateau and southeastern region	284	31	13.5	-1.5	1084	-6	425	-1
South region	40	-24	20.6	-1.1	1203	-4	523	15

Table 3.39 Kazakhstan, agronomic indicators by sub-national regions, current season's values and departure from 5YA, July-October 2020

Region	Cropped arable land fraction		Maximum VCI	Cropping Intensity	
	Current (%)	Departure (%)	Current	Current	Departure (%)
Northern region	77	-8	0.71	100	0
Eastern plateau and southeastern region	78	-6	0.76	100	-1
South region	58	4	0.77	100	0

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

[KEN] Kenya

Kenya experiences two rainy seasons: The long rains last from March to May and the short rains from October to December. Maize can be grown during the long and short rains, whereas wheat is grown during the long rains only. During this reporting period, the long rain maize and wheat were harvested and the short rain maize was planted and started to grow.

At the national scale, precipitation was 21% above average. Above average rainfall was mainly concentrated in the Highland agriculture zone, Northern rangelands and South-west region, thus continuing the trend of the previous monitoring period. Excessive rainfall did not affect temperature and sunshine, both of which were close to the 15YA (TEMP -0.2℃, RADPAR unchanged) and BIOMSS was on average. The NDVI development graph at the national level stayed slightly above average during the entire monitoring period. According to the NDVI clusters and the map of NDVI profiles, 87.6% of the farmlands experienced favorable crop conditions from July to October, except for the central Machakos and southern Kwale. This was in agreement with the maximum VCI graph which showed VCIx in most zones between 0.8-1.0, except for some areas in the central and southern regions. Its national average reached 0.88 and the cropped arable land fraction increased by 11% compared to the 5YA. The national crop condition is assessed as generally favorable. Early growth of short rain maize will benefit from the abundant rainfall recorded in October.

Regional analysis

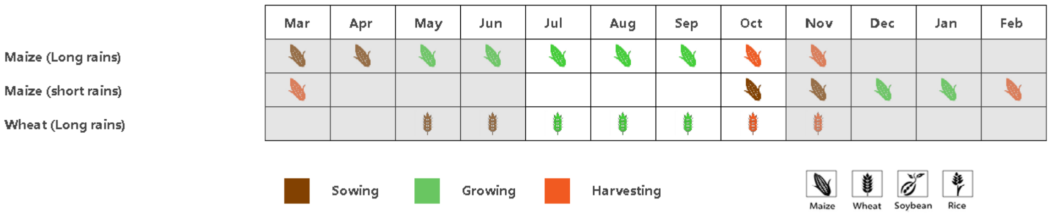
The Eastern coastal region is the only place where rainfall was significantly lower than the 15YA（-41%). Temperatures were slight warmer (+0.4℃) and adequate sunshine (+3%) resulted in an increased estimate for biomass (+3%). The NDVI values stayed below the 5YA with slight fluctuations throughout the reporting period. VCIx reached 0.81 with CALF up 4%. Cropping intensity is 142% close to average. Crop conditions were normal for both livestock and crops in the coastal areas. The crop production will stay at the same level as in previous years.

The Highland agriculture zone recorded 435 mm of rain, above average by 25%. Temperature (TEMP -0.1°C), sunshine (RADPAR -1%) and biomass (BIOMSS -1%) stayed close to average. The NDVI profile was slightly above average during the whole reporting period. The maximum VCIx value was recorded at 0.89. In this area, cropped arable land fraction increased significantly by 16% compared to the 5YA. Cropping intensity was 22% below the average. In general, the crop conditions were favorable.

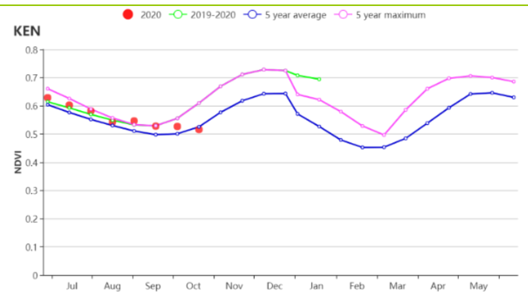
Agroclimatic indicators in **the Northern region** with sparse vegetation were similar to those in the Highland agriculture zone. Precipitation was above average (RAIN +33%). Temperature (TEMP unchanged), sunshine (RADPAR -2%) and BIOMSS (+2%) were close to the 15YA. The NDVI development curve stayed above the 5YA during the entire monitoring period. The maximum VCI was high at 0.90 with a comparative increase in CALF (+19%). Cropping intensity was 154% close to average. Overall, the CropWatch indicators point at favorable conditions.

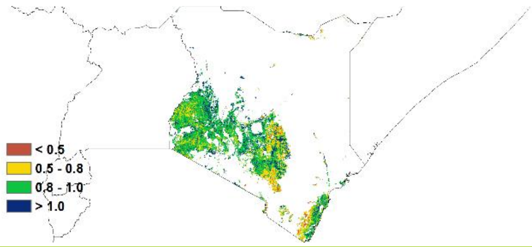
South-west of Kenya includes the districts Narok, Kajiado, Kisumu, Nakuru, and Embu which are major producers of long rain wheat and maize. The total amount of rainfall recorded during the reporting period reached 646 mm (30% above average). Temperatures were slightly cooler (TEMP -0.9 ℃) and solar radiation (RADPAR +1%) was near average. Estimated biomass (BIOMSS -4%) was slightly lower. NDVI trended above average throughout the entire monitoring period. Cropping intensity was 11% above the average. CALF was almost unchanged and VCIx was at 0.87. All in all, crop conditions were favorable and slightly above average yields for long rain wheat and maize are estimated.

Figure 3.24 Kenya's crop condition, July-October 2020

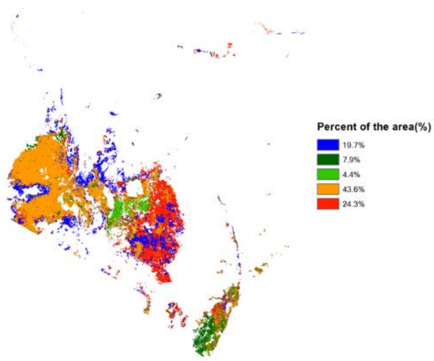


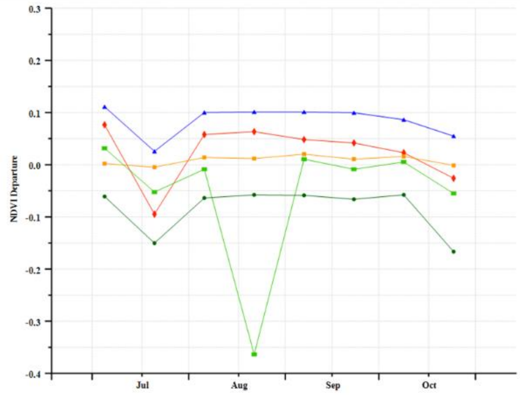
(a) Phenology of major crops



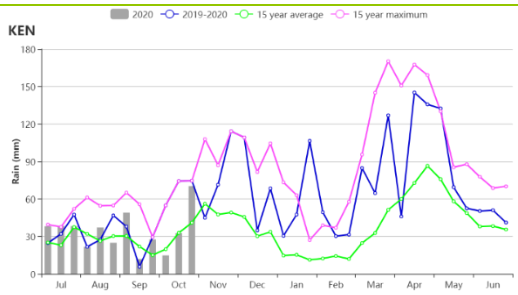


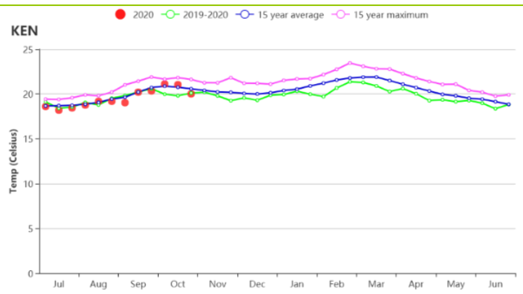
(b) Crop condition development graph based on NDVI (c) Maximum VCI



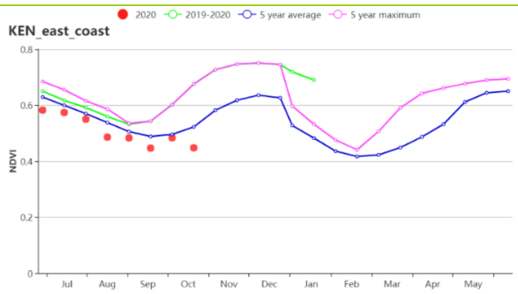


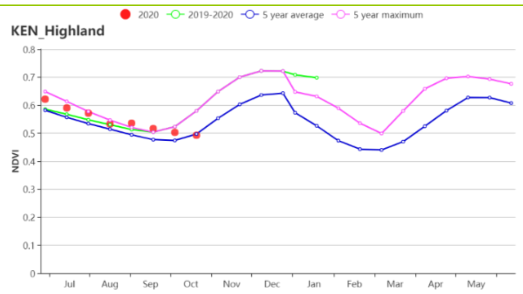
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



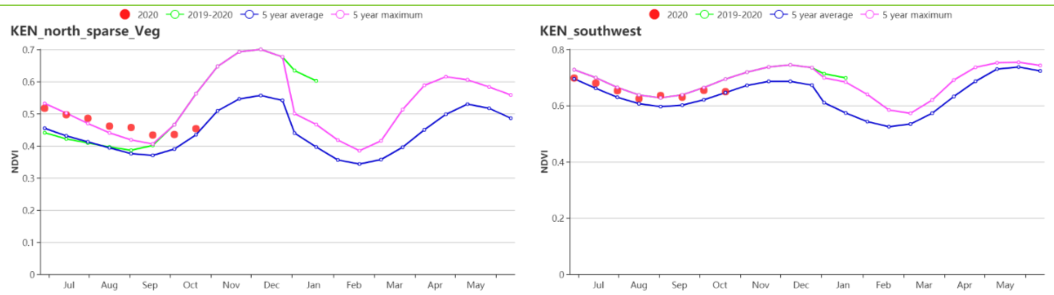


(f) Time series rainfall (g) Time series temperature





(h) Crop condition development graph based on NDVI, The eastern coastal region(left), The Highland agriculture zone(right)



(I)Crop condition development graph based on NDVI, the northern region with sparse vegetation(left), South-west(right)

Table 3.40 Kenya's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July -October 2020

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m2)	Departure (%)	Current (gDM/m2)	Departure (%)
Central region	152	-41	24.8	0.4	1234	3	797	
Highland agriculture zone	435	25	18.3	-0.1	1122	-1	530	
Northern rangelands	335	33	22.7	0.0	1209	-2	710	
South-west	646	30	18.5	-0.9	1215	1	591	

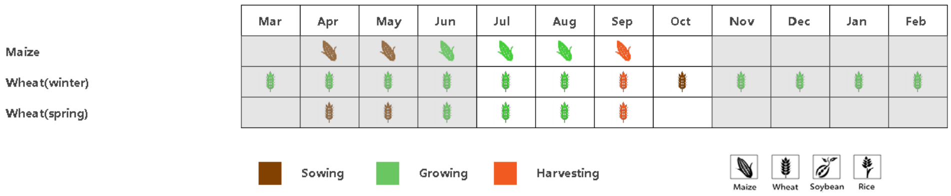
Table 3.41 Kenya's agronomic indicators by sub-national regions, current season's values and departure, July - October 2020

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure (%)	Current (%)	Departure (%)	Current
Central region	97	4	142	-2	0.81
Highland agriculture zone	89	16	113	-22	0.89
Northern rangelands	73	19	154	3	0.90
South-west	100	1	165	11	0.87

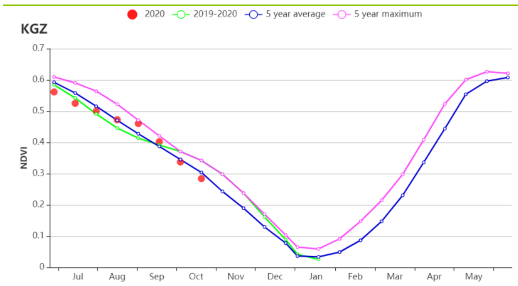
[KGZ] Kyrgyzstan

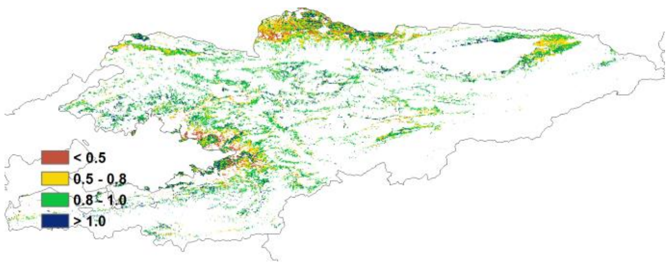
The reporting period covers the growth and harvest of wheat and maize. Among the CropWatch agro-climatic indicators, RAIN (+55%) increased largely and RADPAR (-7%) was below average, while TEMP (-1.6℃) was below average. The combination of these factors resulted in above average BIOMSS (+4%, compared to the 15YA). The time series precipitation profile shows that precipitation was higher than average and even exceeded the 15-year maximum in July. The temperature profile indicates that temperatures were a bit lower than the 15-year average during the reporting period, which was favorable for pastures. NDVI was a bit lower than the 5-year average in July and increased to above average, even close to the 5-year maximum in August and September, then decreased to average in October. The spatial NDVI clustering profile shows that in the northern region, the large area marked with green and blue color experienced a decrease in July, and an increase in August to September then a decrease in October. In the eastern region, the area marked with yellow and red showed similar pattern but higher values. This situation is largely confirmed by the VCIx map which shows high values (>0.8) in the central region of Ming-Kush, Ozgon, while low values were observed in the northern Bishkek and eastern Karakel region. CALF decreased less than 1% and the nationwide VCIx average was 0.84, which is in line with the favorable NDVI trend. Crop intensity is 100%. Crop conditions in Kyrgyzstan can be assessed as favorable. Good wheat and maize yields can be expected.

Figure 3.25 Kyrgyzstan's crop condition, July - October 2020



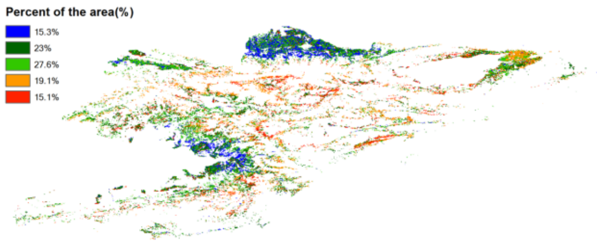
(a). Phenology of major crops

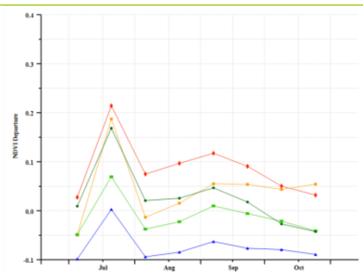




(b) Crop condition development graph based on NDVI

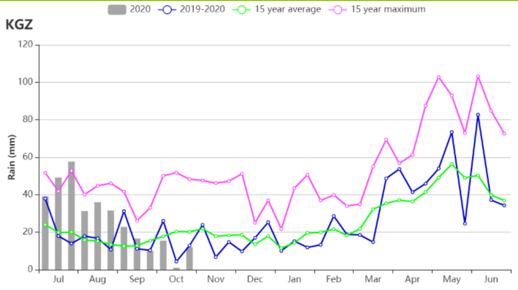
(c) Maximum VCI



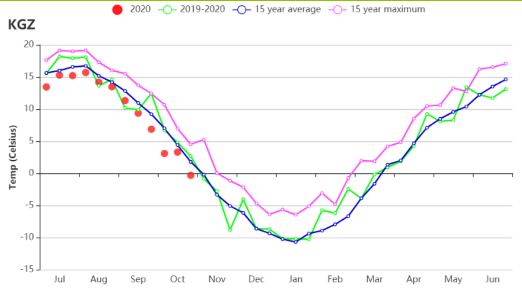


(d) Spatial NDVI patterns compared to 5YA

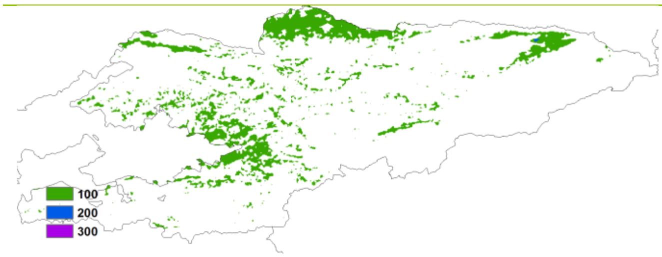
(e) NDVI profiles



(f) Rainfall profiles



(g) Temperature profiles



(h) Crop intensity

Table 3.42 Kyrgyzstan's agroclimatic indicators, current season's values and departure from 15YA, July - October 2020

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Kyrgyzstan	322	55	10.1	-1.6	1209	-7	383	

Table 3.43 Kyrgyzstan's agronomic indicators, current season's values and departure from 5YA, July - October 2020

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure (%)	Current (%)	Departure (%)	Current
Kyrgyzstan	89	0	100	0	0.84

[KHM] Cambodia

This reporting period covers the monsoon season in Cambodia. The sowing period of early rice (wet season) and floating rice started before July, followed by the medium rice and late rice, which started in July and August respectively. The harvesting period of soybean started in July, followed by the wet season maize and early rice (wet season), which started in August and September respectively.

Cambodia generally experienced normal weather conditions, which were close to the respective averages of the previous 15 years. The precipitation (RAIN) was 2% below average, while the temperature (TEMP) rose by 0.2℃ and the radiation (RADPAR) increased by 1%, which resulted in a slightly increased estimate of biomass (BIOMSS, +1%). At the same time, the cropped arable land fraction (CALF, +1%) for the country was 98% and the maximum VCI value was at 0.93.

According to the NDVI profile for the country, the NDVI value was close to the average before August and near the 15-year maximum in early September. During this period, the deficit in precipitation had a small influence on the crop conditions. In late October, the NDVI dropped to below average as a result of excessive rainfall in that month. A large negative anomaly of NDVI was recorded in early October, which was presumably due to cloud cover in the satellite images.

Considering the spatial patterns of NDVI profiles, about 10.9% of crop land, mainly located in the lower Mekong River, experienced an above-average NDVI during the monitoring period. This high NDVI value shows that the crops benefitted from irrigation from the Mekong river. On the contrast, over 16% of the crop land had lower NDVI values than average, which was mainly located around the Tonle Sap Lake. The low NDVI values may have been caused by lower-than-average water levels of Tonle Sap due to water supply deficits from the Mekong River. Around 73% of the crop land had a stable NDVI, which is close to the average. All in all, the prospective production of maize and early rice is close to or slightly higher than average.

Regional analysis

Based on cropping systems, climatic zones and topographic conditions, four sub-national regions are described below: The **Tonle Sap lake area** where the seasonally inundated freshwater lake and especially temperature are influenced by the lake itself, **the Mekong valley between Tonle Sap and Vietnam border**, **Northern plain and northeast**, and **the Southwestern Hilly region** along the Gulf of Thailand coast.

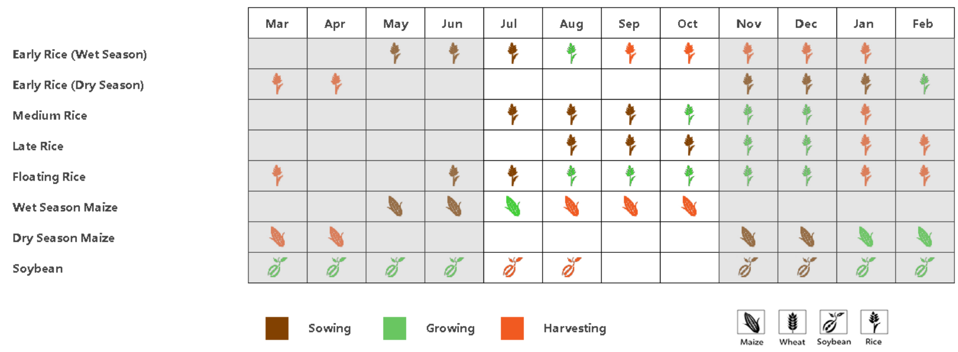
In the **Tonle Sap lake area**, NDVI was close to or higher than average before the middle of September, while it dropped to below average subsequently. Compared to average, the rainfall (RAIN, +8%) and temperature (TEMP, +0.2℃) were higher. However, the radiation (RADPAR, -2%) and biomass (BIOMASS, -2%) for the region were below average. The fraction of cropped arable land (CALF, +1%) was above 5YA. Moreover, this region is cultivated with a mixture of single and double cropping system, and cropping intensity was below 5-year average (CI, -2%).

The **Mekong valley between Tonle Sap and Vietnam border**, the main rice growing area of Cambodia, recorded a slight increase of precipitation (RAIN, +4%) and a rise of temperature (TEMP, +0.3℃). Both the radiation (RADPAR) and the biomass (BIOMSS) were near average. At the same time, this region is cultivated with a mixture of single and double cropping system, and cropping intensity was lower than 5-year average (CI, -1%). However, the NDVI profile for the region shows that the NDVI was higher than average before October and then dropped to below average. As a result, the soybean and wet season maize harvested there seems to have a good production.

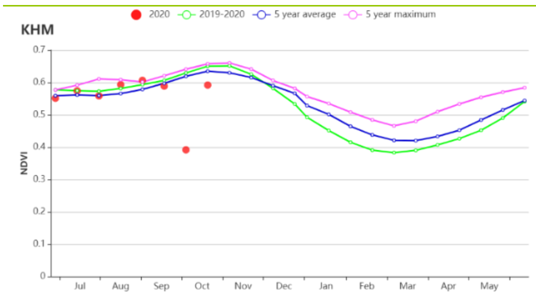
The **Northern plain and northeast** had a deficit of rainfall (RAIN, -12%) accompanied by above-average radiation (RADPAR, +3%) and biomass (BIOMSS, +4%). The temperature (TEMP) was at average. Moreover, this region is cultivated with a mixture of single and double cropping system, and cropping intensity was below 5-year average (CI, -11%). The regional NDVI was slightly higher than average in middle August. Otherwise, it was below average, which indicates that the crop conditions for the region were unfavorable.

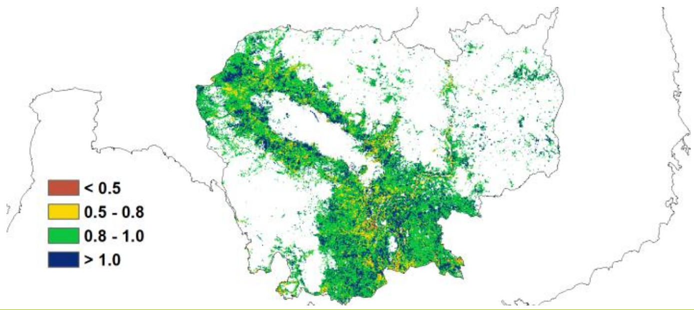
The **Southwest Hilly region** experienced an increase of rainfall (RAIN, +8%) and a rise of temperature (TEMP, +0.4℃), while the radiation (RADPAR) and biomass (BIOMSS) were near average. At the same time, the cropped arable land remained very close to average (CALF, -0%) and the maximum VCI value was at 0.92. This region is cultivated with a mixture of single and double cropping system, and cropping intensity was below 5-year average (CI, -22%). However, the NDVI for the region was higher than average before September. It subsequently dropped to below average, which means that the crop conditions for this region were unfavorable at the end of this monitoring period.

Figure 3.26 Cambodia's crop condition, July - October 2020

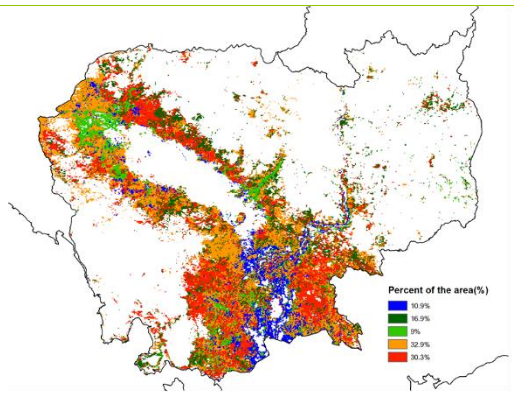


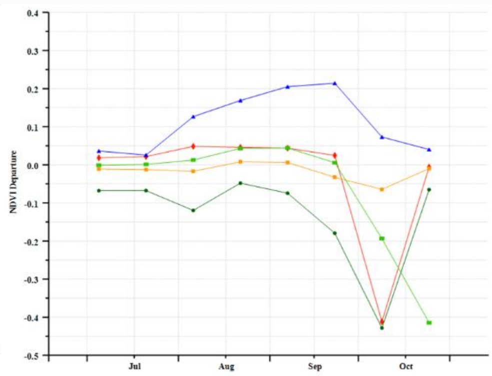
(a). Phenology of major crops



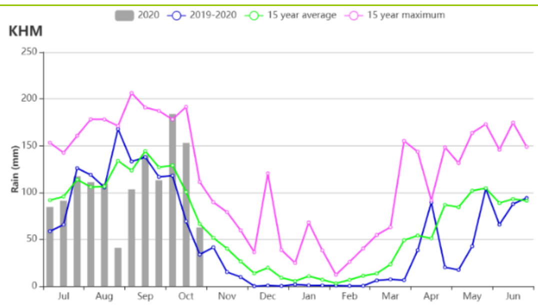


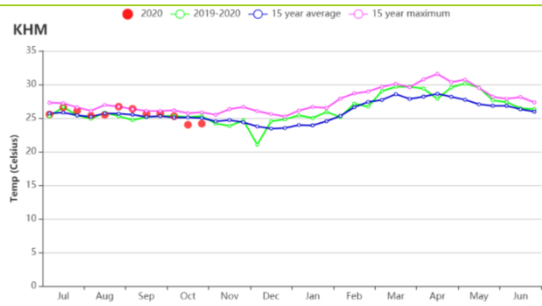
(b) Crop condition development graph based on NDVI (c) Maximum VCI



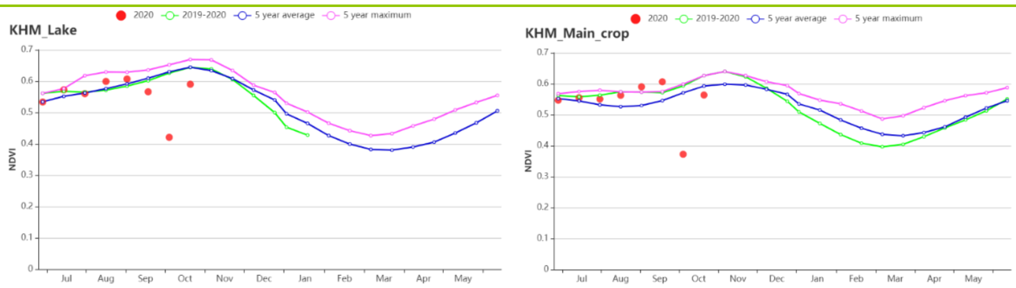


(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles

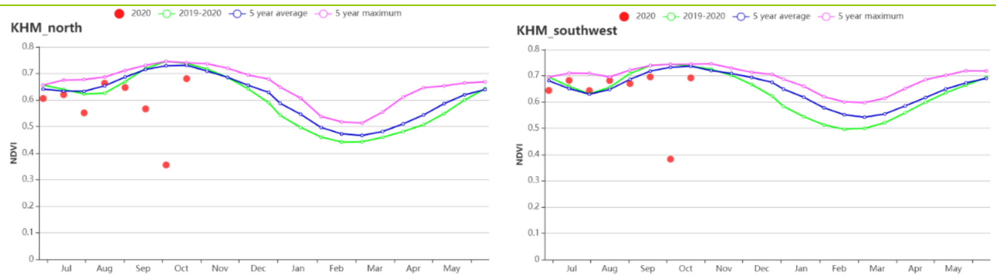




(f) Rainfall profiles (g) Temperature profiles



(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 3.44 Cambodia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2020

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Tonle Sap lake area	1201	8	25.8	0.2	1079	-2	727	-2
Mekong valley	1244	4	26.1	0.3	1104	0	749	0
Northern plain and northeast	1399	-12	25.3	0.1	1085	3	726	4
Southwest Hilly region	1344	8	24.7	0.4	1079	0	735	0

Table 3.45 Cambodia's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2020

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure (%)	Current (%)	Departure (%)	Current
Tonle Sap lake area	99	1	112	-2	0.93
Mekong valley	96	2	121	-1	0.93
Northern plain and northeast	99	0	104	-11	0.94
Southwest Hilly region	99	0	103	-22	0.92

[LKA] Sri Lank

This report covers the second season (Yala) growing and harvesting of rice and maize from July to September, as well as the main season (Maha) sowing for crops in October. According to the CropWatch monitoring results, crop conditions were near average for the period from July to October.

Similar to the last monitoring period, this period was dominated by the south-western monsoon, which is active between May and September. At the national level, temperature experienced a slight increase (TEMP +0.2℃), while precipitation and radiation decreased as compared to the 15YA (RAIN -23%, RADPAR -3%). The decrease in rainfall mainly happened between August to October, which are harvesting and sowing periods. The fraction of cropped arable land (CALF) remained nearly comparable to the 5YA, while cropping intensity increased by 22% than the 5YA. BIOMSS was 3% down comparable to the 15YA. As shown on the NDVI development graph, NDVI values were near average from July to August and slightly below-average from September to October. The below-average NDVI values in September and October can be seen as a result from the significantly reduced precipitation. Nevertheless, the normal NDVI values in growing season indicated good condition for biomass accumulation and favorable prospect of crop production. The maximum VCI for the whole country was 0.95.

As shown by the NDVI clusters map and profiles, the trends were quite different across the island. More than half of the country's cropland showed below-zero NDVI departure values during the whole period. 10% of cropland showed a large decline of NDVI values in early August, as well as the 6.5% of cropland in early August and late September, which may have been outliers due to cloud cover. These croplands with negative NDVI departure values were mainly distributed in the north and southwest part of the country, including south of North Western Province, North Central Province, Western Province and Southern Province. Almost half of the cropland, i.e., 44.3%, showed above-zero NDVI departure values before mid-October. These croplands were distributed in North Western Province, Eastern Province and Uva Province.

Regional analysis

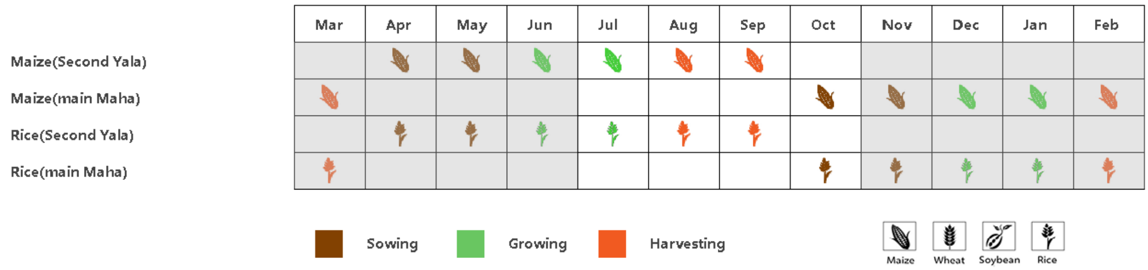
Based on the cropping system, climatic zones and topographic conditions, three sub-national agroecological regions can be distinguished for Sri Lanka. They are the Dry zone, the Wet zone, and the Intermediate zone.

In the Dry zone, the recorded RAIN (361 mm) was 41% below 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, RADPAR was down by 4% and BIOMSS also decreased by 5% as compared to the 15YA. CALF was near the 5YA level and 97% of cropland was utilized. NDVI followed a similar trend as the whole county. The VCIx for the zone was 0.93. Overall, crop conditions were below average for this zone.

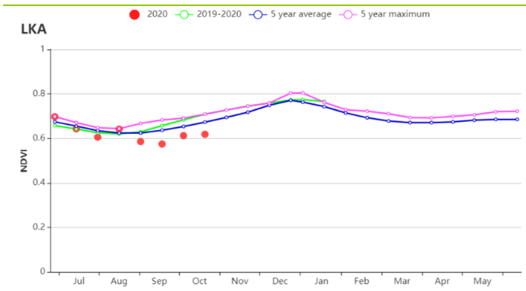
The Wet zone received the highest precipitation among three sub-national regions. RAIN (1836 mm) was down by 13% as compared to the 15YA. TEMP and RADPAR were near average. BIOMSS was comparable to the 15YA and cropland was fully utilized as usual. NDVI values were below average almost for the whole period, especially in from July to September. The VCIx value for the zone was 0.98. Crop conditions were also below average for this zone.

The Intermediate zone also experienced deficient rain (RAIN 840 mm), 25% below the 15YA. This is 7 mm per day and is supposed to be sufficient for rice and maize. TEMP was average and RADPAR down by 2% compared to the 15YA. With full use of cropland, BIOMSS was 3% below average. Similar to the last report, the NDVI values fluctuated around the average and the VCIx value for this zone was 1. Conditions of crops were assessed as near average.

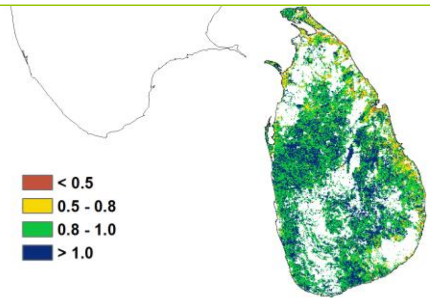
Figure 3.27 Sri Lanka's crop condition, July - October 2020



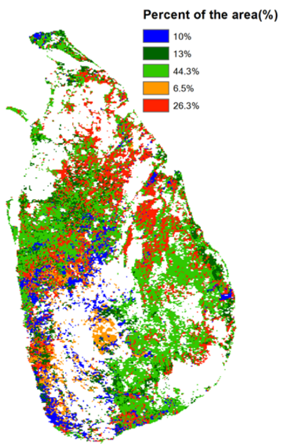
(a). Phenology of major crops

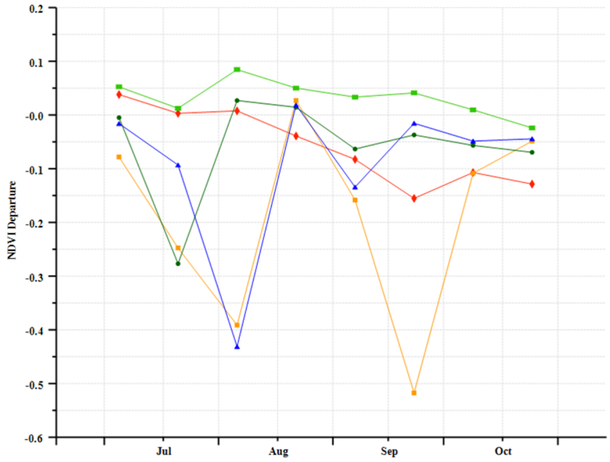


(b) Crop condition development graph based on NDVI



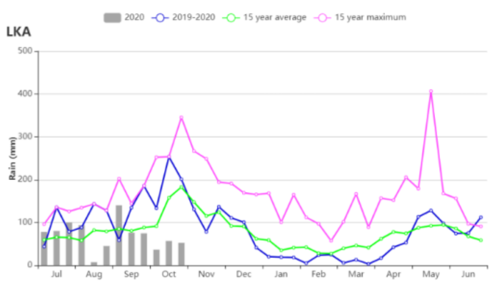
(c) Maximum VCI

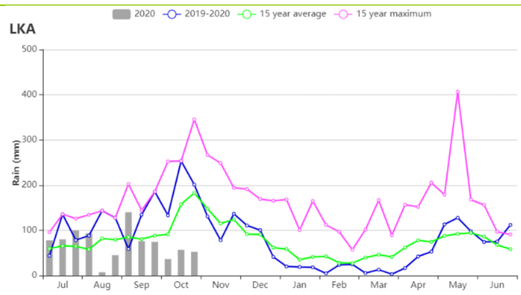




(d) Spatial NDVI patterns compared to 5YA

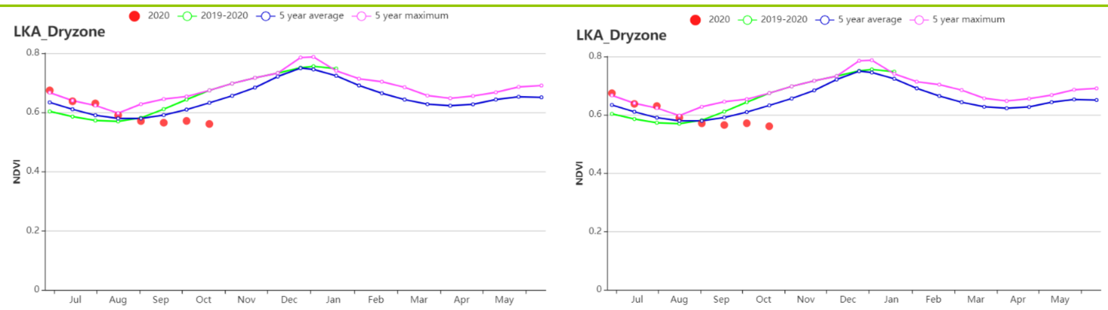
(e) NDVI profiles



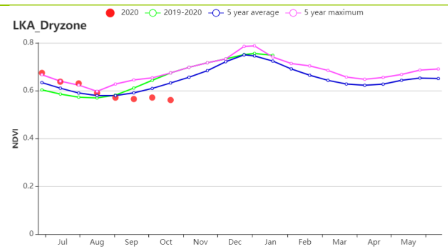


(f) Rainfall profiles

(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 3.46 Sri Lank's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2020

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Dry zone	361	-41	27.5	0.2	1201	-4	780	-5
Wet zone	1836	-13	24.3	0.1	1168	1	780	0
Intermediate zone	840	-25	24.8	0.0	1135	-2	733	-3

Table 3.47 Sri Lank's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2020

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure (%)	Current (%)	Departure (%)	Current
Dry zone	97	0	166	17	0.93
Wet zone	100	0	134	19	0.98
Intermediate zone	100	0	180	33	1.00

[MAR] Morocco

Apart from irrigated maize, which is harvested in July, no cereal crops are grown during this monitoring period in Morocco. Sowing of winter wheat starts in November. Precipitation has been below average in recent months, although most rains fall in the November to March period. The cumulative rainfall was 53 mm, it is lower than the 15-year average (15YA) by 39% The average temperature was 23.1°C (higher than the 15YA by 0.4 °C). The temperature profile fluctuated around the average.

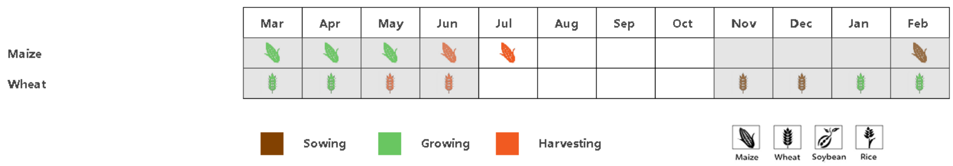
Regional analysis

CropWatch adopts three agro −ecological zones (AEZs) relevant for crop production in Morocco: the Sub-humid northern highlands, the Warm semiarid zone, and the Warm sub-humid zone. Both RADPAR and BIOMSS were below the 15YA by 2% and 5%, 1% and 2%, and 1% and 6% respectively for the three zones in their listed order.

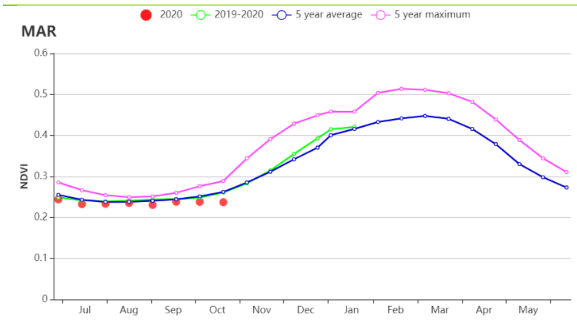
In the Sub-humid northern highlands and the Warm sub-humid zone, rainfall was below the 15YA by 35% and 39% respectively while the temperature was at the 15YA. The cropped arable land fraction (CALF) was above the 5YA by 11% and 8% respectively. The crop condition development graph based on NDVI indicates average conditions. The maximum VCI values for both zones were 0.62 and 0.61, which confirms the near-average conditions.

In the Warm semiarid zone, rainfall was below the 15YA by 42% while the temperature was above the 15YA by 1°C. The CALF was below the 5YA by 13%. The crop condition development graph based on NDVI indicates below-average conditions. The VCIx was at 0.42. Cropping Intensity estimates indicate that in general all regions dominated by single cropping during the investigation period.

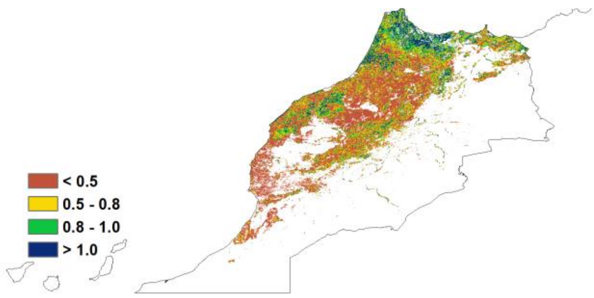
Figure 3.28 Morocco's crop condition, July - October 2020



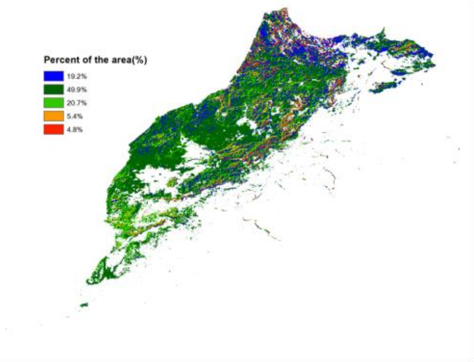
(a). Phenology of major crops

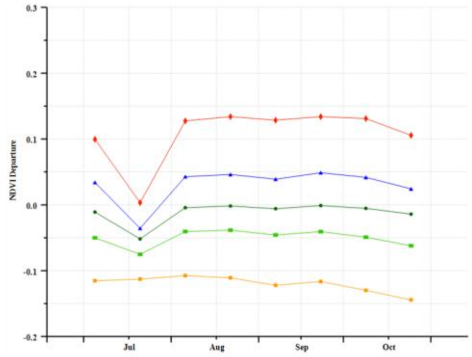


(b) Crop condition development graph based on NDVI



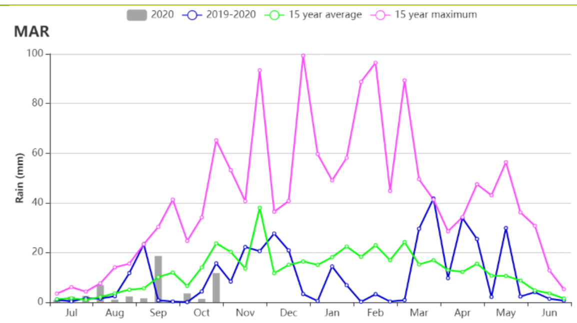
(c) Maximum VCI

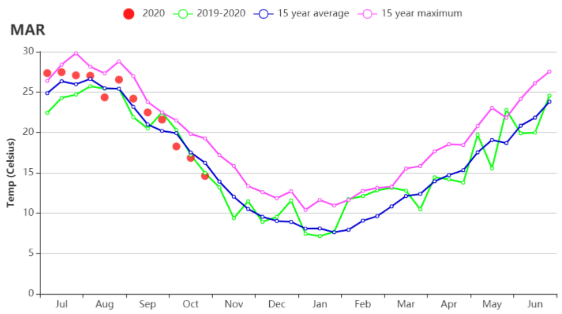




(d) Spatial NDVI patterns compared to 5YA

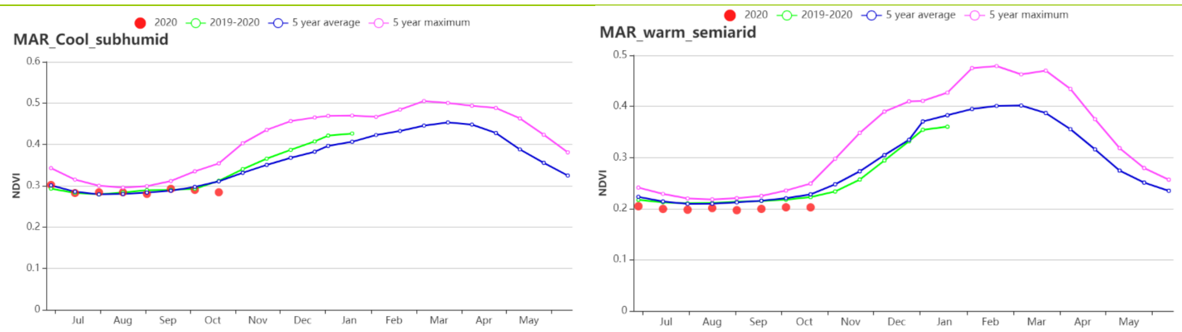
(e) NDVI profiles



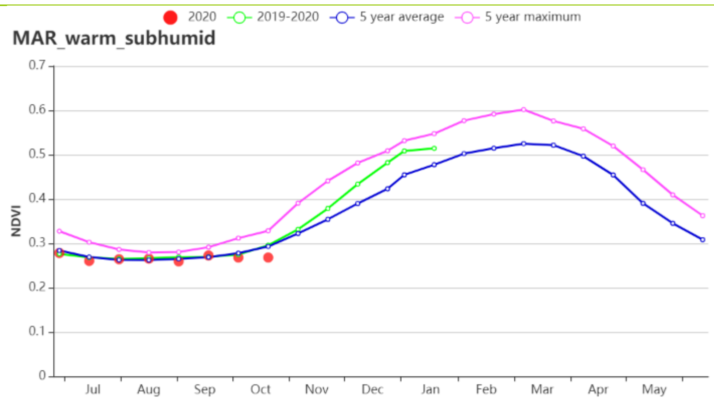


(f) Rainfall profiles

(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 3.48 Morocco's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2020

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Sub-humid northern	68	-35	23	0	1340	-2	558	-5

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
highlands								
Warm semiarid zones	41	-42	24	1	1355	-1	587	-2
Warm sub-humid zones	61	-39	23	0	1337	-1	573	-6

Table 3.49 Morocco's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2020

Region	Cropped arable land fraction		Cropping Intensity		Maximum VCI
	Current (%)	Departure (%)	Current (%)	Departure from 5YA (%)	Current
Sub-humid northern highlands	19	11	105	1	0.62
Warm semiarid zones	2	-13	101	-1	0.42
Warm sub-humid zones	14	8	102	-1	0.61

[MEX] Mexico

Maize is the most important crop grown in Mexico. In the rainfed production regions of the country, maize reached maturity in September and October. Sowing of irrigated maize started in September. Its main production region is in the northwest. Winter wheat sowing begins in November. Both soybean and rice reached maturity by the end of this reporting period.

Crop conditions were below average between July and October according to the crop condition development graph based on NDVI. The CropWatch agroclimatic indicators show that TEMP (+0.4°C) and RADPAR (+1%) were close to average, but RAIN was down (-6%), which was unfavorable to crop growth, as indicated by a relatively normal value of maximum VCI (0.83). CALF decreased by 6%, compared with the previous 5-year average. BIOMSS decreased by 5% as compared to the average. According its spatial pattern, maximum VCI greatly varied within the country. Very high values (greater than 1.0) occurred mainly in the coastal area of Tamaulipas whereas extremely low values (less than 0.5) occurred in the North (Chihuahua and Sonora). The maximum VCI in other regions of Mexico was moderate, with the values between 0.5 and 1.0. As shown in the spatial NDVI profiles and distribution map, about 17.1% of the total cropped areas were below average during the entire monitoring period, mainly distributed in Chihuahua, Sonora and the western coastal area of Sinaloa, while 22.7% of the total cropped areas, mainly in the coastal area of Veracruz and Tamaulipas, were just slightly above average. An area accounting for 60.2% 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 agroecological 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.

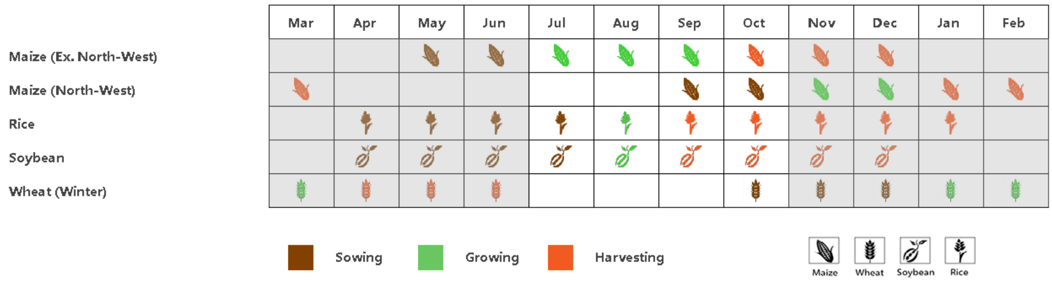
The Arid and semi-arid region located in northern and central Mexico accounts for about half of the cropland of the country. The maximum VCI was relatively low with a value of 0.70 and CALF decreased by 14%. Compared with the 15YA average, rainfall was reduced by 20%, which caused NDVI to be lower than the average during the July to October period according to the NDVI development graph. TEMP (+0.5°C) and RADPAR (+2%) were higher, but BIOMSS decreased by 9%. On the whole, crop conditions were unfavorable for this region, due to a lack of rainfall.

The Sub-humid temperate region with summer rains is situated in central Mexico. Crop conditions were below average from July to October. The agroclimatic condition showed that RAIN decreased by 6% and TEMP and RADPAR increased by 0.2°C and 2% compared to average, BIOMSS also increased by 1%. The maximum VCI (0.94) confirmed moderate crop condition in this region.

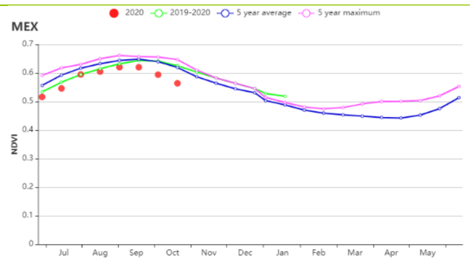
The Sub-humid hot tropics with summer rains region is located in southern Mexico. During the monitoring period, crop conditions were slightly below average in this region, as shown by the NDVI profiles. Agroclimatic conditions showed that RAIN was significantly below average (-7%) while TEMP and RADPAR were near average (+0.3°C and 0%). The VCIx in these areas was 0.92 and BIOMSS decreased by 1%. Climatic conditions were close to normal and the relatively high VCI indicates that the crop conditions were near average.

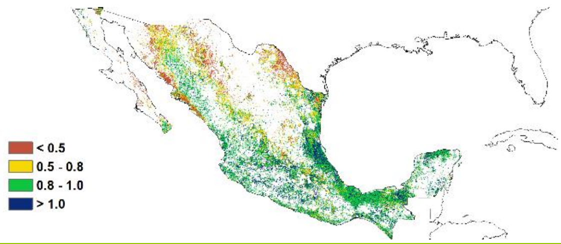
Humid tropics with summer rainfall located in southeastern Mexico. The agro-climatic conditions show that RAIN was above average (+9%), average TEMP was 0.1℃ warmer and RADPAR was down by 1%. As shown in the NDVI development graph, crop conditions were closed to average from July to October. The Maximum VCI (0.95) and suitable climatic conditions confirmed favorable crop condition in this agroecological region.

Figure 3.29 Mexico's crop condition, July - October 2020

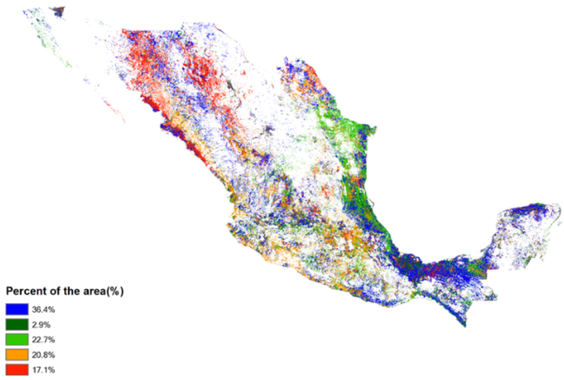


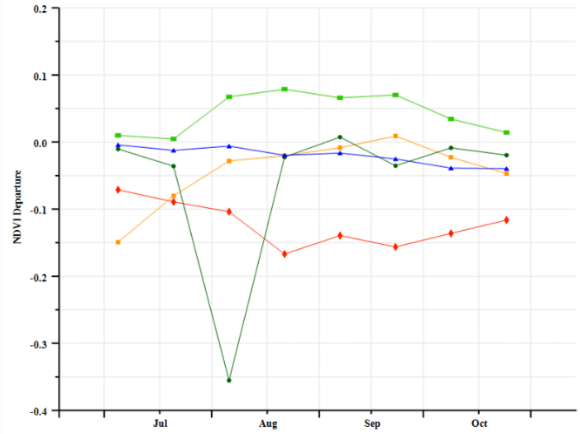
(a). Phenology of major crops



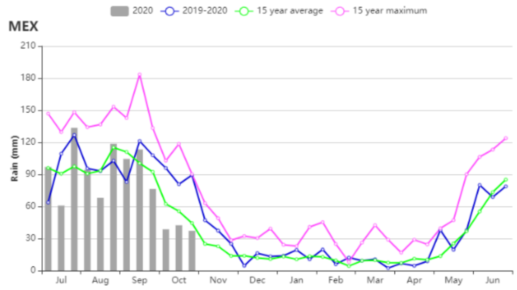


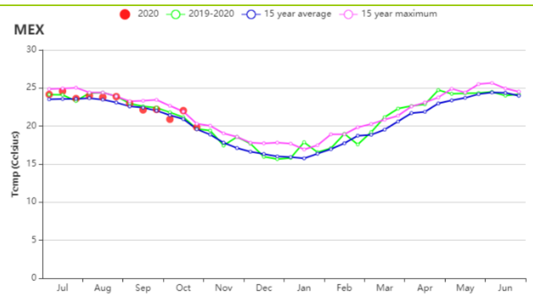
(b) Crop condition development graph based on NDVI (c) Maximum VCI



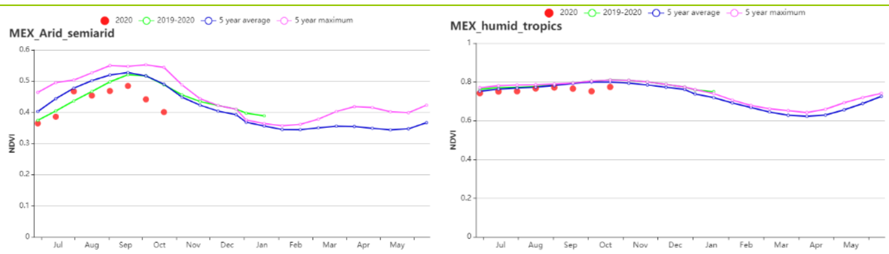


(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles

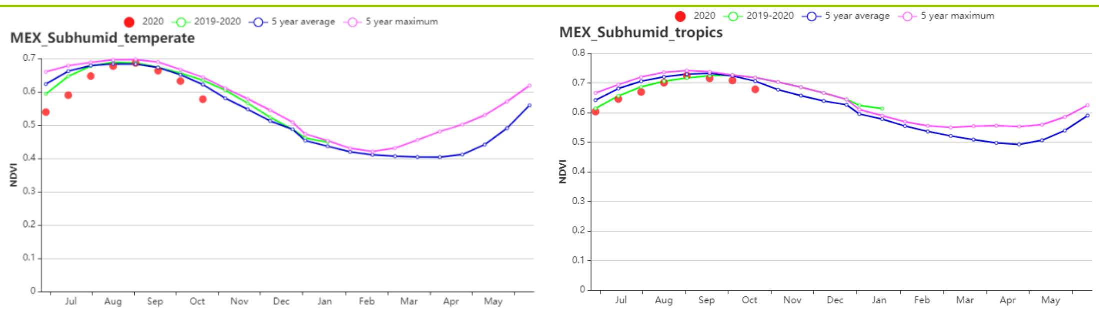




(f) Rainfall profiles (g) Temperature profiles



(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 3.50 Mexico's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2020

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Central region	579	-20	23.2	0.5	1319	2	641	-9
Dry region	1385	9	24.9	0.1	1254	-1	829	0
Dry and irrigated cultivation region	1124	-6	18.9	0.2	1246	2	607	1
Dry and grazing region	1130	-7	22.7	0.3	1234	0	709	−1

Table 3.51 Mexico's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2020

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure (%)	Current (%)	Departure (%)	Current
Central region	70	-14	104	-4	0.70
Dry region	100	0	114	3	0.95
Dry and irrigated cultivation region	98	0	108	1	0.94
Dry and grazing region	94	-2	113	2	0.92

[MMR] Myanmar

This monitoring period covers the monsoon season in Myanmar. The main rice (monsoon rice) was grown between June and September. Harvest started in October. Planting of maize and wheat started in September and October. Crop conditions were generally below average during the monitoring period.

RAIN (-4%) and RADPAR (-3%) were lower than the 15YA, whereas TEMP (+0.6°C) was above the 15YA. As a result, potential cumulative biomass (BIOMSS) was 2% below the average, while the utilization of cropland was close to the 5YA. Cropping intensity was also at the level of 5YA. NDVI values were below average during the entire period except for mid-July and early September. The maximum VCI during this period was 0.92.

More than half of country's croplands suffered from below-average crop condition during the period. Negative departures were mainly observed for the Central plain and the Hills region, including Mandalay Region, Magwe Region, south of Sagaing Region and Shan State. 19.7% of cropland showed positive NDVI departures from July to mid-September, whereas 23.2% of cropland was above average in July only. These croplands were mostly located in the Delta and Southern Coast region, including Regions of Yangon, Bago, Ayeyarwady, part of Magwe, Thanintaryi and States of Mon and Kayin. The maximum VCI was less than 0.8 in the central dry zone. Higher values were observed in the other regions.

Regional analysis

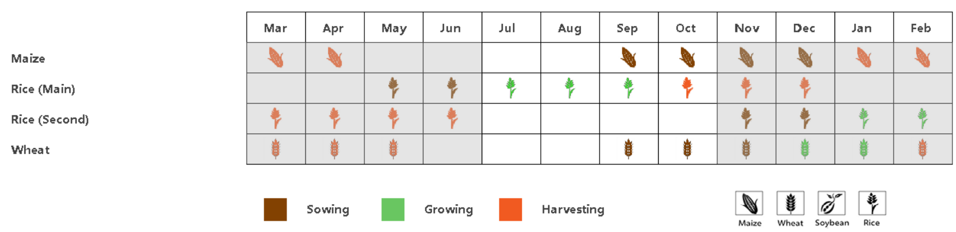
Three sub-national agro-ecological zones (AEZ) can be distinguished for Myanmar based on the cropping system, climatic zones and topographic conditions. They are the Central plain, the Hills and the Delta and Southern Coast regions.

The Central Plain had a marked rainfall deficit (RAIN -21%), with RADPAR down 1% and TEMP up 1°C compared to the 15YA. BIOMSS was 1% higher than the 15YA, which was the only increase among the three sub-national regions. CALF showed that 95% of the cropland was fully utilized, but it was 2% below the 5YA. NDVI was consistently below the 5YA level during the whole period. The VCIx was 0.89. Crop conditions for this region were unfavorable.

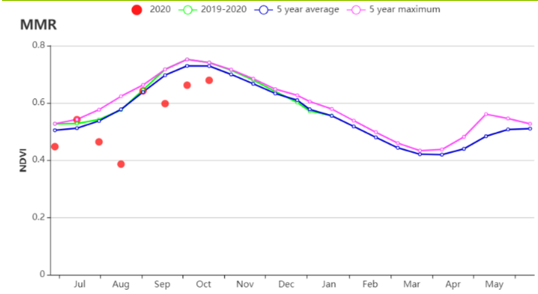
The Hills region had the highest RAIN (1936 mm) compared with the other two sub-national regions. It was 9% above the 15YA. RADPAR decreased by 5% while TEMP increased by 0.4°C. BIOMSS was 3% below 15YA. The cropland was almost fully used (CALF 99%). The NDVI values were generally below the 5YA and near average only in mid-June and October. The VCIx was 0.97. Crop conditions are assessed as below the 5YA level.

The Delta and Southern Coast region experienced a dry monsoon season, with RAIN far below the 15YA (-25%). TEMP increased by 0.3°C and RADPAR was near average. Estimated BIOMSS was also at the level of 15YA. Since the vast majority of cropland in this region is irrigated, the lack of rainfall had a limited negative impact on crop growth and production. CALF was 1% above the 5YA and VCIx was 0.93. Similar to other sub-national regions, crop conditions in this region were below average.

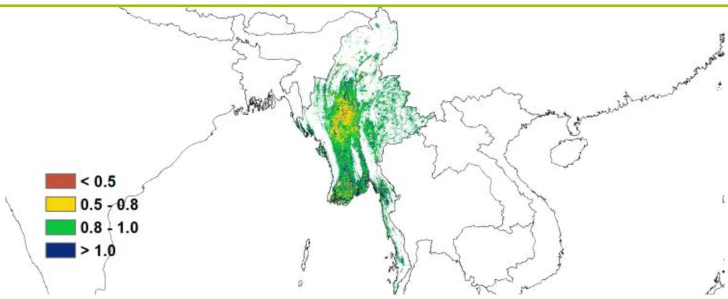
Figure 3.30 Myanmar's crop condition, July - October 2020



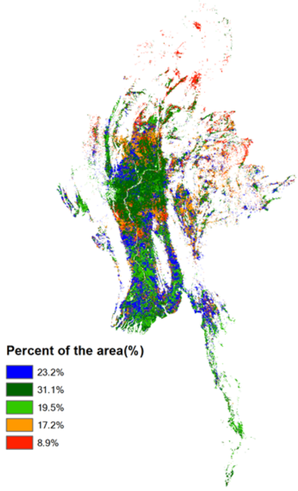
(a). Phenology of major crops



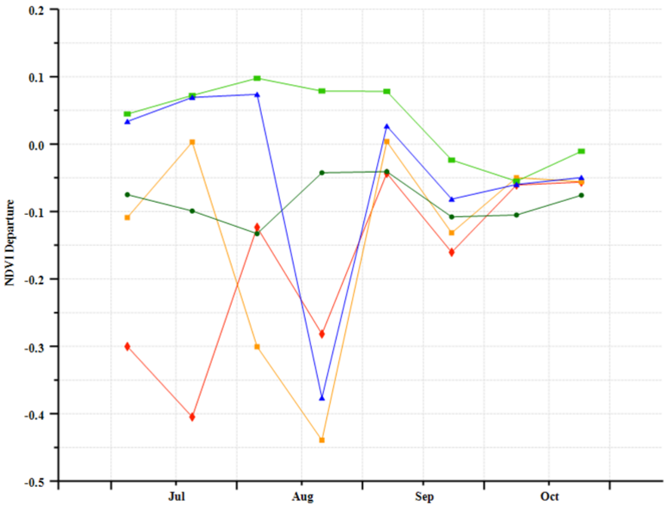
(b) Crop condition development graph based on NDVI



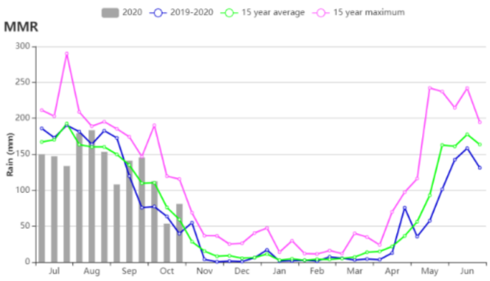
(c) Maximum VCI



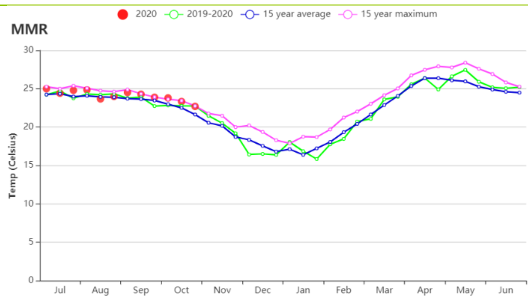
(d) Spatial NDVI patterns compared to 5YA



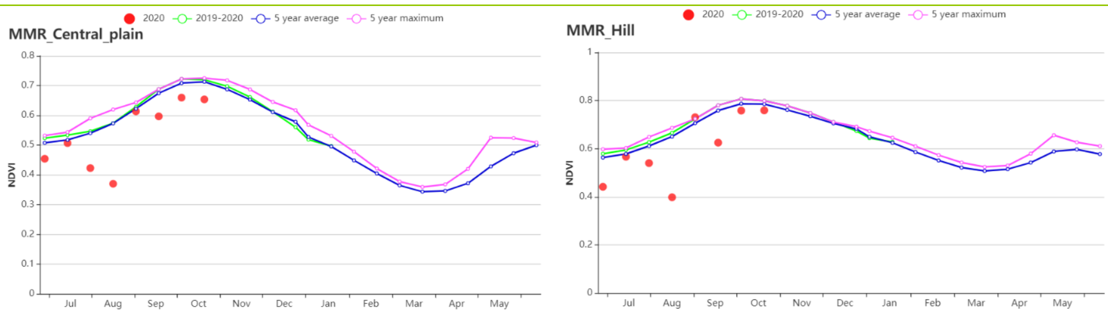
(e) NDVI profiles



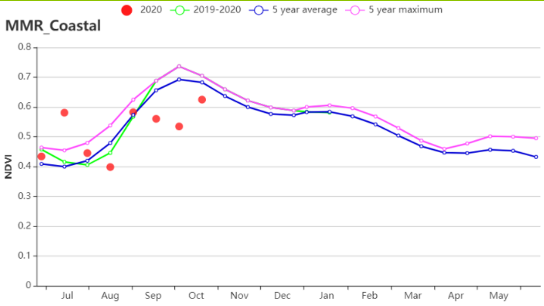
(f) Rainfall profiles



(g) Temperature profiles



(h) Crop condition development graph based on NDVI (Central Plain (left) and Hills regions (right))



(i) Crop condition development graph based on NDVI (Delta and Southern Coast)

Table 3.52 Myanmar's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 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	933	-21	25	1	1031	-1	670	1
Hills region	1936	9	22.9	0.4	913	-5	559	-3
Delta and southern-coast	1632	-21	26	0.3	1078	0	733	0

Table 3.53 Myanmar's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2020

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure (%)	Current (%)	Departure (%)	Current
Central plain	95	-2	105	-1	0.89
Hills region	99	0	109	1	0.97
Delta and southern-coast	95	1	125	1	0.93

[MNG] Mongolia

This reporting period covers the humid summer and autumn season in Mongolia from July to October. Wheat, which is the main cereal crop, is harvested during September. The agroclimatic indicators for this 4-month period show a large increase in rainfall (RAIN, +67%). The average temperatures were cooler than the 15YA (TEMP -1.2°C) and solar radiation was also below average (RADPAR -8%). The decline in solar radiation combined with cooler temperatures caused a reduction in estimated biomass by 14% as compared to the 15YA. The recorded crop arable land fractions (CALF, 82%-100%) and maximum vegetation condition index (VCIx, 0.89-0.97) were favorable. The crop condition development graph indicates that the crop conditions were slightly better than the 5YA from July to September and near average in October.

The maximum VCIx map shows that relatively favorable crop conditions (around 80%) were observed in all of the territories. Among all regions, Hangai Huvsgul had slightly less favorable conditions during these four months. The crop conditions, as assessed by the NDVI profile, were favorable in Mongolia.

Regional analysis

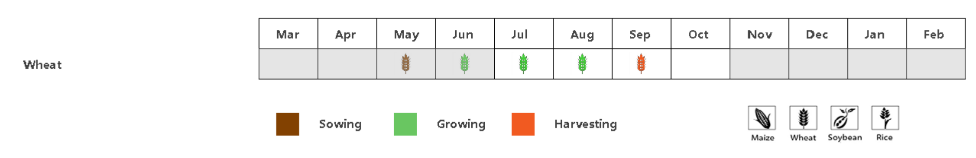
Taking into consideration the climate, vegetation, altitude, soil, and farming systems, Mongolia is divided into five agro-ecological zones (AEZ). Three of them (Selenge-Onon Region, Central, and Eastern Steppe, and Hangai Khuvsgul Region) are cultivated as cropland, and two (Altai and Gobi Desert) are non-agriculture land. For all the subregions, crop intensity is 100%, same as last year.

TEMP and RADPAR in the Hangai Khuvsgul region decreased by 1.1°C and 7% respectively, while RAIN was 65% above average. Accordingly, BIOMASS declined by 13% from the fifteen-year average. VCIx (0.90) was just average, and CALF was elevated by 1%. According to unfavorable conditions of agroclimatic indicators, the NDVI profile was mostly below the 5YA excluding August, where the NDVI profile was near average. Overall, crop conditions were negatively impacted by the cool temperatures.

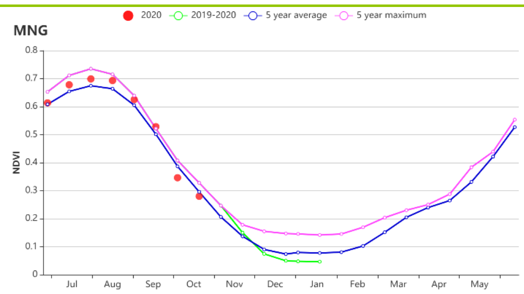
In the Selene-Onon region, RAIN was 71% above average, but temperature and radiation were significantly below average (TEMP -1.2°C; RADPAR -8%). The estimated BIOMSS decreased by 16%, and the cropped arable land fraction was up by 2%. The maximum VCIx for this region was 0.97. The crop condition development graph indicates that the crop conditions were above the 5YA during the season. In conclusion, the crop conditions in the Selene-Onon region were favorable.

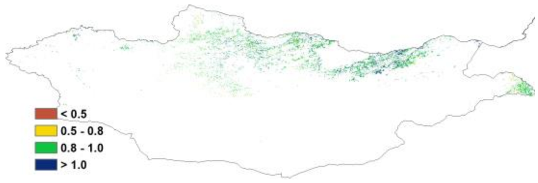
For the period from July to September, crop conditions were slightly above the five-year average in theCentral and Eastern Steppe region. This region also received above-average rainfall (RAIN, +53%). Temperature and radiation were below average (TEMP -1.0°C; RADPAR -9%). CALF increased by 3%, and regional VCIx was 0.89. The estimated BIOMSS decreased by 12%. The Central and Eastern Steppe region has only a small fraction of cropland. Most of the arable land experienced favorable conditions during this reporting time.

Figure 3.31 Mongolia's crop condition, July - October 2020

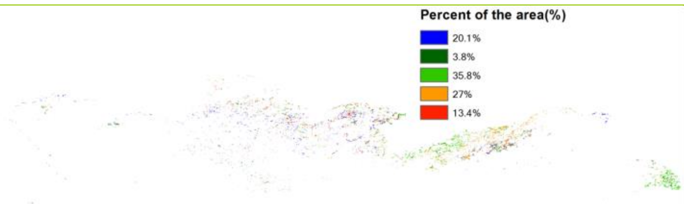


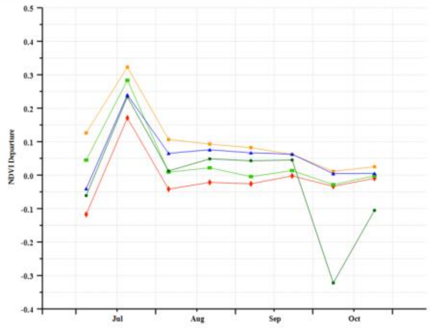
(a). Phenology of major crops



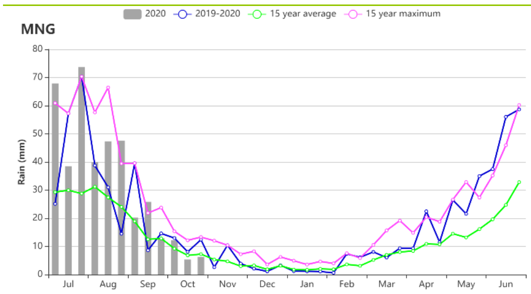


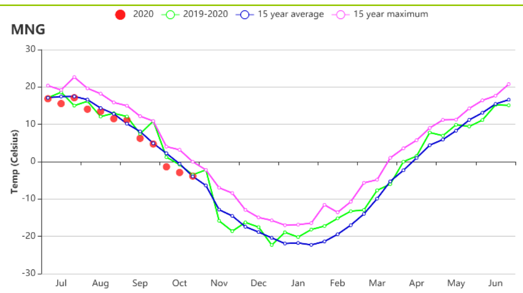
(b) Crop condition development graph based on NDVI (c) Maximum VCI



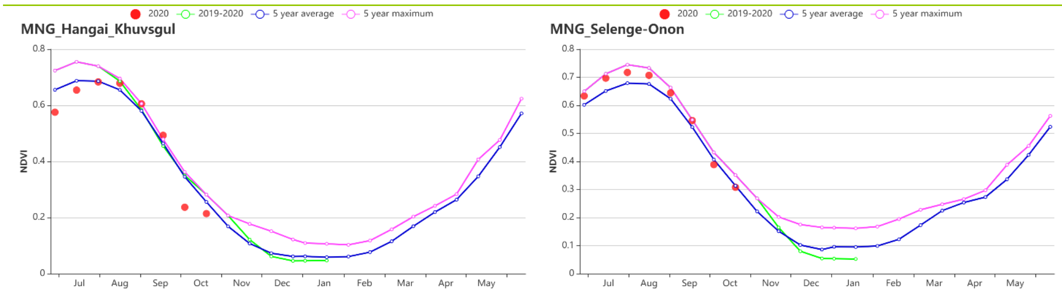


(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles

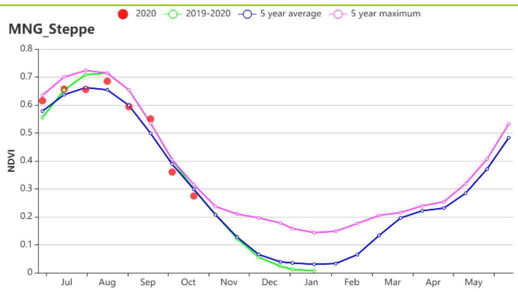


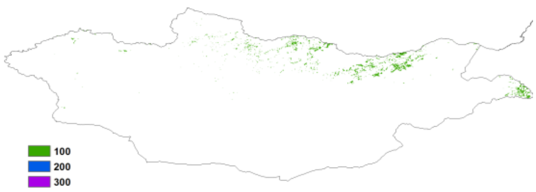


(f) Rainfall profiles (g) Temperature profiles



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





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

Table 3.54 Mongolia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2020

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Hangai Khuvsgul Region	439	65	5.9	-1.1	985	-7	258	
Selenge-Onon Region	406	71	9.1	-1.2	963	-8	311	
Central and Eastern Steppe	301	53	12.5	-1	951	-9	396	

Table 3.55 Mongolia's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2020

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure (%)	Current (%)	Departure (%)	Current
Hangai Khuvsgul Region	100	1	100	0	0.9
Selenge-Onon Region	100	2	100	0	0.97
Central and Eastern Steppe	100	3	100	0	0.89

[MOZ] Mozambique

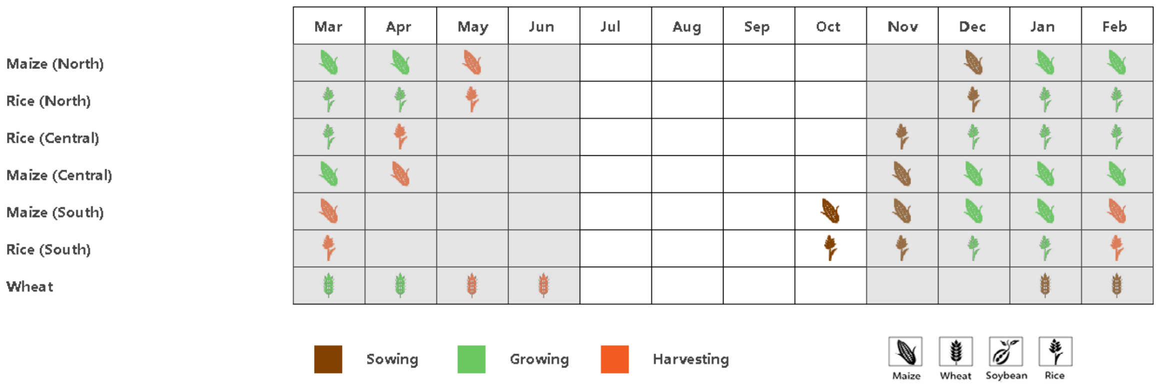
In Mozambique, the July-October monitoring period is the dry season and covers mostly land preparation. During this period, maize sowing started in southern Mozambique, followed by rice in late October. Except for rainfall (RAIN +15%), decreases in the remaining agroclimatic indicators were observed (TEMP -0.4°C and RADPAR -7%). Estimated biomass production also decreased by about 4%. With few crops growing in the field, the NDVI development graph was well below the average of the past five years, and the spatial NDVI patterns show that only 7.7% of the arable land, mostly along the Limpopo River (southern Mozambique) which is irrigated, presented favourable crop conditions. During this period, CALF was near average and a maximum VCIx of 0.81 was observed.

Regional analysis

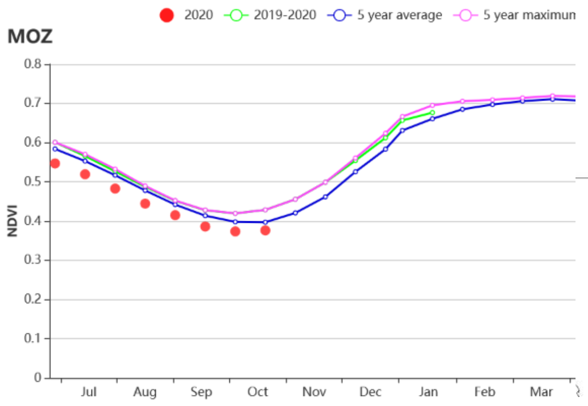
According to the cropping system, topography and climate, CropWatch has subdivided Mozambique into five agro-ecological zones (AEZ): Buzi Basin, Northern High-altitude Areas, Low Zambezi River Basin, Northern Coast, and Southern Region.

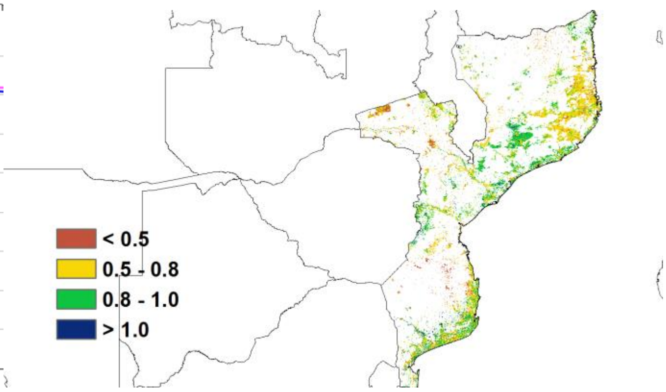
With the exception of the Buzi basin, the country's sub-regions development graphs based on the NDVI indicates below-average crop conditions in all agro-ecological zones. All agro-ecological zones recorded increases in rainfall. Highest increases were recorded in the Buzi basin and High-altitude areas (about 19% and 31%), as compared to the 15YA. In the Buzi basin, Low Zambezi river basin and Southern region, the temperature decreased by about 0.7°C, 0.5°C, and 0.7°C, respectively. The temperature in Northern High-altitude areas was near average, while a slight decrease of about 0.1ºC was recorded in the Northern coastal area. The increased rainfall will be beneficial for the upcoming sowing period. CALF was estimated at 90% (+2%). In general, prospects for the upcoming main growing season are favorable.

Figure 3.32 Mozambique's crop condition, July - October 2020



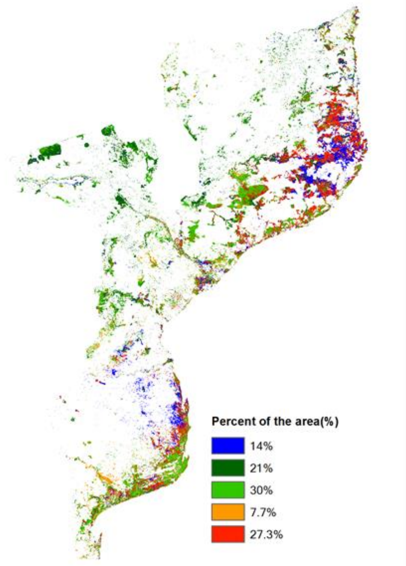
(a) Phenology of major crops

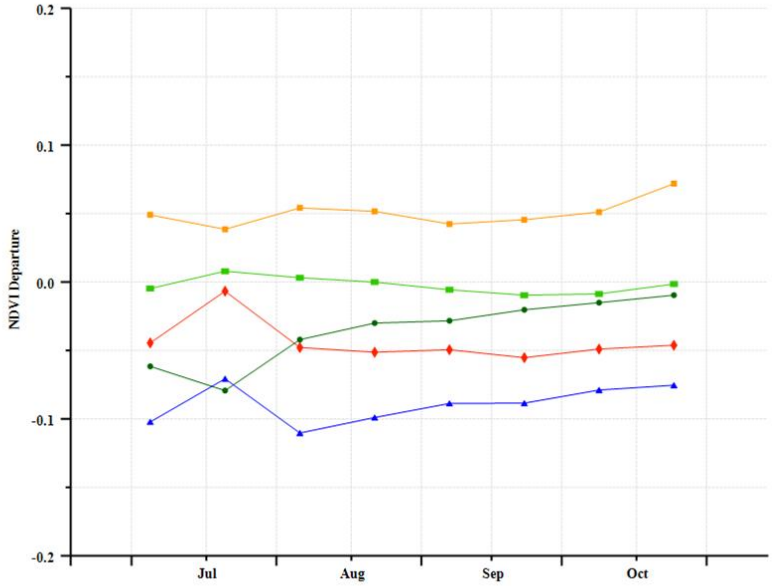




(b) Crop condition development graph based on NDVI

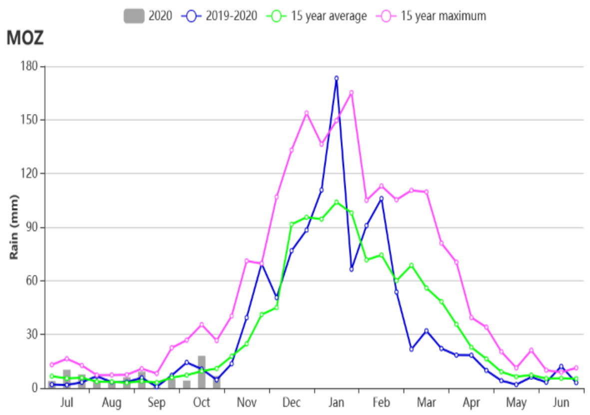
(c) Maximum VCI

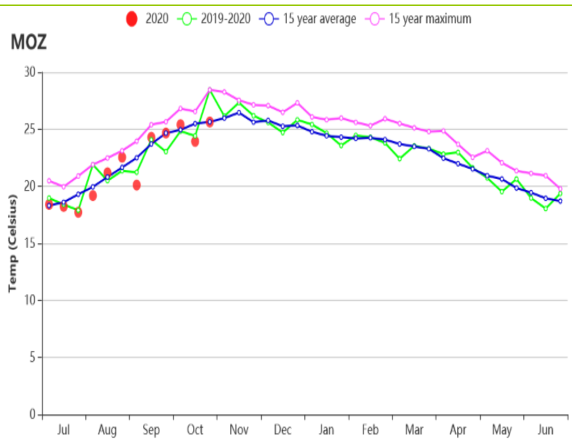




(d) Spatial NDVI patterns compared to 5YA

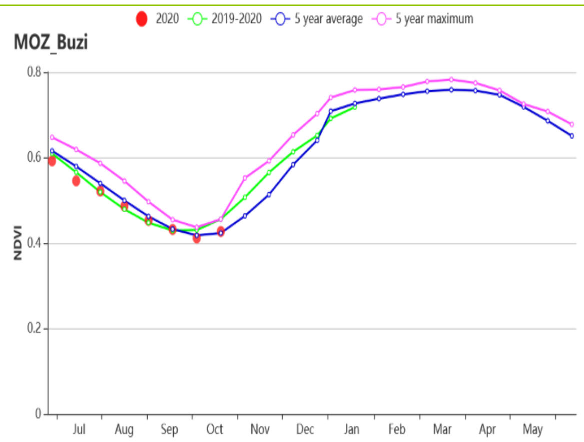
(e) NDVI profiles

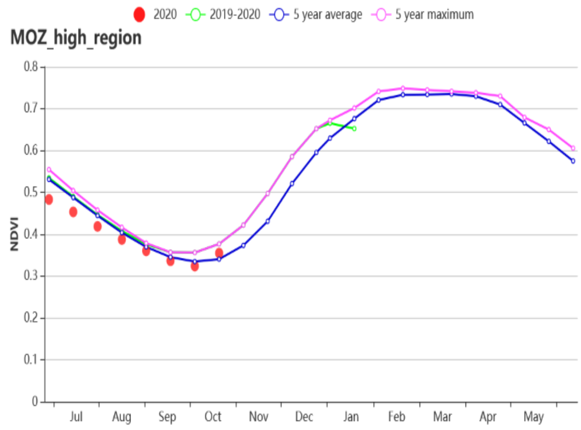




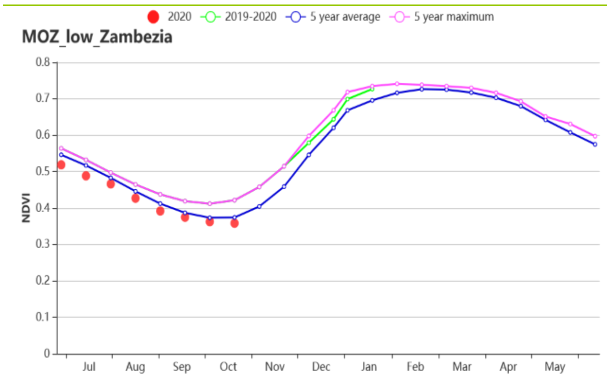
(f) National time-series rainfall profiles

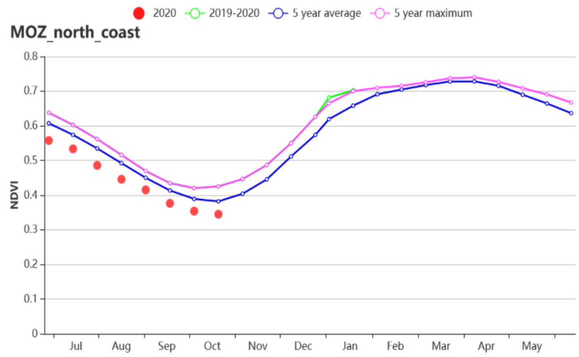
(g) National time-series temperature profiles



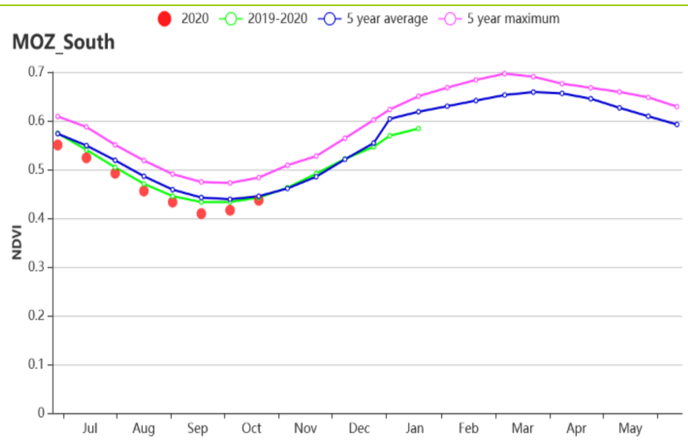


(h) Crop condition development graph based on NDVI-Buzi basin (left), and Northern high-altitude areas (right)





(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 3.56 Mozambique agro-climatic indicators by sub-national regions, current season's values and departure from 15YA, July-October 2020.

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)	Current (gDM/m^2)	Departure from 15YA (%)
Buzi basin	80	19	19.1	-0.7	1126	-9	557	-6
Northern high-altitude areas	60	31	21.7	0.0	1140	-4	603	-1
Low Zambezia River basin	71	13	21.8	-0.5	1111	-8	566	-3
Northern coast	86	16	22.8	-0.1	1087	-7	622	-4
Southern region	94	8	21.1	-0.7	971	-9	546	-8

Table 3.57 Mozambique agronomic indicators by sub-national regions, current season's values and departure from 5YA, July-October 2020.

Region	CALF		Cropping Intensity		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current	Departure from 5YA (%)	Current
Buzi basin	94	-2	100	0	0.80
Northern high-altitude areas	66	-21	100	-1	0.70
Low Zambezia River basin	67	-10	100	-1	0.72
Northern coast	95	-3	100	0	0.74
Southern region	90	2	100	-1	0.74

[NGA] Nigeria

The current reporting period covers the harvest of main season maize and sorghum in the south. The soybean growing season spanned from June to October. Across the country, rainfall was 708 mm and the temperature was 25.1 °C. The radiation was 1080 MJ/m² (-1%), while the estimated biomass was 667 gDM/m², which was below the 15YA (-4%). Cropping intensity was 122% (-3%). CALF was 94 (+1%) and the vegetation condition was at 0.93. The NDVI development curve was generally below average, but improved to average conditions by the end of this monitoring period. Crop conditions were mostly unfavorable, especially in the derived savanna and humid forest zones due to a lack of rainfall.

Regional analysis

The CropWatch analysis is done for four agro-ecological zones in Nigeria; the Sudano-Sahel which is the driest zone located in the north, the Guinea savanna and Derived savanna， both in the center, and the Humid forest zone in the south.

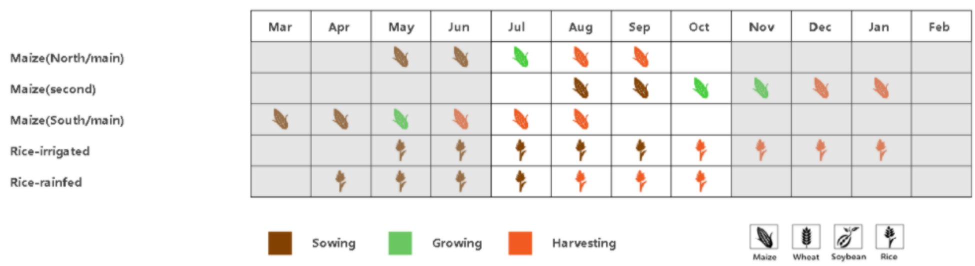
In the the Sudano-Sahelian zone, the observed rainfall was much lower than average (290 mm, -37%), temperature was 27.8ºC (-0.1°C) and radiation was slightly lower (-4%) as compared to the 15YA. These climate conditions resulted in a biomass of 670 gDM/m² (-7% of departure from 15YA) while CALF was 86% (+3%) and VCIx was 95. The NDVI graph shows that from July up to August, NDVI values were slightly below average and subsequently fluctuated around the average.

In the Guinean savanna, recorded precipitation was 585 mm, a 29% drop as compared to the 15YA. Temperature was close to the average of 24.8°C (-0.1°C). The radiation was 1124 MJ/m2 (-2%), the biomass was 666 gDM/m² (-8 %) and CALF was 99, with no departure from the 15YA. Vegetation condition index was at 0.93. Based on the NDVI development graph, crop conditions stayed below average throughout most of this monitoring period, but reached the 5YA in October.

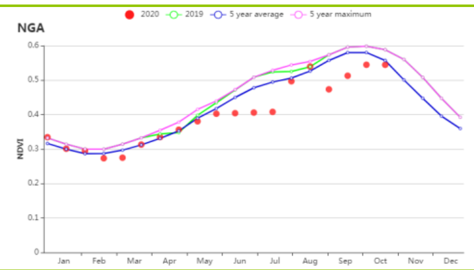
In the Derived savanna zone, rainfall was also much below average at 794 mm (-26%), the temperature was 24.2°C (+0.1°C) and the radiation was 1064 MJ/m2, a +1% increase as compared to the 15 YA. The estimated biomass was 685 gDM/m² (+1%). The cropped land was at 99, and the vegetation condition index was 0.93. The NDVI profile graph shows that values trended below average for the whole period.

In the Humid forest zone, rainfall was 1236 mm (-22%), the temperature was 24 ºC (-0.1°C) and the radiation increased by 1% above the 15YA. Average values were observed for biomass at 633 gDM/m² (+1%) and CALF was 97% (+1%). The vegetation condition index (VCIx) in this region was at 92. The crop development graph based on NDVI indicates below-average crop conditions for the entire monitoring period.

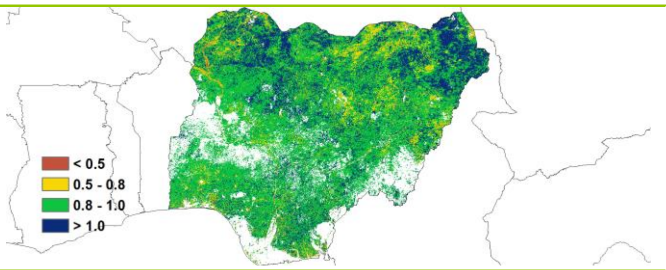
Figure 3.33 Nigeria's crop condition, July - October 2020



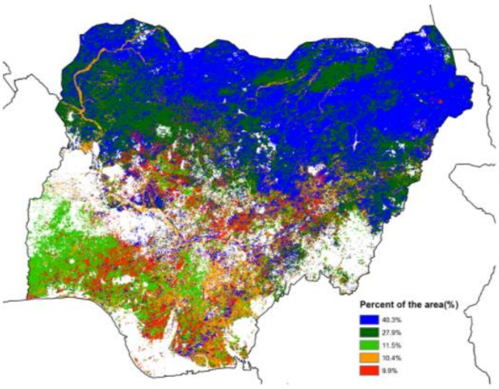
(a). Phenology of major crops



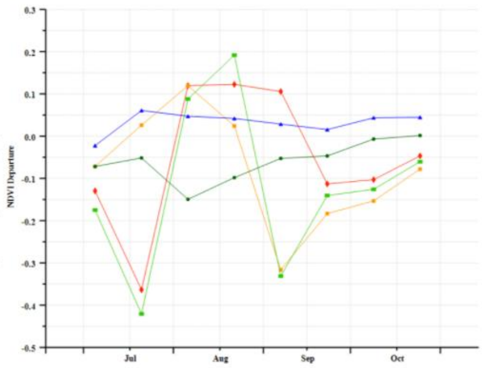
(b) Crop condition development graph based on NDVI



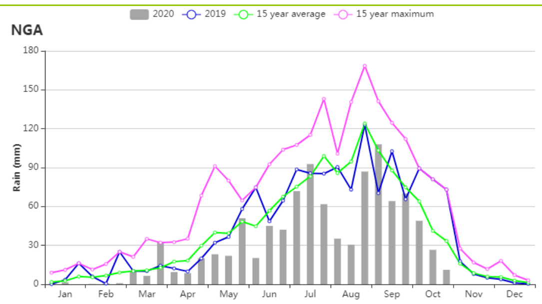
(c) Maximum VCI



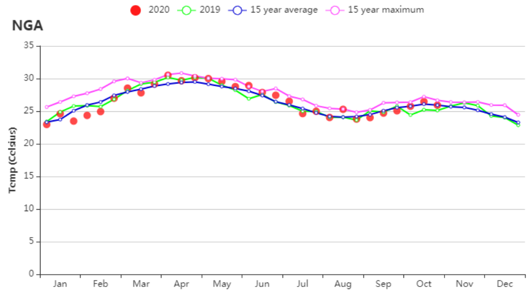
(d) Spatial NDVI patterns compared to 5YA



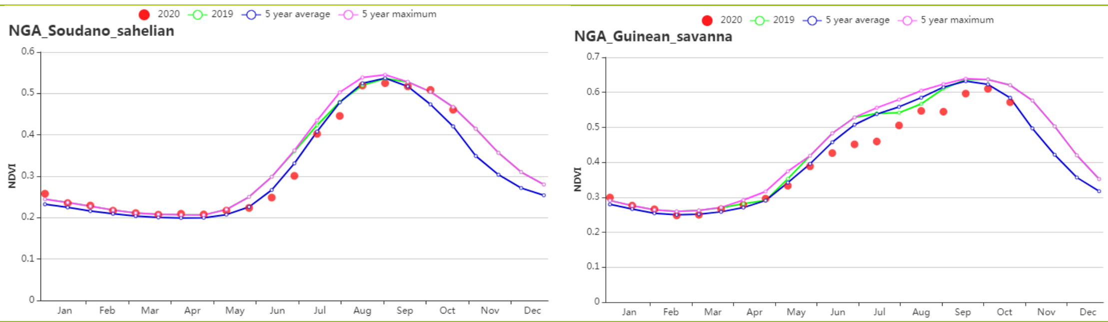
(e) NDVI profiles



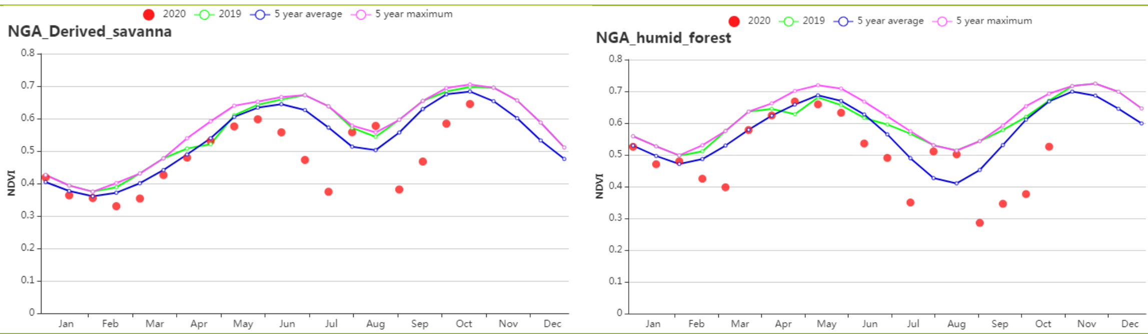
(f) Rainfall profiles



(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 3.58 Nigeria's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2020

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Derived_savanna	794	-26	24.2	0.1	1064	1	685	1
Guinean_savanna	585	-29	24.8	-0.1	1124	-2	666	-8
humid_forest	1236	-22	24.1	-0.1	955	1	633	1
Soudano_sahelian	290	-37	27.8	-0.1	1156	-4	670	-7

Table 3.59 Nigeria's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2020

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure (%)	Current (%)	Departure (%)	Current
Derived_savanna	99	0	157	-7	0.93
Guinean_savanna	99	0	106	-2	0.93
humid_forest	97	1	178	-2	0.92
Soudano_sahelian	86	3	100	0	0.95

[PAK] Pakistan

This report covers the production period for main maize and rice, which were harvested in October. It also covers the sowing of winter barley and wheat. Overall, crop conditions were generally favorable from July to October.

RAIN was slightly below average (-2%), together with lower TEMP and RADPAR (-0.3°C and -3% respectively), which resulted in a decrease of BIOMSS (-1%). CropWatch agro-climatic Indicators (CWAIs) were close to average over the 15YA. The overall favorable conditions, together with a high VCIx (0.96) and a significant increase of the fraction of cropped arable land (+12%) indicate favorable production prospects for the summer crops.

As shown by the nationwide NDVI development graph, crop conditions were close to average in July and August and later reached and even exceeded the maximum of 5YA in September, which was consistent with the time series profile of RAIN. According to the spatial NDVI patterns and profiles, 7.2% of the cropped areas presented continuously below-average conditions during the reporting period, which were mostly distributed along the rivers. This could be a result of flooding over the areas close to the rivers due to excessive rainfall. About 22.6% of cropland, concentrated in northern Pakistan, northern Multan and eastern Hyderabad, presented slightly below average conditions before August but recovered to average levels starting in September. Cropping Intensity for the whole country was 146%, which was 1% above average.

Regional analysis

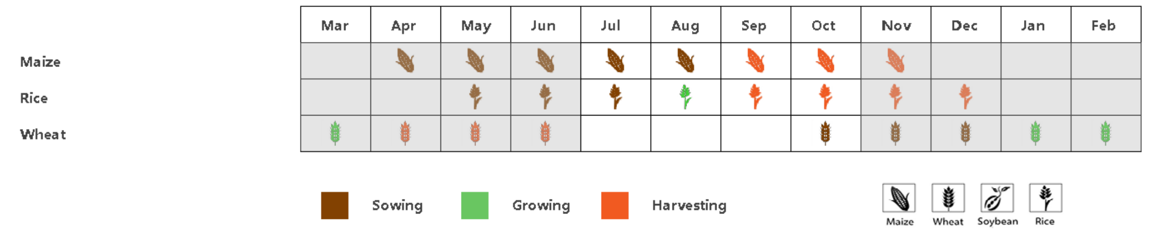
For a more detailed spatial analysis, CropWatch subdivides Pakistan into three agro-ecological regions based essentially on geography and agro-climatic conditions: the Northern highlands, Northern Punjab region and the Lower Indus river basin in South Punjab and Sind.

In **the Lower Indus basin,** RAIN was greatly above average (+80%), TEMP and RADPAR were below average by 0.1°C and 4% respectively. The estimated BIOMSS was 4% above average. NDVI was average in July and August, and later markedly above average. The CALF value of 66% exceeds the average by 15% and a VCIx of 0.92 also indicates excellent crop conditions. Overall, the situation for the region is assessed as favorable.

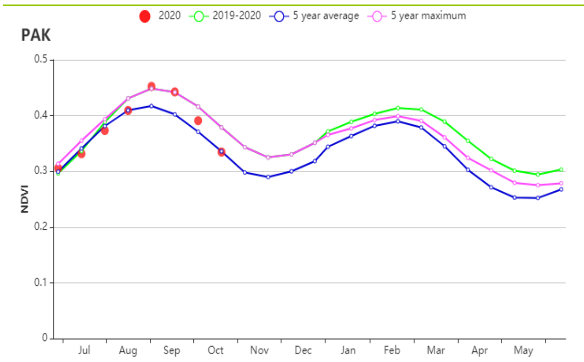
Compared to average, in **the northern highland region**, RAIN was above average by 5% and RADPAR and TEMP were below average (-5% and -0.6°C respectively). BIOMSS decreased by 10%. The region also showed a low CALF of 65%, but still higher than the 5YA by 12%. The NDVI profile stayed below average during July to August and subsequently recovered. Overall, the situation for the region is deemed to be at least average.

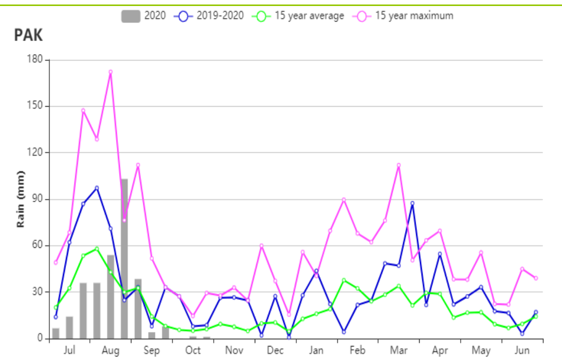
Northern Punjab, the main agricultural region of Pakistan, recorded below-average RAIN (-21%). TEMP and RADPAR were below average (-0.2°C and -2% respectively). The resulting BIOMSS was 18% below average. The NDVI profile presented below-average conditions during the July to August period, mainly due to a slow start of the monsoon rains. Heavy rainfall in August promoted crop growth and NDVI exceeded the maximum of the 5YA from September to early October. In addition, CALF in this area reached 84%, which was up by 7% compared to 2019, and VCIx was at 0.94. CI was above average by 3%. Overall, the crop production potential for the region is assessed as favorable.

Figure 3.34 Pakistan's crop condition, July-October, 2020



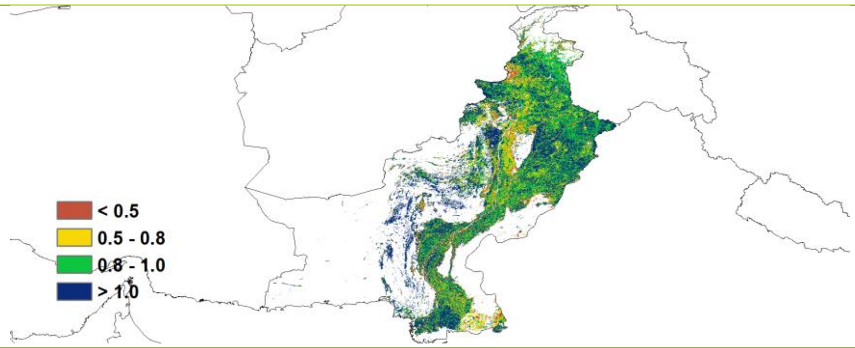
(a). Phenology of major crops



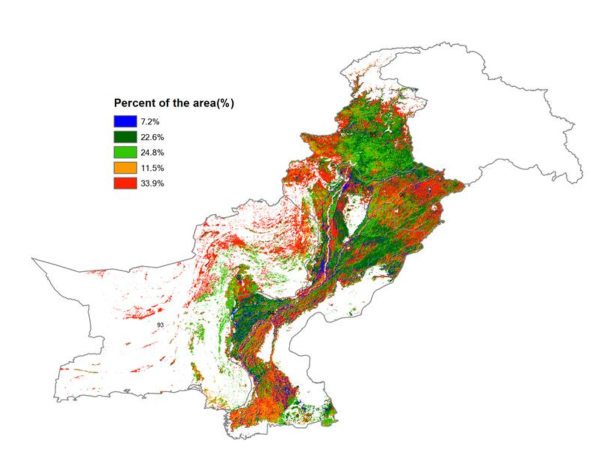


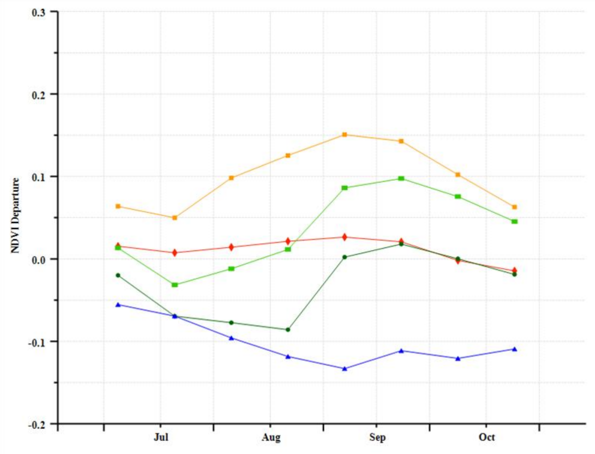
(b) Crop condition development graph based on NDVI

(c) Time series precipitation profile



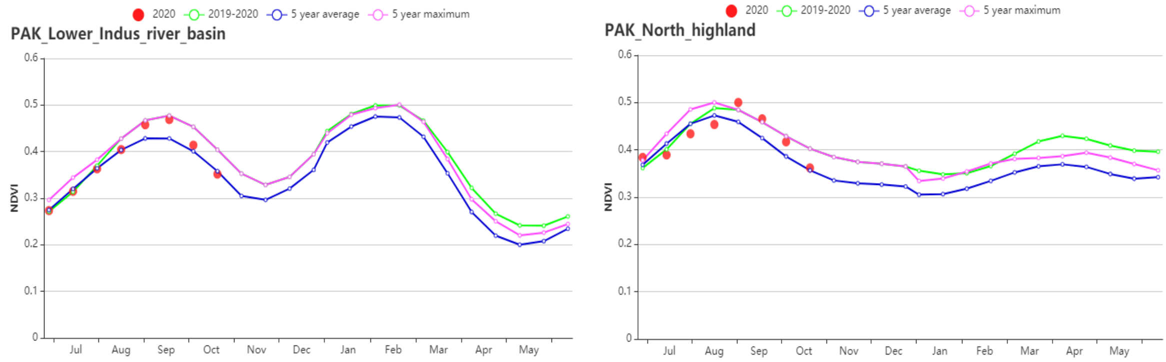
(d) Maximum VCI



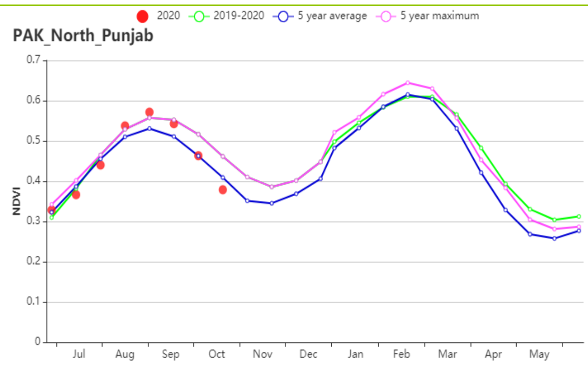


(e) Spatial NDVI patterns compared to 5YA

(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

Table 3.60 Pakistan's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July-October 2020

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Lower Indus river basin in south Punjab and Sind	261	80	32.8	-0.1	1265	-4	591	2
Northern highlands	375	5	20.9	-0.6	1309	-5	537	-10
Northern Punjab	281	-21	30.7	-0.2	1239	-2	611	-18

Table 3.61 Pakistan's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July-October 2020

Region	Cropped arable land fraction		Cropping Intensity		Maximum VCI
	Current (%)	Departure (%)	Current (%)	Departure (%)	Current
Lower Indus river basin in south Punjab and Sind	66	15	157	1	0.92
Northern highlands	65	12	132	3	0.95
Northern Punjab	84	7	177	3	0.94

[PHL] Philippines

This report covers the second half of the monsoon season, which lasts from May to October. The harvest for the main maize was completed at the end of September, followed by the harvest for the main rice crop. The second maize and second rice crops started to be planted in October. Compared to average, the country suffered a small precipitation deficit (RAIN, -2%) accompanied by warmer temperatures (TEMP, +0.4℃) and higher radiation (RADPAR, +3%). In response, the biomass (BIOMASS) for the country showed a slight rise by 3% compared to average. The cropped arable land fraction (CALF) for the country was almost close to 100% and the maximum VCI value was at 0.97, which means the crop conditions were generally favorable.

According to the NDVI profile for the country, conditions were near average until October. The slight departure in early August may have been due to cloud cover in the satellite image or temporal flooding. The negative departures of NDVI starting in September can probably be attributed to the frequent typhoons. Especially the 17th typhoon Saudel and 18th typhoon Molave caused widespread flooding.

Considering the spatial patterns of NDVI, around 52.7% of cropland, mainly located in the western coast and middle area of Luzon island and most part of Mindanao island, had a stable NDVI which was close to average during the reporting period. For about 17.1% of the cropland, NDVI was close to average before October and suffered a great decrease of up to 0.4 NDVI units in October. This was mainly in the Central Luzon region, south CalgayanValley region and south Cordillera region. Although the great decrease was due to cloud cover brought by typhoon in satellite images, the vegetation there suffered a lot as well, which was reflected in a decrease of the NDVI curve. An anomaly, in which the NDVI dropped up to 0.4 NDVI units in middle October and recovered 0.35 NDVI units in late October, appeared in Southern Tagalog region and the middle of Calgayan Valley region. Another anomaly, in which the NDVI dropped over 0.35 NDVI units in early August and recovered 0.4 NDVI units in middle August was observed for the Southern Tagalog region and Southern Mindanao region, on around 18.7% of crop land. Subsequently, the NDVI for these regions decreased gradually. Both anomalies may have been caused by cloud cover in the satellite image, while the general drop of NDVI in October is probably due to the influence of typhoons. All in all, taking the NDVI without anomalies and near-average agro-climate indicators into consideration, the estimated production for the country in the reporting period is slightly below average.

Regional analysis

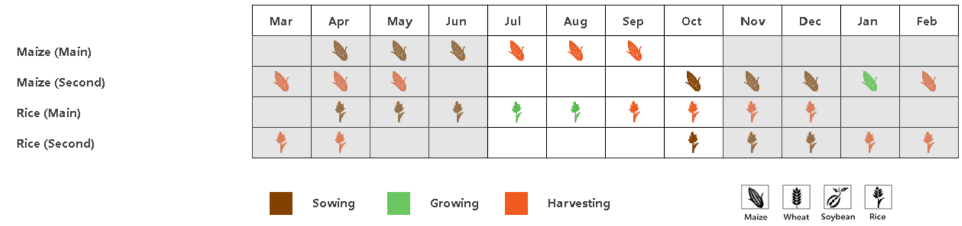
Based on the cropping systems, climatic zones and topographic conditions, three main agro-ecological regions can be distinguished for the Philippines. They are **the Lowlands region** (northern islands), **the Hilly region** (Island of Bohol, Sebu and Negros), and **the Forest region** (mostly southern and western islands). All the regions are characterised by a stable (almost 100%) cropped arable land fraction (CALF) and a high maximum VCI value (VCIx>0.96).

The **Lowlands region** experienced warmer temperature (TEMP, +0.5℃) and higher radiation (RADPAR, +6%) compared to average. Although the rainfall (RAIN, -15%) for the region was lower, the potential biomass (BIOMASS, +6%) value was higher than average. In terms of the NDVI profile, the NDVI for the region was lower than average in late July and improved gradually. However, a drop of NDVI appeared in early September again and the departure of NDVI from average reached a maximum at the end of the reporting period. It seems that the typhoons had a great influence on the crops in this region. As a result, the crop conditions were not favorable.

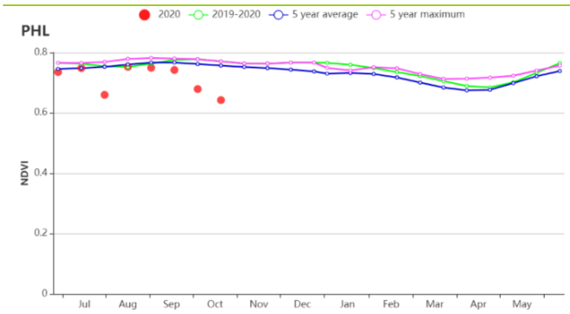
Compared to the previous 15 years, **the Hilly region** (Negros and central Visayas island region) went through wetter than normal conditions, as the rainfall (RAIN +9%) and the temperature (TEMP +0.5℃) increased. Both the radiation (RADPAR, +4%) and potential biomass (BIOMASS, +4%) for the region were higher than average. As for the NDVI for the region, it was below average in July but recovered to average in middle August. However, the NDVI decreased again in September and was recovering at the end of the reporting period. Crop conditions were generally unfavorable.

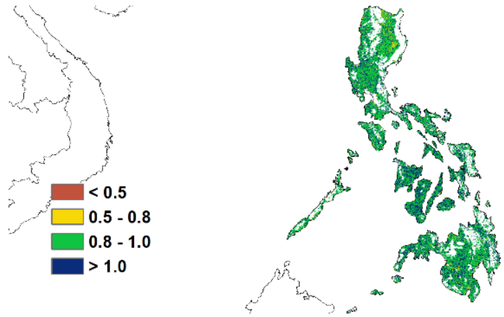
The **Forest region** had an above-average rainfall (RAIN, +13%) and slightly warmer temperatures (TEMP, +0.2℃). The radiation (RADPAR) for the region was above average by 1% and the potential biomass (BIOMASS) was close to average. The NDVI profile shows that the NDVI for the region was below average in late July and recovered in middle August. Subsequently, the NDVI dropped to below average again in October. Although the NDVI was varying, the departures of NDVI from the average were relitevely small. As a result, the prospected crop conditions for the region were slightly below or close to average.

Figure 3.35 Philippines' crop condition, July - October 2020

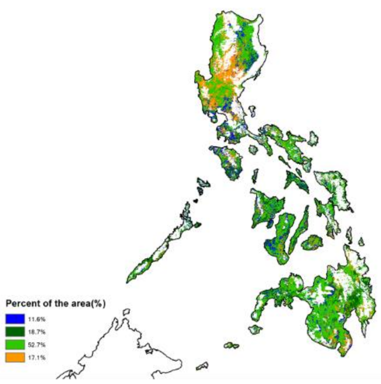


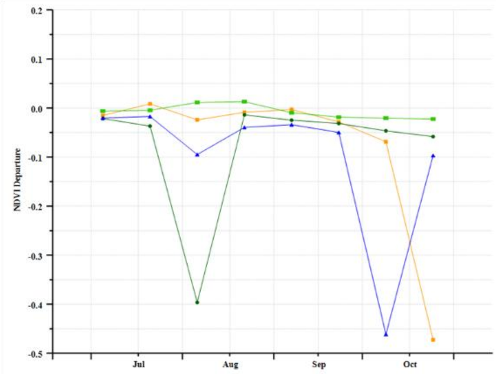
(a). Phenology of major crops



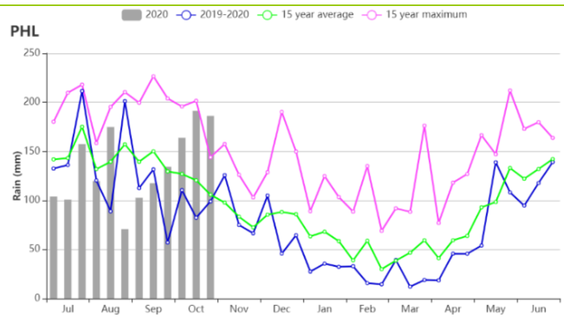


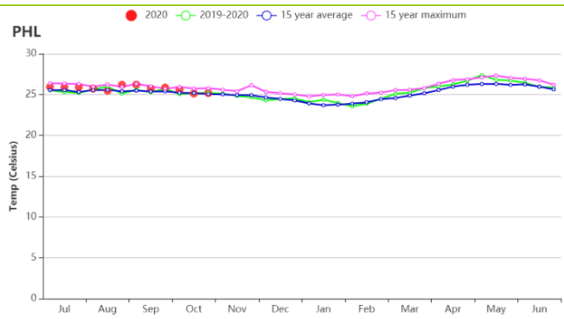
(b) Crop condition development graph based on NDVI (c) Maximum VCI



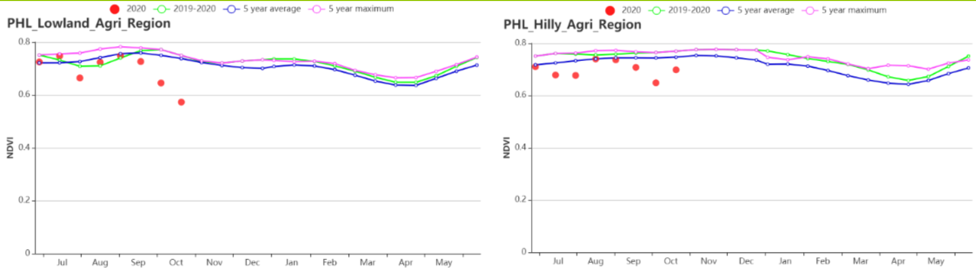


(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles

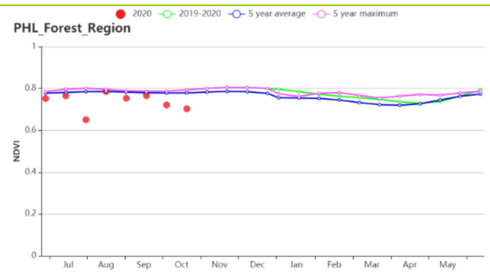




(f) Rainfall profiles (g) Temperature profiles



(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 3.62 Philippines' agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2020

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Forest region	1609	13	25.4	0.2	1222	1	820	0
Hilly region	1773	9	27.1	0.5	1289	4	883	4
Lowlands region	1609	-15	25.9	0.5	1235	6	833	6

Table 3.63 Philippines' agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2020

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure (%)	Current (%)	Departure (%)	Current
Forest region	100	0	135	-3	0.97
Hilly region	100	0	121	-3	0.99
Lowlands region	100	0	142	-2	0.97

[POL] Poland

This monitoring period covers the harvesting period of three crops: Maize (October), spring wheat (August) and winter wheat (July-August), as well as the main growing period of maize (July-September) and the sowing period of winter wheat (September-October). Compared to the average of the last 15 years, the national-scale rainfall and average temperatures in Poland during the monitoring period were higher by 13% and 0.5°C respectively; while sunshine (RADPAR) was lower by 3%. Estimated BIOMSS was lower by 5%, due to cloudy conditions. CALF was close to the average of the last 5 years and up to 100%. VCIx was 0.99.

As shown in the graph of crop growth, NDVI was close to the average of the last 5 years during the entire monitoring period, with temperatures being lower in July and higher after August, and rainfall being slightly below average from July to August and significantly higher in September-October, compared to the average of the last 15 years. VCIx was above 0.8 for the entire country. The NDVI cluster map shows that NDVI on 25.2% (blue) of the country's cropland was above average throughout the monitoring period, 15.5% (dark green) was below average and 32.3% (red) was significantly above average in July and close to average after August, and the rest of the cropland was characterized by fluctuating changes.

Overall, crop conditions are satisfactory, but October's heavy rainfall may have had a negative impact on winter wheat planting and maize harvesting.

Regional analysis

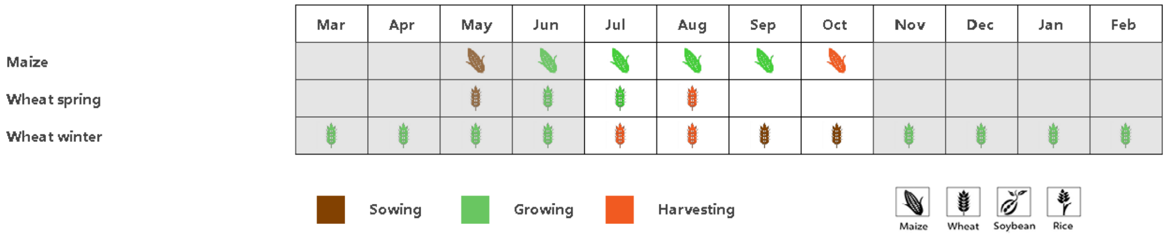
Poland is divided into four subregions based on agro-ecological characteristics, namely: (a) **Northern oats and potatoes area** (including the Western Pomeranian, Eastern Pomeranian and Wamenia-Masuria regions), (b) **Northern-central wheat and sugar-beet area** (including the Cuyavia-Pomeranian to Baltic Sea region), (c) **Central rye and potatoes area** (including the Lubus to South Podlaski and North Lublin regions) and (d) **Southern wheat and sugar-beet area** (including the southern Lower Silesia to South Lublin and the Carpathian along the Czech and Slovak border).

In the **Northern oats and potatoes area** temperature was higher by 0.6°C, while rainfall and RADPAR were lower by 11% and 4% respectively and potential biomass was 8% lower than the average of the last 15 years. Lower rainfall mainly occurred before mid-August, while the NDVI was also below average in August, but due to good soil moisture conditions in the early stages, it did not adversely affect the summer crop harvest, and the rainfall was abundant after September. The moisture content of the soil was conducive to the cultivation of winter crops. VCIx in the subregion reached 1.00, CALF was close to 100%. In general, crop growth was satisfactory.

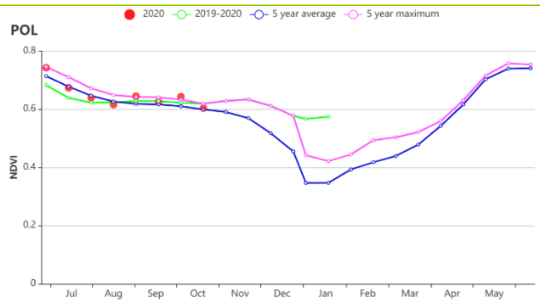
In **Northern-central wheat and sugar-beet area** and **Central rye and potatoes area**, rainfall was 4% to 6% higher and temperatures were 0.5°C higher in both subregions and were also above the average of the last 15 years. But RADPAR was 3-4% lower and potential biomass was 4-8% lower. Both subregions were characterized by cool and dry weather in July and above-average rainfall and temperatures after August, which favored crop growth. VCIx for both subregions were close to 1.0 and CALF approached 100%. Overall, agronomic conditions were favorable for crop growth in both areas.

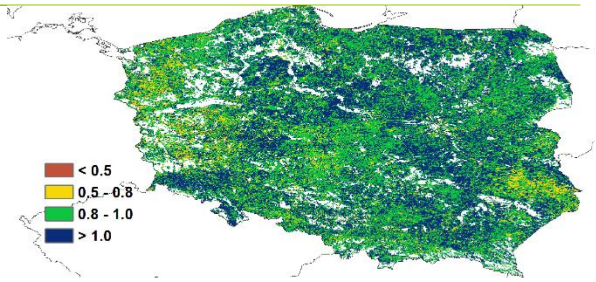
Compared to the average of the last 15 years, rainfall in the **Southern wheat and sugar-beet area** was significantly higher by 35%, temperature was slightly higher by 0.3°C, and RADPAR and BIOMSS were lower by 4% and 3%, respectively. Rainfall in the region was consistently above average levels, and in mid-September and mid-October, it was even close to the highest levels of the past 15 years, which favors winter crops, but may be detrimental to the harvesting of summer crops and the planting of winter crops.

Figure 3.36 Poland's crop condition, July - October 2020



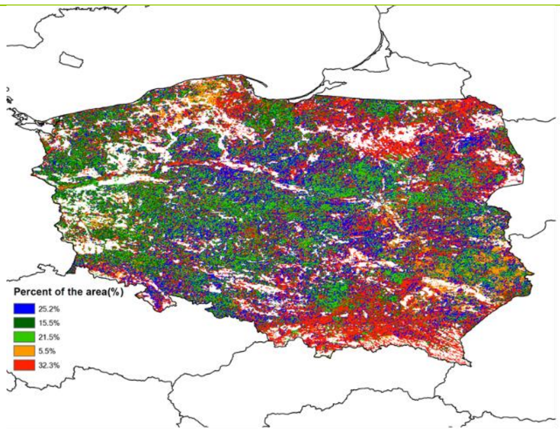
(a). Phenology of major crops

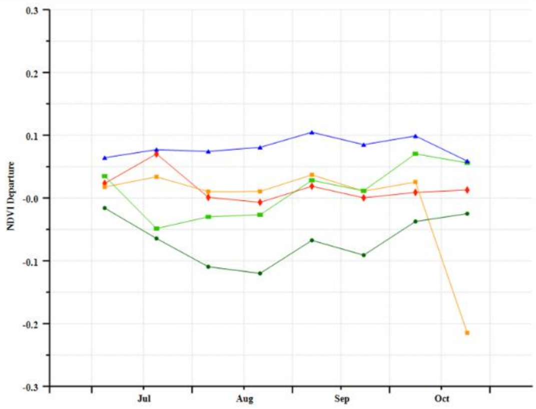




(b) Crop condition development graph based on NDVI

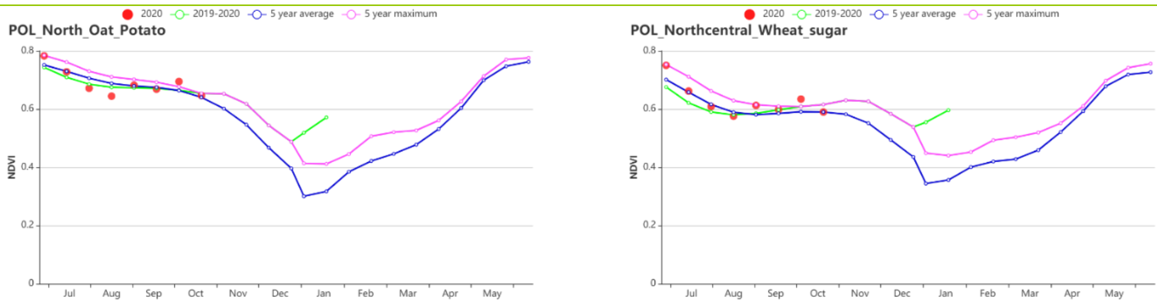
(c) Maximum VCI



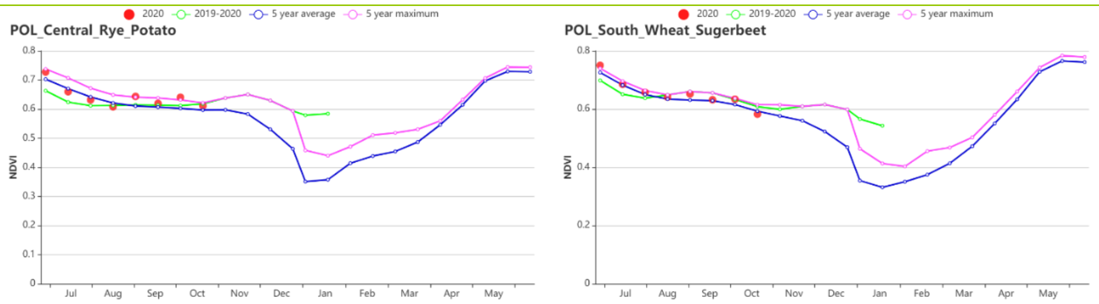


(d) Spatial NDVI patterns compared to 5YA

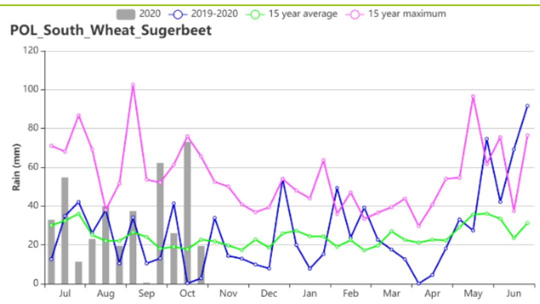
(e) NDVI profiles



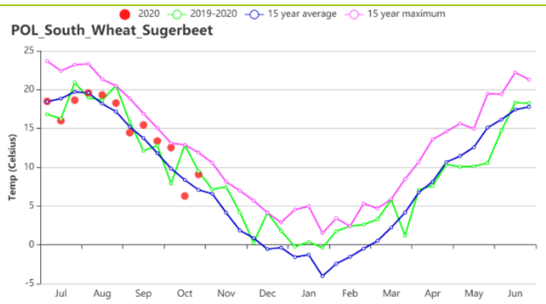
(f) Crop condition development graph based on NDVI, Northern oats and potatoes area (left) and Northern-central wheat and sugar beet area (right).



(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 3.64 Poland's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July-October 2020

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Northern oats and potatoes areas	287	-11	15.4	0.6	774	-4	326	-8
Northern-central wheat and sugarbeet area	292	4	15.6	0.5	789	-4	339	-8
Central rye and potatoes area	293	6	16.1	0.5	817	-3	372	-4
Southern wheat and sugarbeet area	400	35	15.1	0.3	864	-4	381	-3

Table 3.65 Poland's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July-October 2020

Region	Cropped arable land fraction		Cropping Intensity		Maximum VCI
	Current	Departure (%)	Current	Departure (%)	Current
Northern oats and potatoes areas	100	0	103	1	1.00
Northern-central wheat and sugarbeet area	100	0	104	-3	1.00
Central rye and potatoes area	100	0	106	-2	0.98
Southern wheat and sugarbeet area	100	0	110	6	0.99

[AFG] Romania

The reporting period includes the harvest of the 2019-20 winter wheat (which started in July), the sowing of the 2020-21 winter wheat (which started in September) and also the harvesting of spring wheat, maize and other summer crops in September. Overall, crop conditions were fair. Rainfall was 16% lower than average; TEMP (+0.7°C) was above the 15YA, whereas RADPAR (-1%) and BIOMSS (-2%) were below average. The nationwide NDVI profile shows that crop conditions was a bit lower than average during July to early October and above average in late October. The temperature fluctuated around above average levels and rainfall was below average in August. The southeast suffered from drought conditions, which had started already in the previous reporting period. The CALF of Romania during the reporting period was 97%, 2% lower than average and the maximum VCIx was 0.86, which was fair.According to the spatial distribution of VCIx, the western and central subregion has higher values (0.8-1.0) than the eastern subregion (0.5-0.8). The NDVI pattern profile shows that regions marked with blue color located in the western and central maize, wheat and sugar beet plateau experienced a sharp decrease during July-October. NDVI was also far below average in the eastern and southern maize, wheat and sugar beet plain, shown in light green and red. Conditions improved in October, but all major summer crops grown in that region had reached maturity by then. These crops suffered from drought conditions, which had been observed already in the previous report. Hence, production prospects for this important region of Romania are unfavorable, while they are closer to normal for the other regions.

Regional analysis

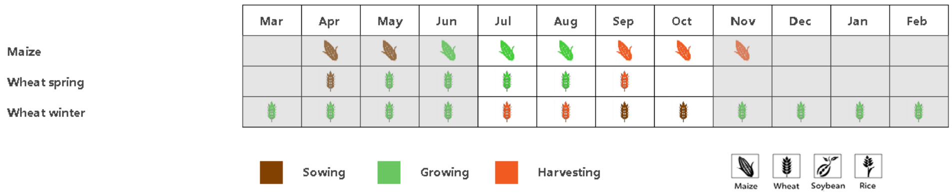
More spatial detail is provided below for three main agro-ecological zones: **Western and central maize**, **wheat and sugar beet plateau** (106), the **Central mixed farming and pasture Carpathian hills** (104) and the **Eastern and southern maize**, **wheat and sugar beet plains** (105).

For the **Western and central maize**, wheat and sugar beet plateau, rainfall was higher than average by 45%, temperature was average and radiation were somewhat lower (TEMP +0℃, RADPAR -3%), and biomass decreased 4%, probably due to decrease in solar radiation. Spatial NDVI profiles show that crop condition was better than average during August to September. However, this period was the end of wheat growing, and the total biomass is less affected. Maximum VCI of this region was 0.88, a bit low and the spatial distribution was between 0.8 and 1.0. Also the NDVI development decreased from July to October, consistent with the VCI values.The crop inensity is 102, -0.58 lower than last year.

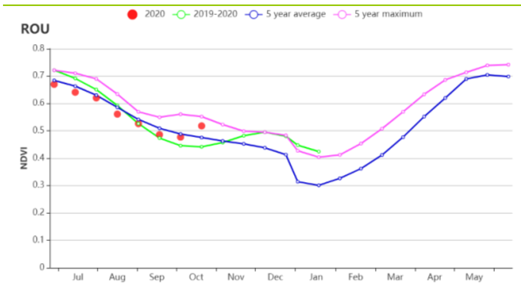
For **the Central mixed farming and pasture Carpathian hills**, rainfall increased by as much as 27% above average while temperature and radiation were both up (TEMP +1℃ , RADPAR -2%) and BIOMSS decreased 1%. According to the NDVI development, crop condition was better than average during reporting period. The maximum VCI map shows values above 0.8 , with the regional average at 0.97. The NDVI spatial distribution shows that NDVI was fair throughout the reporting period. As this AEZ occupies only a small fraction of cropland in Romania, a small patch of irrigated land in Transylvania, its fair NDVI cannot represent much of Romania crop production.The crop inensity is 100, -2.34 lower than last year.

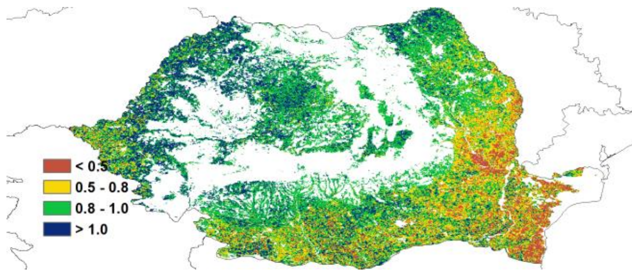
For **the Eastern and Southern maize**, wheat and sugar beet plains, rainfall decreased 9%, temperature increased 1℃, radiation remained average and biomass decreased 2%. The NDVI development graph shows that crop condition was worse than average during July to August and improved afterwards. The increase of precipitation in this period has partially mitigated the drought impact from previous periods, while current NDVI condition is still below average. VCI max value of this region was 0.80 and according to the distribution map, VCI values were between 0.5-0.8 in most of the central and middle region (counties of Tulcea and Constanta), representing about 14.3% of national cropland. The crop inensity is 105, -2.78 lower than last year.

Figure 3.37 Romania's crop condition, July - October 2020

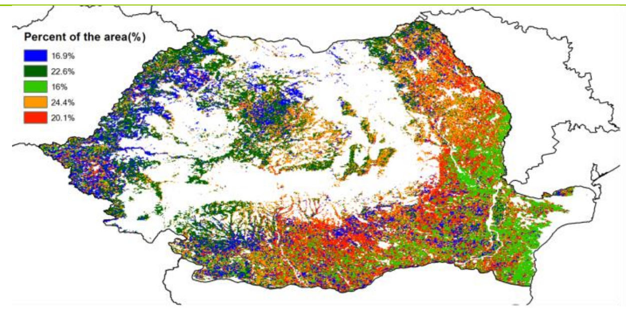


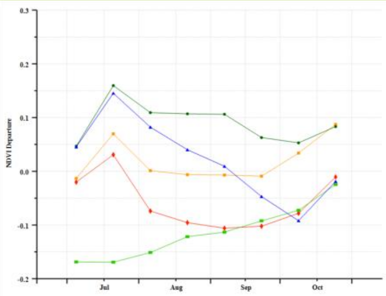
(a) Phenology of major crops



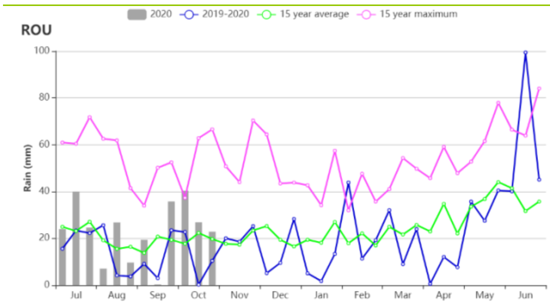


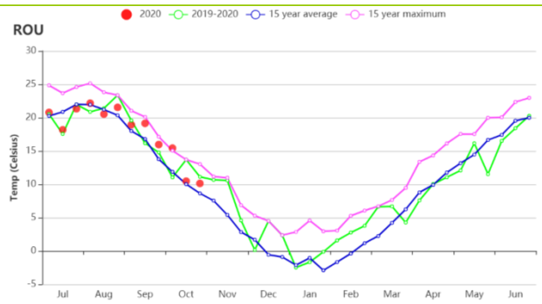
(b) Crop condition development graph based on NDVI (c) Maximum VCI



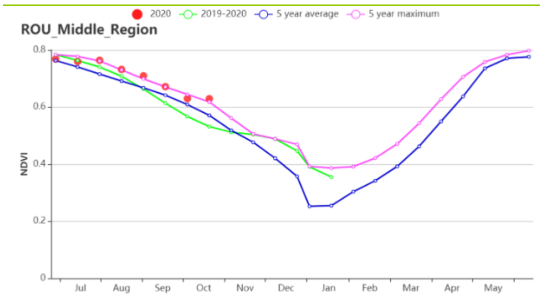


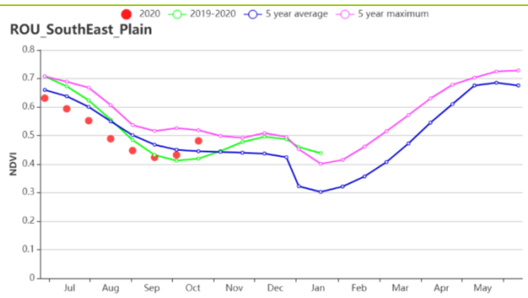
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



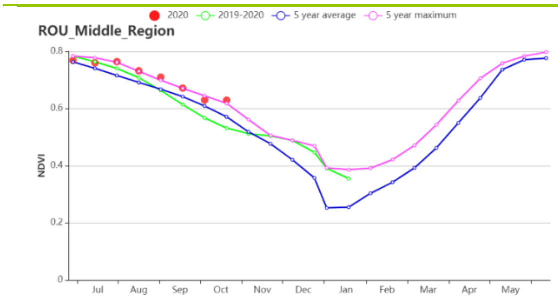


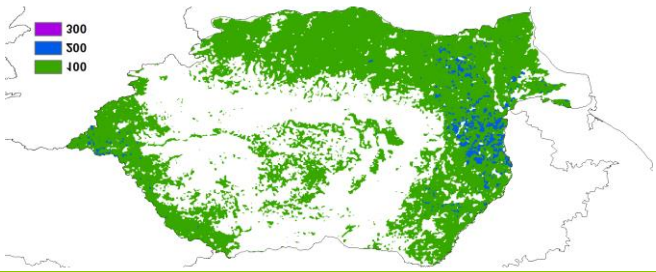
(f) Rainfall profiles (g) Temperature profiles





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





(i) Crop condition development graph based on NDVI (Western and central maize, wheat and sugarbeet plateau) (j) Crop intensity

Table 3.66 Romania's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2020

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Central mixed farming and pasture Carpathian hills	353	27	15	1	1020	-2	430	
Eastern and southern maize wheat and sugarbeet plains	205	-9	19	1	1060	0	523	
Western and central maize wheat and sugarbeet plateau	343	45	17	0	1017	-3	468	

Table 3.67 Romania's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2020

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure (%)	Current (%)	Departure (%)	Current
Central mixed farming and pasture Carpathian hills	100	0	100	-2.34	0.97
Eastern and southern maize wheat and sugarbeet plains	95	-3	105	-2.78	0.8
Western and central maize wheat and sugarbeet plateau	100	0	102	-0.58	0.98

[RUS] Russia

July to October is the main harvesting time in Russia: winter crops are harvested from the end of June to the middle of July; spring grain crops have their peak season in July and are mainly harvested from August to September. The sowing of the current year's winter crops starts in Augut. Therefore, weather conditions are crucial in this monitoring period as they affect not only the spring grain crops (their growth in July and harvest in August and September) but also the winter crops (the harvest of the previous year's in July and the sowing and germination of the current year's winter crops from August to October).

According to CropWatch national data, NDVI was below both the 5-year average and the previous year's level during the monitoring period. However, there were large differences between the regions. Conditions in the spring wheat producing areas (Volga, Urals and Siberia) were generally more favorable than in the winter wheat regions.

Precipitation was above average at the beginning of the period. By the end of September, there was a sharp drop in precipitation. In early and late July, as well as in late October, precipitation exceeded the level of 2019 and the 15YA. The precipitation was about 30% lower than the 15-year average and 2019 in late September and early October.

Above-average crop condition with VCIx above 0.8 was observed in Middle Volga and central black soil area as well the central and northern parts of Ural and Volga, where areas with positive NDVI departure prevailed. However, in some other regions, like northern Caucasus, crop conditions were average or below average with VCIx below 0.8 or even below 0.5, and with average NDVI or negative departures.

In the regions with positive NDVI departures the yield of the wheat crops is expected to be at or above the level of the previous year. Winter wheat, which is predominantly grown in the regions with negative NDVI departures, was harvested in July. Hence, crop conditions were generally favorable.

Regional analysis

In **South Caucasus** region, rainfall was below the 15-year average by 25%. Temperature increased by 0.9℃ compared to the 15-year average, with RADPAR up by 2% and BIOMSS up by 4%. VCIx was 0.62, the lowest value for Russia. CALF had decreased by 15% compared to the 5-year average. NDVI was mainly below the level of the 2019 and the 5-year average. The yield of winter crops is likely to be lower than in the previous year in this region.

The **North Caucasus** experienced the lowest rainfall, which was below the 15-year average by 40%. Compared to the 15-year average, temperature was rose by 1.0℃, RADPAR increased by 3% and BIOMSS increased by 1%. CALF was 4% below the 5-year average. VCIx was 0.66. Unfavorable agroclimatic conditions resulted in NDVI being below both the 5-year average and the previous year average.

In **Central Russia**, rainfall was close to the 15-year average. Compared to the 15-year average, the temperature increased by 0.4℃, RADPAR decreased by 3%, and BIOMSS dropped by 9%. CALF was at the level of the 5-year average (100%). From July to October NDVI was below the 5-year average while close or slightly above the level of the previous year. In early July and early October, NDVI was above the previous level.

In the **Central black soils region**, there was a significant decrease in rainfall, which was below the 15-year average by 37%. Both temperature (TEMP) and radiation (RADPAR) exceeded the 15-year average, by 0.6℃ and 5% respctively, while BIOMSS decreased by 1% due to unfavorable weather conditions. VCIx was 0.94 and CALF was 100%. NDVI was above the 5-year average and the previous year average in early July but then fell below the 5-year average from August to October. On account of unfavorable weather conditions, a decrease in yield can be expected in this region.

In the **Middle Volga** region, there was a decrease in rainfall by 12% relative to the 15-year average while the temperature rose by 0.1℃ and RADPAR was up 2%. BIOMSS decreased by 1% compared to the 15-year average. CALF was 96% and VCIx was 0.87. At the beginning of July, NDVI was above that of 2019 but then fell below the 5-year average for the remainder of this monitoring period.

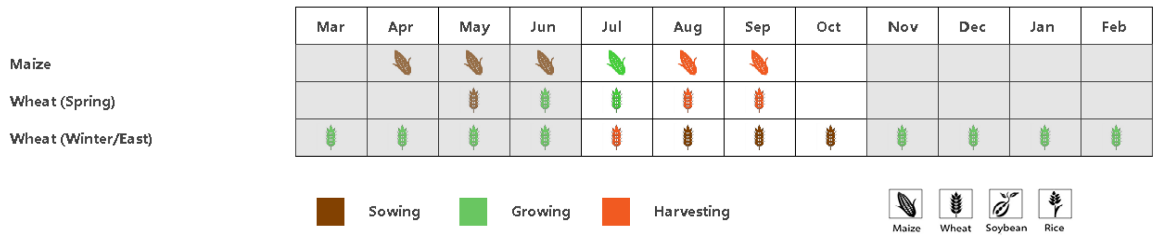
In **Ural and Western Volga** region, a major spring wheat production area, there was an increase in precipitation by 7% relative to the 15-year average, while the temperature increased by 0.7℃ and RADPAR was up by 1%. Due to favorable weather condition, BIOMSS increased by 8% compared to the 15-year average. CALF was about 99% and VCIx was 0.87. From July to August NDVI was below both the 5-year average and the previous year average while in early September it reached the 5-year average. NDVI was near the 5-year average from mid-September to October.

In **Eastern Siberia**, another major spring wheat production area, precipitation exceeded the average by 15% while temperature and RADPAR decreased by 0.1℃ and 13% respectively, compared to the 15-year average. Due to abundant precipitation and low temperature and RADPAR, BIOMSS decreased by 14% compared to average. As to the agronomic indicators, CALF was about 99%, VCIx was 0.98. Except for mid-July and early October, NDVI was near the 5-year average. Moreover, from early August to early October, NDVI was above the previous year's level. An increase in yield is expected in this region.

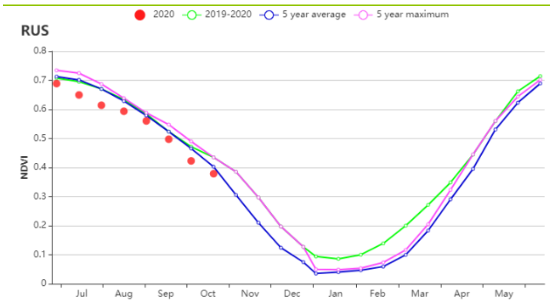
Rainfall was 33% above the 15-year average in **Middle Siberia** while temperature was only slightly higher (+0.4℃). RADPAR decreased 9% compared to the 15-year average. Unfavorable weather conditions led to a BIOMSS decrease by 10%. CALF was 99% and VCIx was 0.95. NDVI was above the 5-year average from July to September while only slightly below the average in October. An increase in yield is expected in this region.

In **Western Siberia**, there was an increase in rainfall by 22% relative to the 15-year average while the temperature rose by 0.2℃ and RADPAR was down 6%. Due to unfavorable weather conditions, the BIOMSS decreased by 2% compared to the 15-year average. CALF was 100% and VCIx was 0.86. From July to August, NDVI was below both the 5-year average and the previous year average. NDVI was near the previous year's level in September and above the 5-year average in late October.

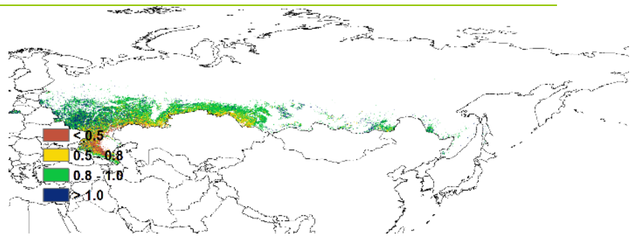
Figure 3.38 Russia's crop condition, July - October 2020



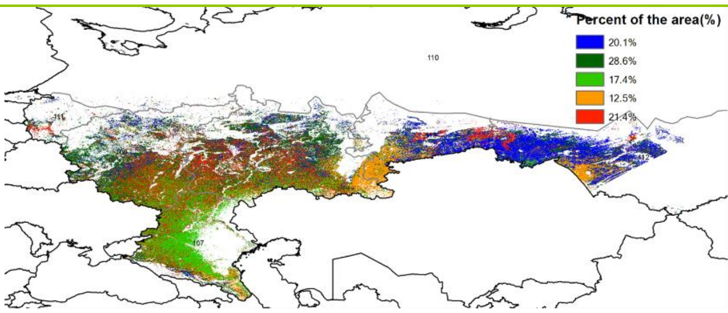
(a) Phenology of major crops

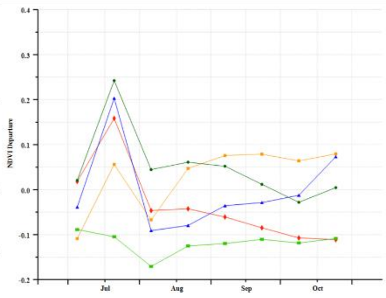


(b) Crop condition development graph based on NDVI

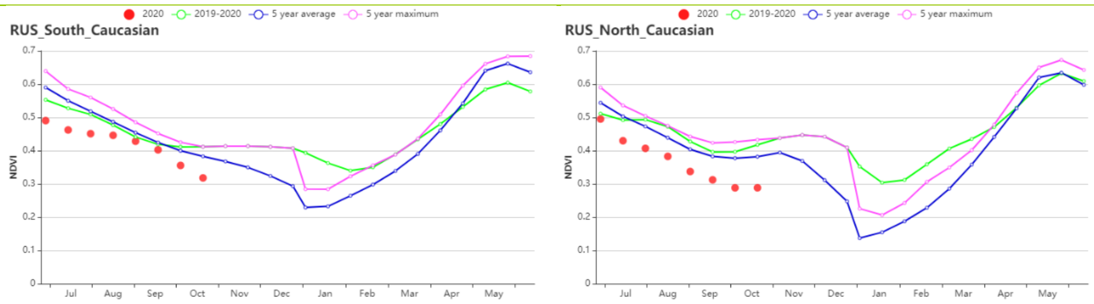


(c) Maximum VCI

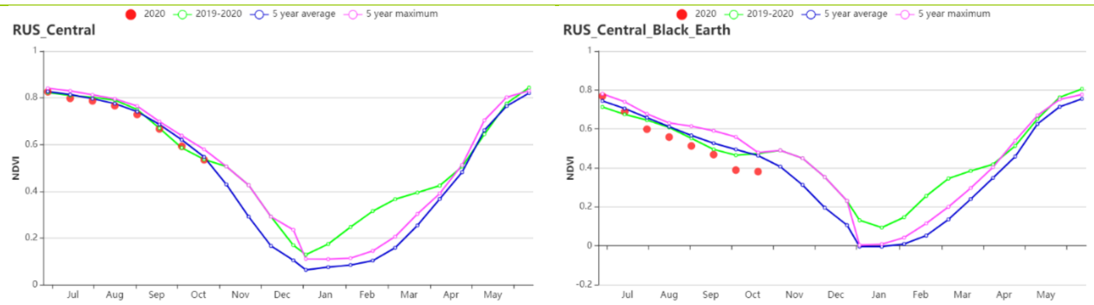




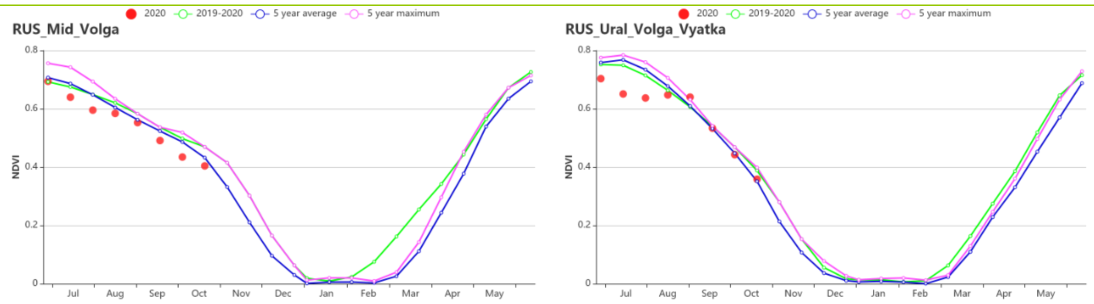
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



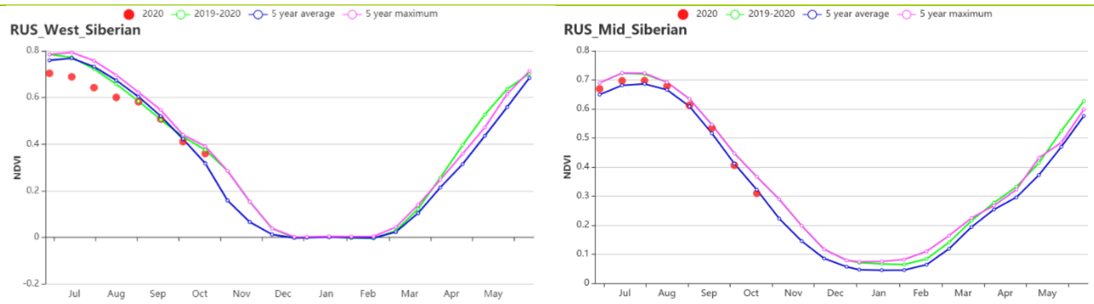
(f) Crop condition development graph based on NDVI (Southern Caucasus (left) and Northern Caucasus (right))



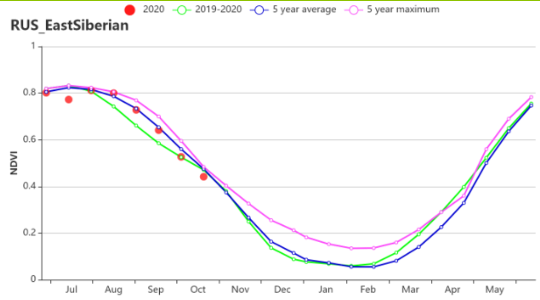
(g) Crop condition development graph based on NDVI (Central Russia (left) and Central black soils area (right))



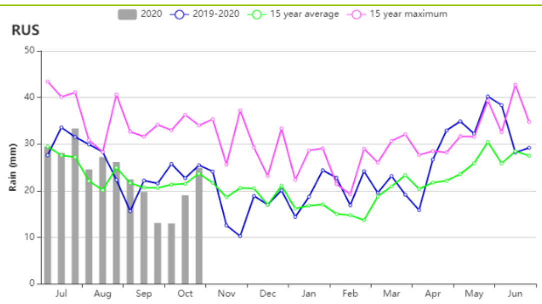
(h) Crop condition development graph based on NDVI (Middle Volga (left) and Ural and western Volga region (right))



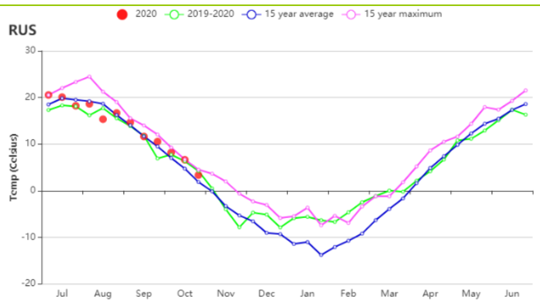
(i) Crop condition development graph based on NDVI in the Western Siberia (left) and the Middle Siberia (right)



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



(k) Rainfall index



(l) Temperature index

Table 3.68 Russia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 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	479	41	13.8	0.2	816	-12	356	-9
Central Russia	311	0	13.4	0.4	706	-3	283	-9
Central black soils area	153	-37	15.6	0.6	885	5	385	-1
Eastern Siberia	556	15	13.1	-0.1	759	-13	305	-14
Middle Siberia	377	33	9.3	-0.4	843	-8	288	-10
Middle Volga	240	-12	13.7	0.1	814	2	356	1
Northwest Region including Novgorod	292	-13	13.2	0.5	661	-5	257	-10
Northern Caucasus	122	-40	19.9	1.0	1074	3	536	1
Southern Caucasus	257	-25	17.9	0.9	1088	2	521	4
Ural and western Volga region	279	7	12.8	0.7	746	1	334	8
Western Siberia	328	22	12.2	0.2	758	-6	321	-2
West subarctic region	390	12	11.2	0.2	561	-8	210	-13

Table 3.69 Russia's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2020

Region	Cropped arable land	Cropping Intensity	Maximum VCI

	fraction				
	Current (%)	Departure (%)	Current (%)	Departure (%)	Current
Amur and Primorsky Krai	100	0	100	0	0.97
Central Russia	100	0	100	0	0.98
Central black soils area	100	0	102	2	0.94
Eastern Siberia	100	0	100	0	0.98
Middle Siberia	99	3	100	0	0.95
Middle Volga	95	-1	101	1	0.87
Northwest Region including Novgorod	100	0	100	0	0.98
Northern Caucasus	80	-4	102	-1	0.66
Southern Caucasus	67	-15	104	2	0.62
Ural and western Volga region	100	0	100	0	0.87
Western Siberia	100	0	100	0	0.86
West subarctic region	100	0	100	0	0.98

[THA] Thailand

The monitoring period covers the harvest of maize in September and the complete cycle of the main rice crop (from sowing to harvest). According to CropWatch agroclimatic indicators, Thailand experienced wet and warm weather compared to the 15YA. The rainfall (RAIN, +12%) and temperature (TEM, +0.1°C) from July to October was above average, while radiation was below average (-2%), resulting in a close-to-average biomass production potential (BIOMSS), only 1% below average. According to the NDVI development graph, crop conditions were above average until early September, but were below average after that mainly due to the cloud contamination in the satellite images. Increased rainfall provided plenty of water for the crops in this wet season. According to the NDVI departure clusters and the corresponding profiles, the crop conditions were above average except for the end of September on 44% of total arable land, mostly located in Central double and triple-cropped rice lowlands, Chaiyaphum, Nakhon Ratchasima, Phachinburi, Chachoengsao, Chonburi Nakhon Si Thammarat, Songkhla. This was confirmed by the VCIx map. The crop conditions on 21.5% of total cropland were below average throughout this monitoring period, mostly located in Western hill areas, Udon Thani and Kalasin. The crop conditions in the remaining regions were close to average in the beginning but deteriorated to below average after August. In general, favorable condition for crops was observed during the July to October period as indicated by high VCIx values at 0.97. Considering the average CALF, the crop conditions during this season are assessed as close to the average level.

Regional analysis

The regional analysis below focuses on some of the already mentioned agro-ecological zones of Thailand, which are mostly defined by the rice cultivation typology. Agro-ecological zones include Central double and triple-cropped rice lowlands (115), South-eastern horticulture area (116), Western and southern hill areas (117) and the Single-cropped rice north-eastern region (118).

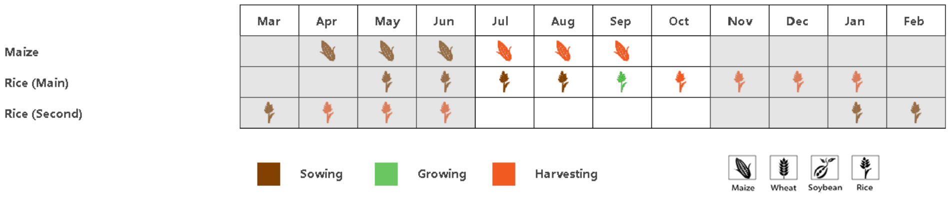
The **Central double and triple-cropped rice lowlands** is the major rice production zone of Thailand. It had received plenty of rainfall during this period. Rainfall was above average (RAIN, +37%), accompanied by average temperature (TEM, 0.0°C), while radiation was below average (RADPAR, -2%). Although rainfall was significantly above average, radiation was the limiting factor during this rainy season. As a result, the low radiation resulted in a decrease of potential production (BIOMSS, -2%). The NDVI development graph shows that crop conditions started to drop below average in September, when the crops were approaching maturity.

The agro-climatic conditions in the **South-eastern horticulture area** were the same as in the Central region**:** Rainfall was above average (RAIN, +10%), accompanied with lower radiation (RADPAR, -2%). Temperature was above average by 0.1℃. This agro-climatic condition led to a slight decrease of potential production (BIOMSS, -3%). According to the NDVI development graph, the crop condition is close to the average of recent 5years.

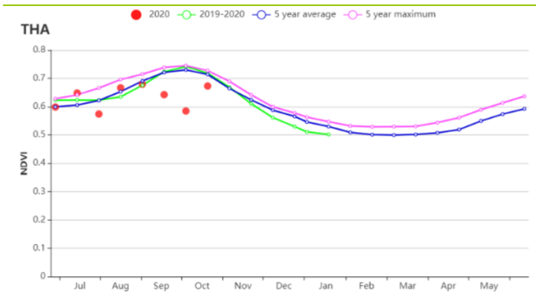
In the **Single-cropped rice north-eastern region** precipitation was above average by 7%, while temperature was above average by 0.1℃. These agro-climatic conditions accompanied with an average radiation led to a average potential production. As a result, crop conditions were above average before September but dropped to below average in September according to the NDVI development graph.

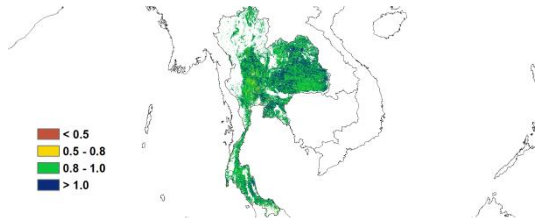
For each region, the VCIx ranging from 0.95 to 0.98 indicates that the peak season was comparable to the 5YA. Almost all cropland was cultivated during the monitoring period.

Figure 3.39 Thailand's crop condition, July - October 2020

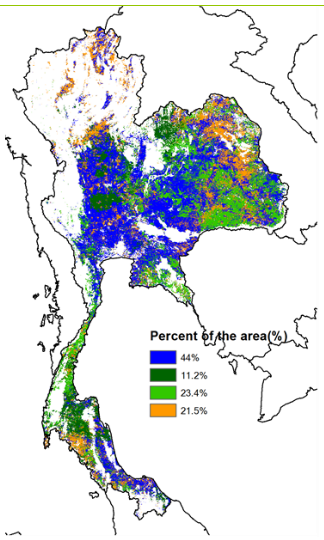


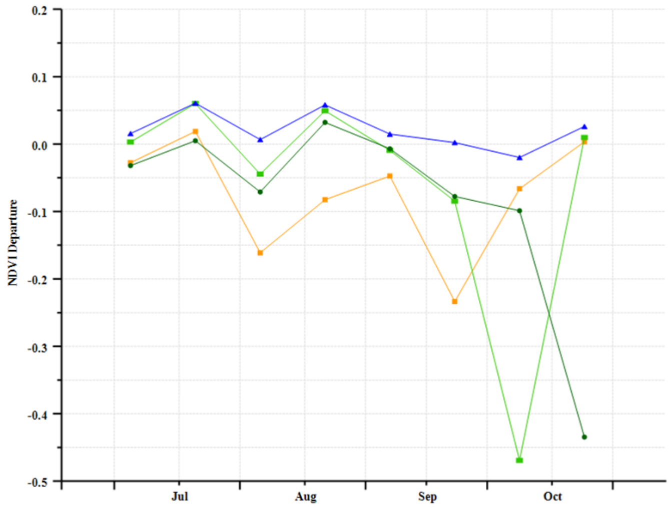
(a). Phenology of major crops



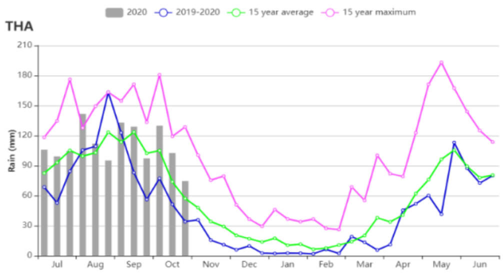


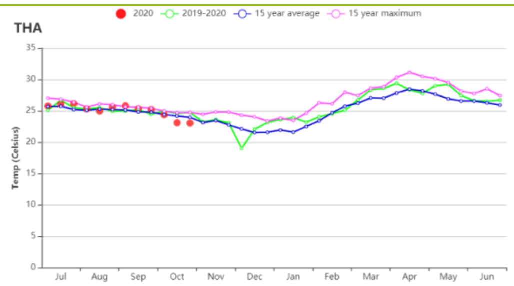
(b) Crop condition development graph based on NDVI (c) Maximum VCI



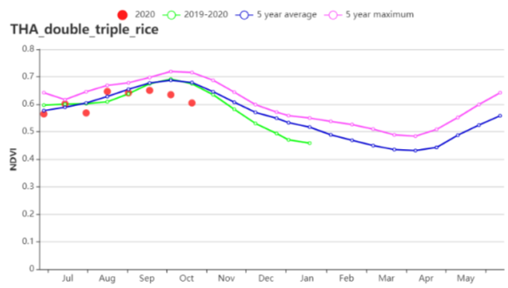


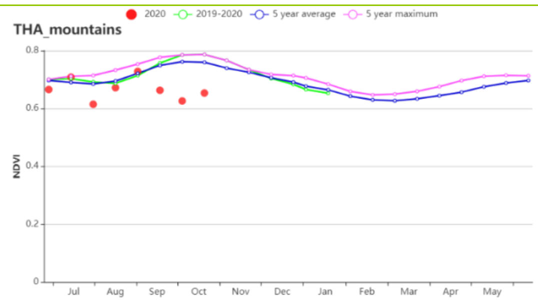
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



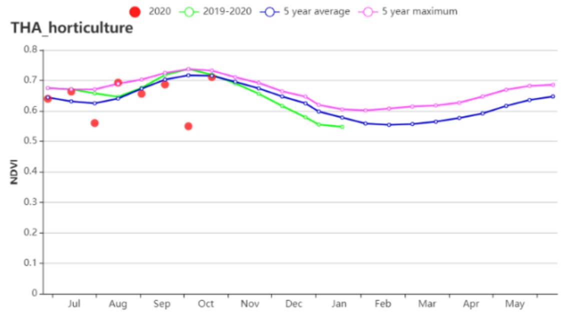


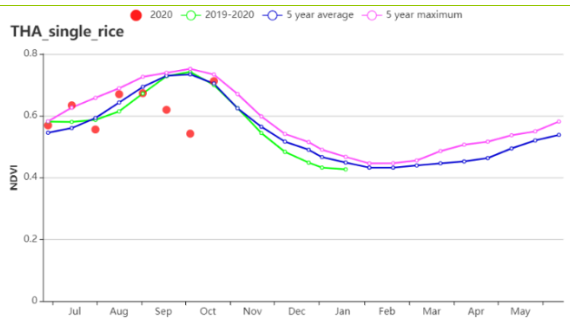
(f) Rainfall profiles (g) Temperature profiles





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





(i) Crop condition development graph based on NDVI (South-eastern horticulture area (left) and Single-cropped rice north-eastern region (right))

Table 3.70 Thailand's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2020

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Central double and triple-cropped rice lowlands	1473	37	25.4	0	1042	-2	696	-2
South-eastern horticulture area	1425	10	25.8	0.1	1088	-3	742	-3
Western and southern hill areas	1231	11	24.4	0.1	1073	-3	701	-2
Single-cropped rice north-eastern region	1384	7	25.4	0.1	1084	0	724	0

Table 3.71 Thailand's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2020

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure (%)	Current (%)	Departure (%)	Current
Central double and triple-cropped rice lowlands	100	0	110	-12	0.95
South-eastern horticulture area	99	0	122	-7	0.98
Western and southern hill areas	100	0	120	-6	0.96
Single-cropped rice north-eastern region	100	0	107	-3	0.98

[TUR] Turkey

The reporting period covers the harvest of winter wheat (which mostly concluded in July), the growth and harvest of maize and rice, and the planting of winter wheat from September to October. Nationwide, RAIN was below average (-54%), and both TEMP (+1.1℃) and RADPAR (+2%) were above the 15YA. BIOMSS was -6% below the average. CALF was 3% up, indicating more land was cultivated.

The NDVI-based crop condition development graph indicates slightly below-average crop conditions during the whole monitoring period. The national average of VCIx was 0.78. Only limited parts of Turkey (mainly including the provinces of Kirklareli, Istanbul, Mus, Igdir, Sirnak, Tunceli, and Yozgat, etc.) experienced very promising VCIx values above 1.0, indicating that crops in those regions outperformed the best recent conditions. Most provinces located in central and western parts, such as Kirikkale, Afyonkarahisar, and Konya had low VCIx (< 0.5), which indicates below-average crop conditions.

In terms of the NDVI spatial departure clustering map, the results confirmed the spatial pattern described above. As shown by the VHIn graph, the proportion of cultivated areas experiencing minor to severe droughts was increasing to approximately 40% at the end of the monitoring period. Overall, most zones experienced some drought conditions throughout this monitoring period. Crop production is generally expected to be slightly below average.

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**.

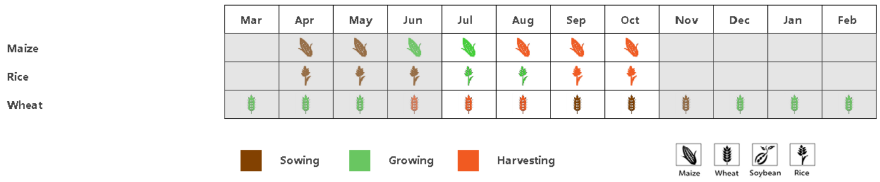
In the **Black Sea zone**, crop conditions were generally below average. The rainfall was below average (RAIN, -46%), while the temperature (TEMP) increased by 1.2℃. CALF was at average with a value of 95%, which was the highest among the four AEZs of Turkey. Cropping Intensity (CI) was at average. The average value of VCIx was high at 0.87, also the highest among all four AEZs. The crop conditions are assessed as normal.

During this monitoring period, the crop conditions were generally below average in the **Central Anatolian plateau**. This AEZ experienced the biggest rainfall deficit (RAIN, -64%) during this monitoring period. TEMP (+1.4℃) and RADPAR (+3%) were both above the 15YA. The BIOMSS index decreased slightly (-7%). Cropping Intensity (CI) was at average. The average VCIx for this region was 0.74, the lowest among the four AEZs. The cropped land area increased slightly (CALF +2%). Crop conditions are assessed as slightly below average.

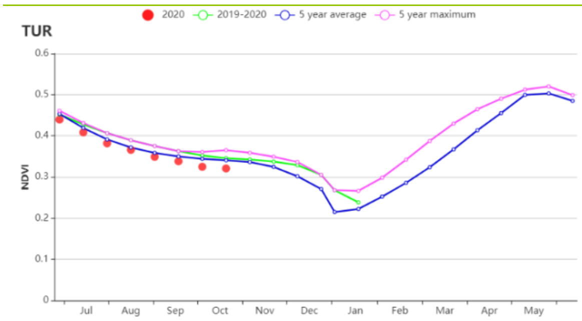
In **Eastern Anatolia**, crop conditions were above average from mid-July to early September and then dropped to below average in October. TEMP and RADPAR were 0.7℃ and 1% above the average, respectively, while the rainfall was below average (RAIN -46%). BIOMSS increased by 9%, which was the biggest positive departure among the four AEZs. The CALF increased (+8%) compared to the average. Cropping Intensity (CI) was 6% down comparing to the 5YA, which is the largest negative departure among AEZs. With VCIx at 0.85, crop output is assessed to be favorable.

As indicated by the NDVI profile, in the **Marmara Aegean Mediterranean lowland zone**, the crop conditions were below the 5YA during the whole monitoring period. RAIN was 58% below the average. The temperature was slightly above average (TEMP +1.1℃). Cropping Intensity (CI) was slightly up (+1%). VCIx was 0.75, and CALF is up 2%. Production prospects in this region are expected to be below or near average.

Figure 3.40 Turkey's crop condition, July - October 2020

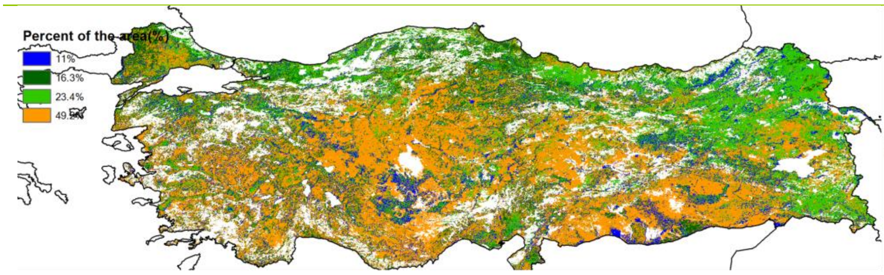


(a). Phenology of major crops

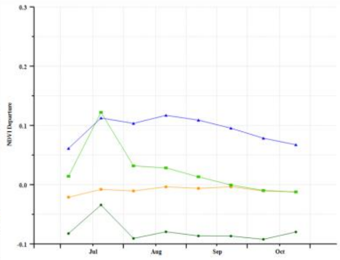


(b) Crop condition development graph based on NDVI

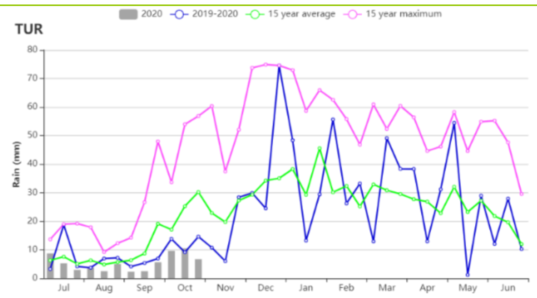
(c) Maximum VCI



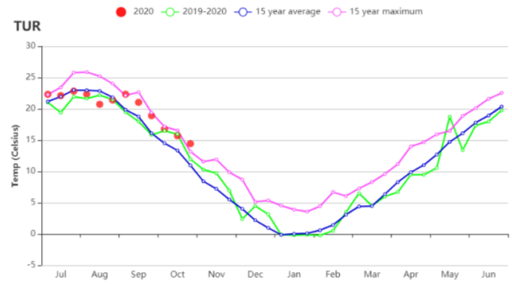
(d) Spatial NDVI patterns compared to 5YA



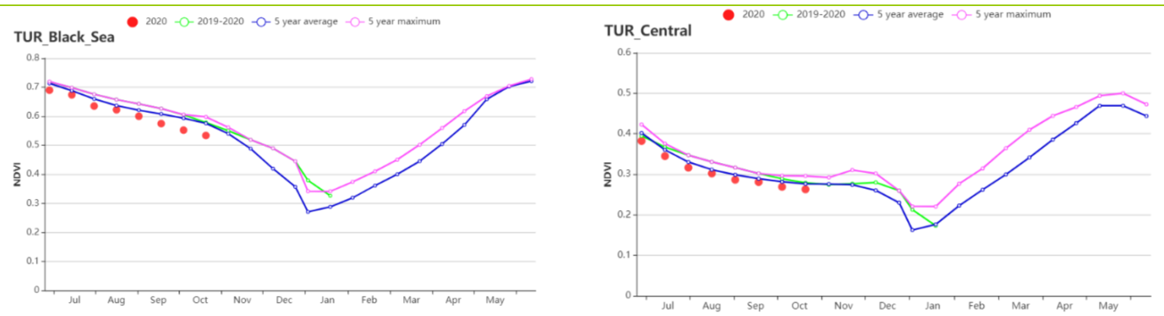
(e) NDVI profiles



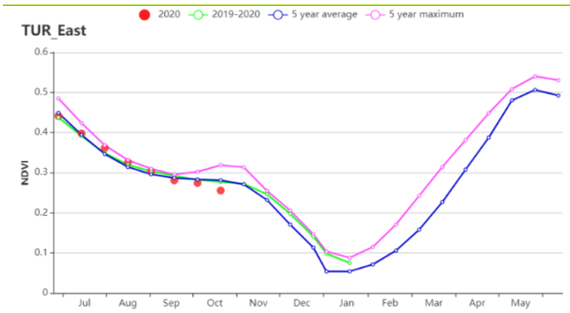
(f) Time series rainfall profile

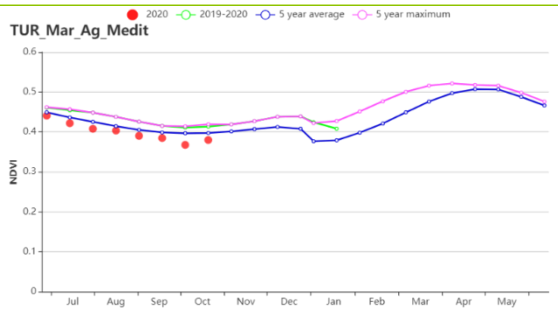


(g) Time series temperature profile

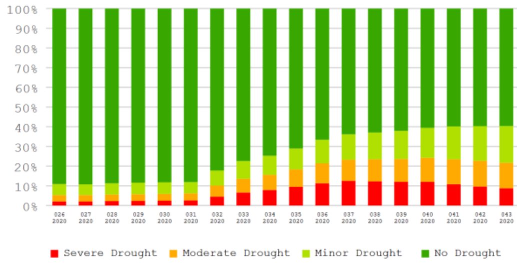


(h) Crop condition development graph based on NDVI (Black Sea region (left) and Central Anatolia region (right))





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



(j) Proportion of VHIm categories compared with 5YA

Table 3.72 Turkey's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2020

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)	Current (gDM/m^2)	Departure from 15YA (%)
Black Sea region	155	-46	16.4	1.2	1164	5	495	6
Central Anatolia region	40	-64	19.3	1.4	1314	3	466	-7
Eastern Anatolia region	80	-46	18.1	0.7	1326	1	422	9
Marmara Agean Mediterranean lowland region	52	-58	22.7	1.1	1326	1	393	-16

Table 3.73 Turkey's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2020

Region	Cropped arable land fraction		Cropping Intensity		Maximum VCI
	Current	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Black Sea region	95	0	102	0	0.87
Central Anatolia region	36	2	103	0	0.74
Eastern Anatolia region	53	8	101	-6	0.85
Marmara Agean Mediterranean lowland region	58	2	108	1	0.75

[UKR] Ukraine

In the Ukraine, the harvest of wheat took place in July, whereas the harvest of maize started in September. In that month, the winter wheat sowing started as well. The national NDVI development curve trended slightly lower than the 5-year average until the middle of October. According to agroclimatic indicators, Ukraine experienced a warmer summer, temperature (17.8℃) was 1.1 ℃ higher than the 15-year average, sunshine was normal (967 MJ/m², +2%), while rainfall was a little bit lower than the 15YA (198 mm, -3%). Based on the above situation, potential biomass was projected to be 2% higher than the 15-year average. Agronomic conditions were also favorable: nearly all cropland was cultivated (CALF, 95%,-1%), and maximum VCI reached 0.88. However, the distribution of VCIx was quite uneven. The VCIx gradually decreased from the west to the east. The lowest value (0.5) was observed for the Crimea. According to the NDVI spatial pattern, NDVI was persistently above average mainly in the western area (26.7%), while in the eastern Ukraine (20.6%) it was below average throughout this monitoring period. All in all, crop conditions were generally favorable.

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 **Northern wheat area** with Rivne; **Eastern Carpathian hills** with Lviv, Zakarpattia and Ivano-Frankivsk Oblasts, **Central wheat area** with the Poltava, Cherkasy, Dnipropetrovsk and Kirovohrad Oblasts; and **Southern wheat and maize area** with Mykolaiv, Kherson and Zaporizhia Oblasts.

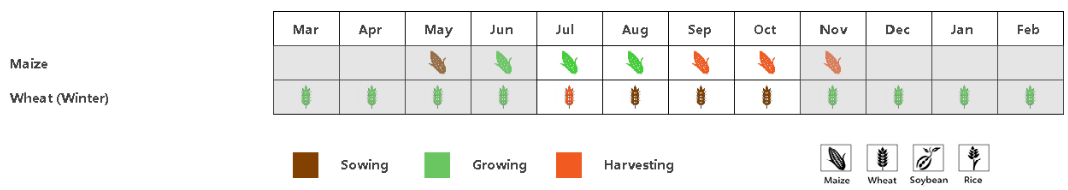
In the **Central wheat area**, rainfall was short by 14% compared to the 15YA, with higher temperature (TEMP +1.3°C) and above average radiation (RADPAR +3%). NDVI had reached the 5 year maximum level in July, and then pretty much followed the trend of last year. BIOMSS was 5% above average, CALF reached 100% and VCIx was satisfactory (0.92).

Similar conditions prevailed in **Northern wheat area**, which had suffered from a rainfall deficit (-8%). However, NDVI trended near the 5 year maximum values. CropWatch estimated BIOMSS at 3% above average. Overall, crop conditions were favorable for this region.

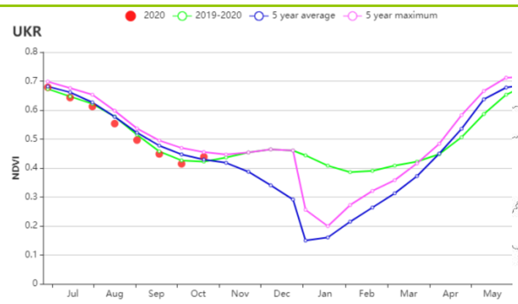
Eastern Carpathian hills received more rainfall as compared to 15-year average (317 mm, +12%), temperature was normal (15.4 °C) while radiation was 1% lower than average. Potential biomass was predicted to be slightly below average (-2%). CALF and VCIx were favorable. All in all, conditions were favorable for this region.

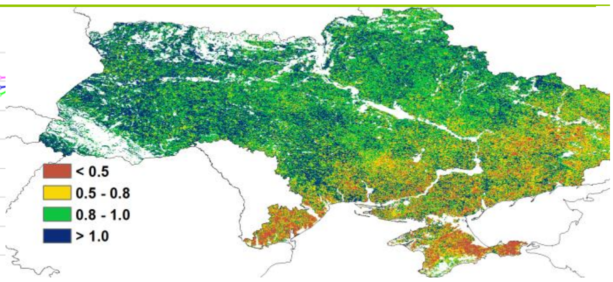
The **Southern wheat and maize area** showed average conditions during the monitoring period. Weather was favorable: rainfall and temperature were above average and radiation increased by 4% compared to the average. This area had good CALF (90%) but relative moderate VCI (0.77), which was lower than other AEZs and the NDVI profile remained below average throughout the monitoring period. In summary, the overall situation was just fair for this region.

Figure 3.41 Ukraine's crop condition, July- October 2020



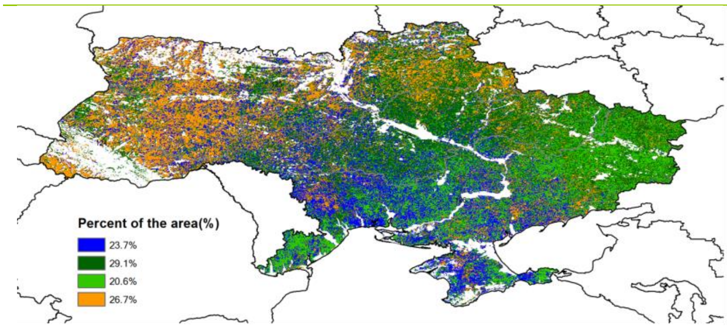
(a). Phenology of major crops

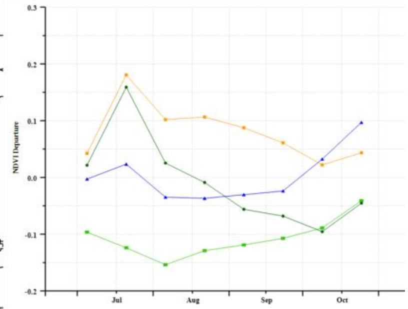




(b) Crop condition development graph based on NDVI

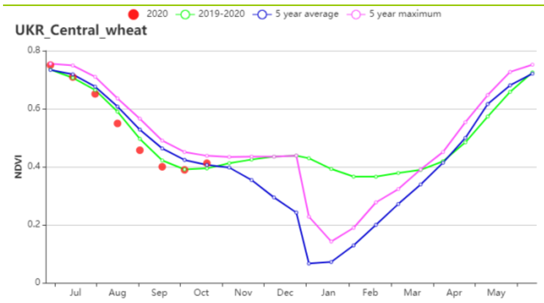
(c) Maximum VCI

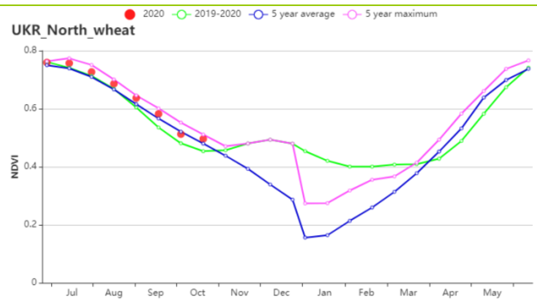




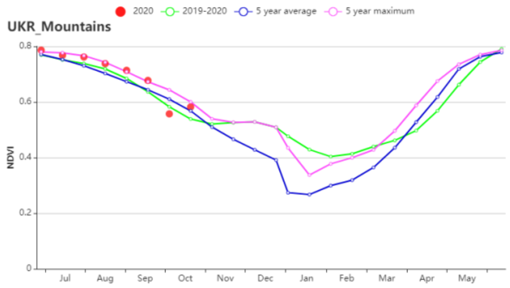
(d) Spatial NDVI patterns compared to 5YA

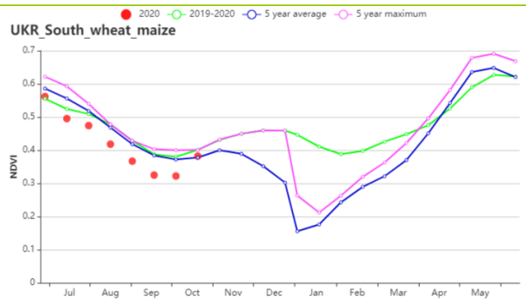
(e) NDVI profiles



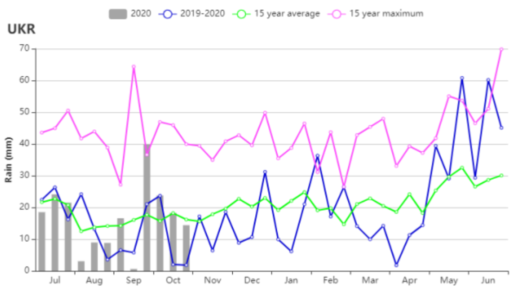


(e) Crop condition development graph based on NDVI (Central wheat area(left) Northern wheat area(right))





(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 3.74 Ukraine's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, - July- October 2020

Region	RAIN	TEMP	RADPAR	BIOMSS

	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Central wheat area	160	-14	18	1.3	972	3	477	5
Eastern Carpathian hills	317	12	15.4	0.5	944	-1	408	-2
Northern wheat area	212	-8	16.6	1.1	901	1	421	3
Southern wheat and maize area	165	3	19.6	1.2	1036	3	519	1

Table 3.75 Ukraine's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July- October 2020

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure (%)	Current (%)	Departure (%)	Current
Central wheat area	100	0	100	-1	0.95
Eastern Carpathian hills	100	0	102	2	0.97
Northern wheat area	100	0	102	2	0.96
Southern wheat and maize area	99	0	105	-1	0.85

[USA] United States

This monitoring period (July to October 2020) covers the main growing season and harvest period of the following summer crops: soybean, maize and rice. Sowing of winter wheat started in September. As reported in the August CropWatch bulletin, conditions for planting and establishment of the summer crops were favorable, with a good supply of soil moisture until July. Close to average rainfall helped sustain crop growth during the grain filling phase. Slightly drier conditions in September and October provided good conditions for harvest. All in all, crop conditions for cereals were favorable.

During this monitoring period, close-to-average agro-climatic condition occurred and precipitation, temperature and radiation were 6%, 0.1℃, 0% below the 15YA. The potential biomass was 3% below the average due to reduced precipitation. During this monitoring period, the southeastern regions of the United States received above-average precipitation, while total rainfall was below average in the Corn Belt, Northern Plains and Western United States. California (-85%) was most affected, followed by Idaho (-32%), Minnesota (-30%), North Dakota (-35%), South Dakota (-39%), Iowa (-22%), Michigan (-15%) and Ohio (-19%). However, these deficits occurred mostly during the period from mid-September to mid-October (Figure 2). The fraction of cropland impacted by drought conditions increased from 25% in July to about 40% in late-October. However, drier-than-normal conditions had little impact on yield as the crops approached maturity in September. Drier-than-normal weather actually improved harvest conditions.

The great spatial heterogeneity in precipitation had caused significantly variation in crop conditions. The NDVI departure profile and cluster map shows that above-average crop conditions were widely observed in the southeastern USA, while average crop conditions were generally observed in the northern plains, northern Corn Belt, and western part of the country starting in September. Crops don't require much water anymore in September as they are reaching maturity. Dry conditions during that month provide good conditions for harvest. Therefore, drops in NDVI in September had no negative impact on yield. A VCIx value higher than 0.8 also indicates that the crops in the southern corn belt were in good conditions. Although California suffered from severe precipitation shortages, its crop conditions were close to average, which may be attributed to developed irrigation infrastructures. Compared with the last 5 years, the cropped arable land fraction and the cropping intensity were both 1% below the average.

Considering the lower water requirements of the crops in September and October, CropWatch concluded that below-average precipitation and signs of drought conditions during these months had little impact on final crop yields and crop conditions in the United States were generally favorable.

Regional analysis

During this monitoring period, the biggest challenge for crop growth is insufficient precipitation during July and August. According to the distribution of crops in this current season, the analysis in this section focuses on the Corn Belt, Northern Plains, Northwest, Lower Mississippi, Southeast and Southern Plains.

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, this area experienced slightly below average precipitation during the monitoring period with below-average rainfall (-16%) and temperature (-0.6℃) and slightly above-average radiation (+1%). Significantly below-average precipitation occurred in late August and September. In Iowa, total rainfall was 30% below the average. Fortunately, crops reached the maturity stage in September, so that reduced rainfall had little impact on crop yields. The crop condition development graph based on NDVI indicates that the crops were at their peak in late July and early August. NDVI subsequently dropped faster than usual, but this had no impact on crop yields, as maize reaches physiological maturity in mid-September. CropWatch assessed the crop conditions as 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. The agro-climatic conditions in the lower Mississippi were close to the average with average rainfall (+ 3%) and temperature (-0.4°C), while the average PAR was 3% lower than the 15YA. The observed crop conditions were at average levels during the monitoring period. The VCIx value reached 0.95, which also confirmed the favorable crop growth conditions in this region.

Northwest

This is an important winter wheat producing area in the United States, including Washington (Rain, -7%) and Idaho (Rain, -22%). In the current season, this area experienced below-average precipitation, especially in Idaho. Compared with the 15YA, rainfall was 21% below average, temperature was 0.5℃ above average and PAR was 1% above average. The time series of rainfall shows that the rainfall in the northwestern region was significantly lower than average in July, August, and early September. Fortunately, the main crops in the area (winter wheat and barley) were harvested in July or early August and largely avoided the adverse effects of water stress. The NDVI development profile indicates that the crop conditions were close to the 5 year average until late September and crop conditions were average as well.

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 (Rain, -35%), South Dakota (Rain, -39%), Nebraska (Rain, -13%) and Montana (Rain, -4%). This monitoring period covers the grain filling stages of spring wheat and the flowering and grain filling stages of maize and soybean. This region had benefitted from slightly above-average precipitation during the April to July period. Compared with the 15YA, the northern plains had experienced drier weather conditions, with rainfall and temperature both lower than the 15YA (-19% and -0.1℃ respectively). During the period of mid-September to early October, the Northern Plains experienced a rainfall deficit. Spring wheat was harvested in August and the water shortage had no impact on spring wheat. Maize and soybeans reach maturity in September and they were barely impacted by the drier-than-usual conditions. CALF was at 0.86, 6% higher than the 5YA. All in all, crop conditions were favorable for this region

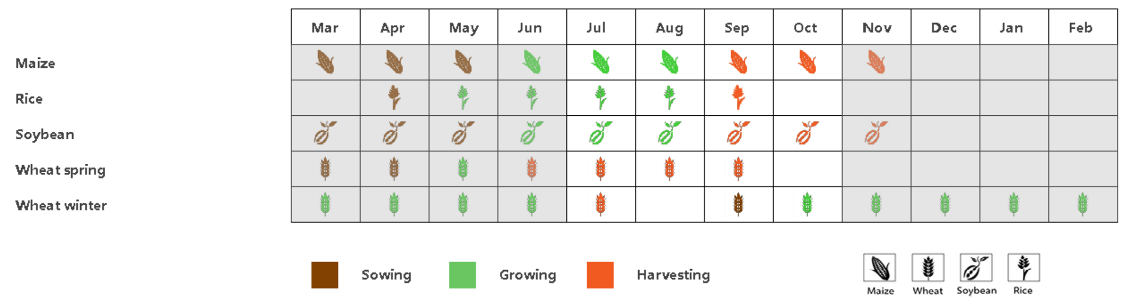
Southeast

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 9% higher, temperature 0.2℃ lower and PAR 3% below average. Rainfall helped sustain vigorous crop growth, and the VCIx value reached 0.94. In general, the crop growth conditions were favorable in the region

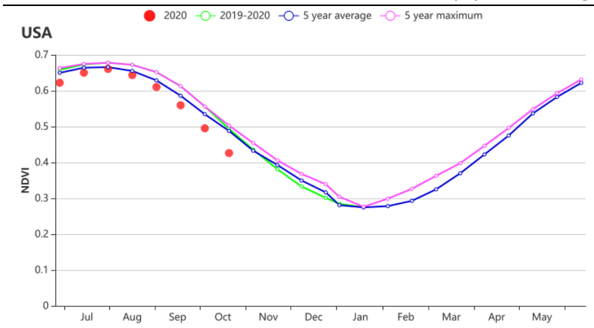
Southern Plains

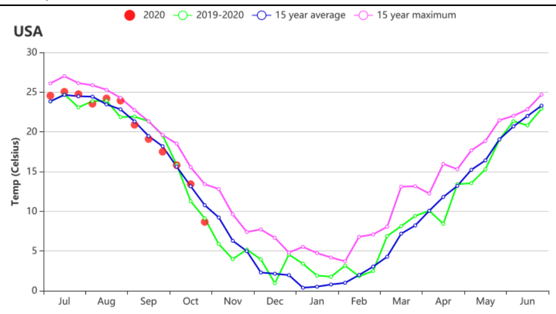
This is the most important winter wheat, sorghum and cotton producing area in the United States. It includes Kansas, Oklahoma, Texas, and eastern Colorado. Texas is the largest cotton producing state in the United States. During this monitoring period, the southern plain experienced normal weather: Compared to the 15YA, rainfall did not deviate from the average, and temperatures were 0.5 ºC below average and PAR 1% below average. Winter wheat was completely harvested at the beginning of July, and this monitoring period covers the grain filling period of sorghum, and setting bolls and harvest of cotton. The development profile of NDVI shows that the crop conditions were significantly below average. CALF was 8% below average. All in all, crop conditions were slightly below average. However, they varied greatly within the region, as shown in Figure 6. Especially the Texas pan handle and Colorado suffered from drought conditions.

Figure 3.42 United States' crop condition, July - October 2020



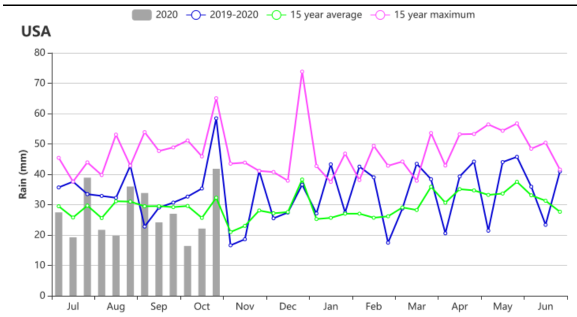
(a). Phenology of major crops

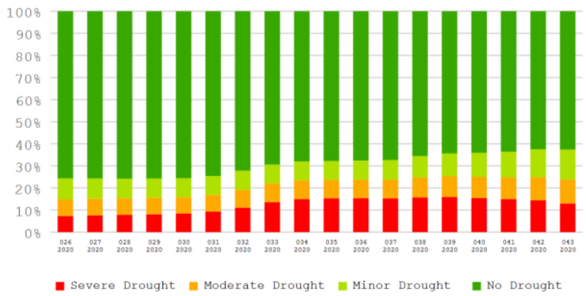




(b) Crop condition development graph based on NDVI_USA

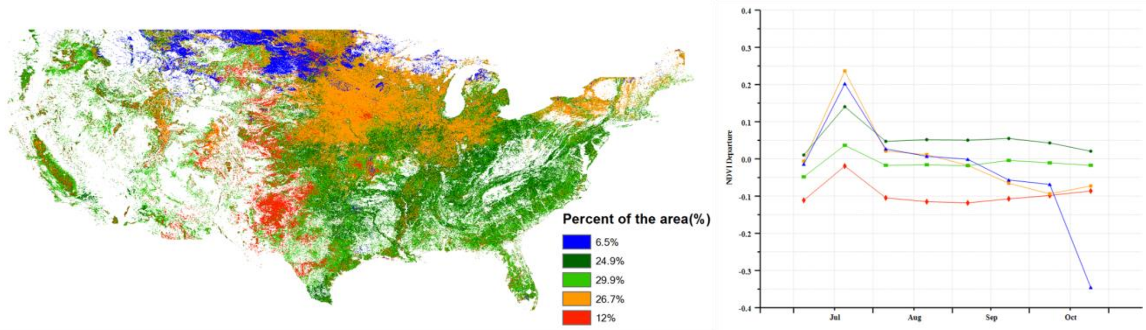
(c) Temperature development graph



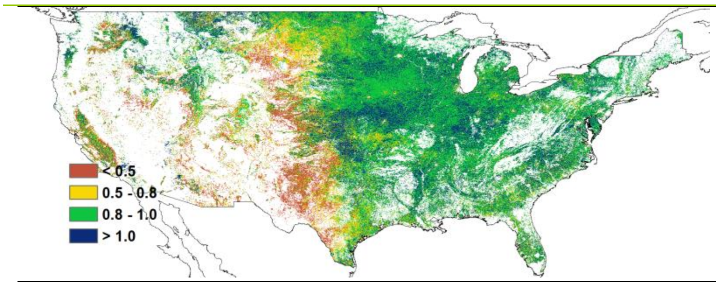


(d) Rainfall development graph

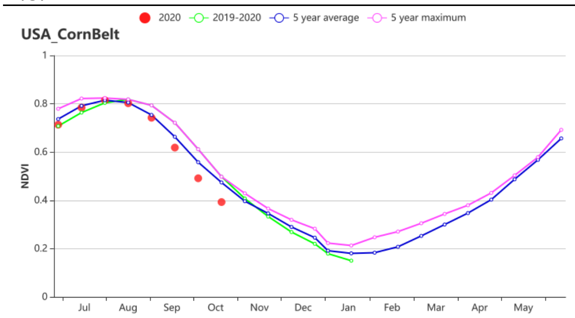
(e)Dynamic change of drought categories

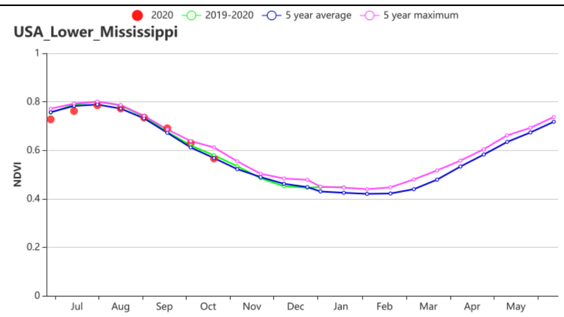


(f) NDVI departure clustering and its development profile

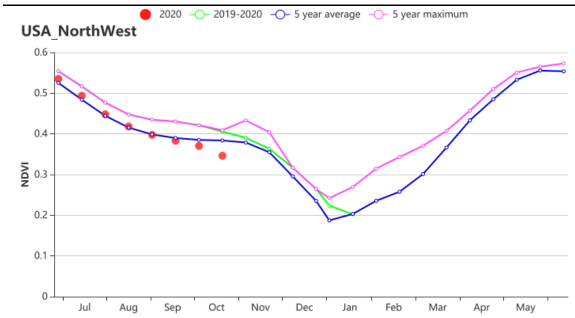


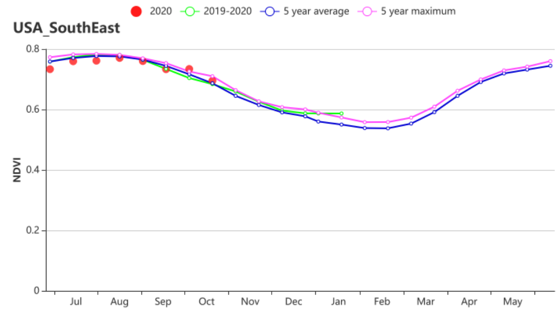
(g) Maximum VCI



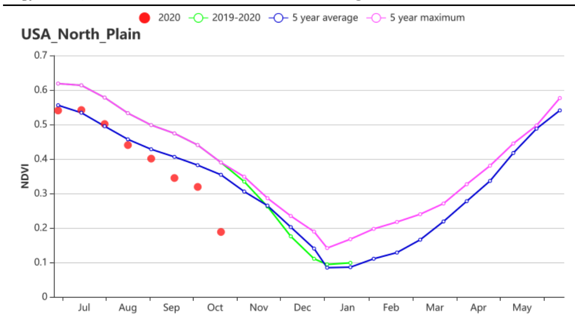


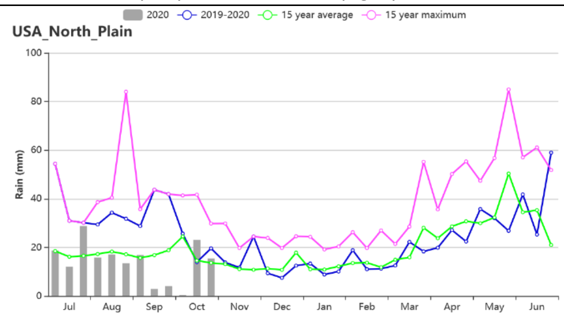
(j) Crop condition development graph based on NDVI of Corn Belt(left) and lower Mississippi(right)



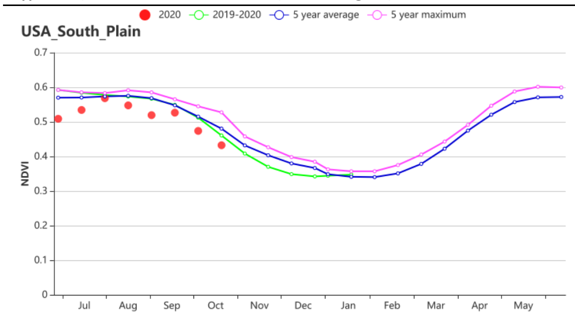


(j) Crop condition development graph based on NDVI of NorthWest(left) and SouthEast(right)





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



(n) Crop condition development graph based on NDVI(South Plain)

Table 3.76 United States' agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July2020 to October 2020

Region	RAIN		TEMP		RADPAR		BIOMSS	RAIN
	Current (mm)	Departure	Current (°C)	Departure	Current (mm)	Departure	Current (gDM/m^2)	Departure
California	9	-84	21.5	1.6	1414	1	336	-21
Corn Belt	257	-16	18.0	-0.6	1100	1	583	2
Lower Mississippi	504	3	24.0	-0.4	1144	-3	710	-3
North-eastern areas	131	-21	15.5	0.5	1202	1	454	-5
Northwest	169	-19	16.7	-0.1	1185	2	571	1
Northern Plains	560	9	24.1	0.2	1158	-3	731	-1
Southeast	150	-43	20.5	1.0	1341	3	514	-15
Southwest	354	0	23.3	-0.5	1211	-1	697	-4
Southern Plains	9	-84	21.5	1.6	1414	1	336	-21

Table 3.77 United States' agronomic indicators by sub-national regions, current season's values and departure, July2020 to October 2020

Region	Cropped arable land fraction		Maximum VCI	Cropping Intensity	
	Current (%)	Departure from 5YA (%)	Current	Current	Departure from 5YA (%)
California	45	8	0.74	103	-1
Corn Belt	100	0	0.96	100	0
Lower Mississippi	100	0	0.95	100	0
North-eastern areas	72	7	0.86	100	0
Northwest	86	6	0.80	103	-3
Northern Plains	100	0	0.94	100	-3
Southeast	37	-8	0.61	102	1
Southwest	80	-8	0.78	105	-1
Southern Plains	100	0	0.96	103	-2

[UZB] Uzbekistan

This report covers the harvest of winter wheat and maize. Sowing of winter wheat started in September.

The crop conditions for the country were generally favorable and peaked at above-average levels in August, according to the NDVI development graph. The national average VCIx was 0.93, and the cropped arable land fraction increased by 14%. Among the CropWatch agroclimatic indicators, TEMP and RADPAR were below average (−1.5° C, and -5%), while RAIN increased by 4%. The agro-climatic conditions resulted in an increase of BIOMSS by 27% compared to the recent fifteen −year average. The NDVI cluster graphs and profiles show generally positive NDVI departures, i.e., conditions were better than average and VCIx was higher from July to October covering most provinces of Samarkand, Kashkadarya on about 38% of the cropland. Only about 11% experienced below-average conditions.

Overall, the crop conditions are estimated as favorable.

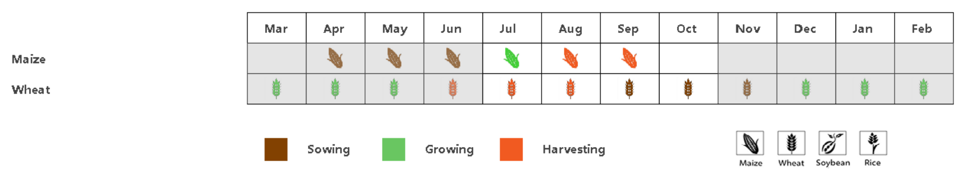
Regional analysis

In the rainfed Eastern hilly cereals zone, the main wheat production region of the country, NDVI was near average from July to early August and above average from the end of August until early October. RAIN was slightly above average (+7%), and RADPAR and TEMP were below average (−5% and -1.6° C). The combination of these factors resulted in a BIOMSS increase (+38%) compared to the 15YA average. The maximum VCI index was 1.00, while the cropped area increased by 24% compared to the five-year average. In short, crop condition was favorable in this zone.

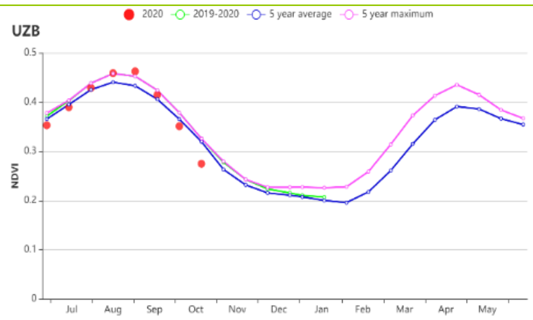
In the Irrigated Aral Sea cotton zone, the crop conditions were the least favorable among the three regions, however, they were still close to average. This zone does usually not receive any significant summer rains, so the shortage of rainfall (RAIN -82%) had no impact on crop production, as all the cotton is irrigated. The maximum VCI index was 0.83 while the cropped arable land increased by 4%. Overall, crop prospects were normal.

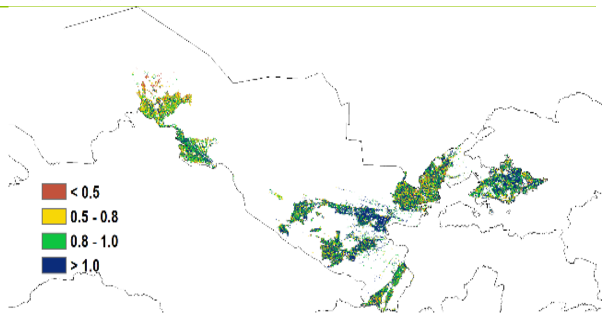
The crops in the Central region experienced the most favorable conditions according to the NDVI development graph. NDVI values exceeded the 5YA for most of the monitoring period. Average TEMP was 22.6°C, 1.2°C below the 15YA and RADPAR was also below average (-3%). The above average estimate for biomass (BIOMSS +5%) was in agreement with the NDVI values. Overall, the maximum VCI at 0.96 and the positive departure of the CALF (+13%) indicated favorable conditions in this region. Above average production is estimated for this region.

Figure 3.43 Uzbekistan's crop condition, July - October 2020

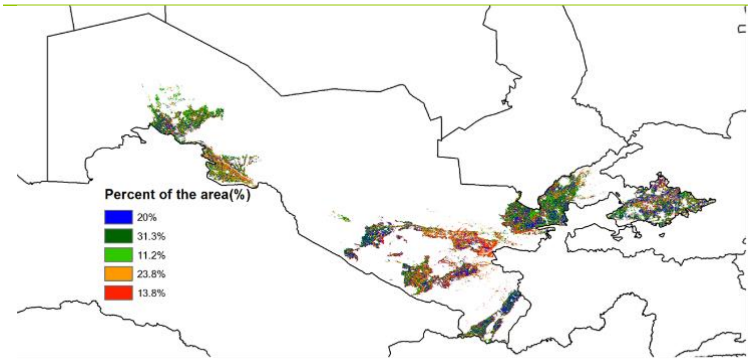


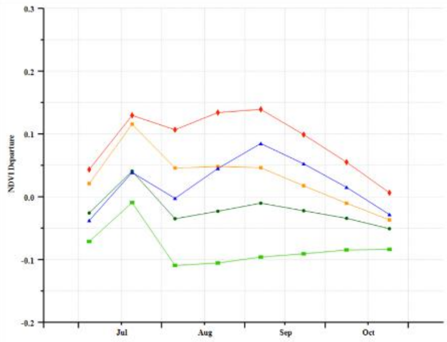
(a). Phenology of major crops



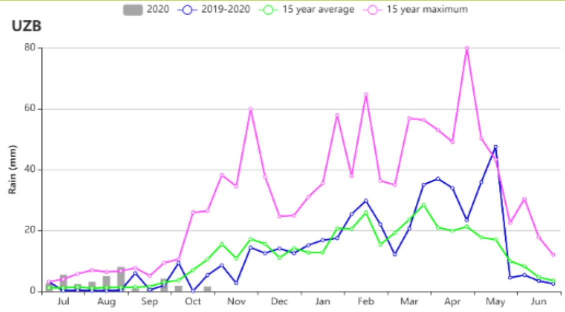


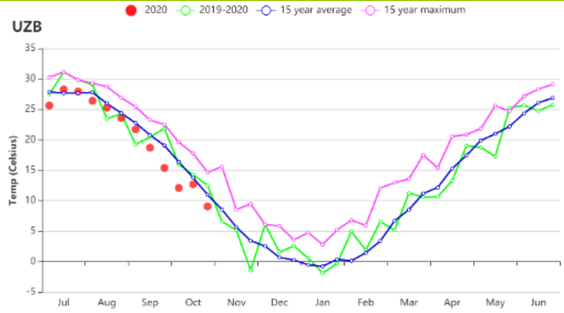
(b) Crop condition development graph based on NDVI (c) Maximum VCI



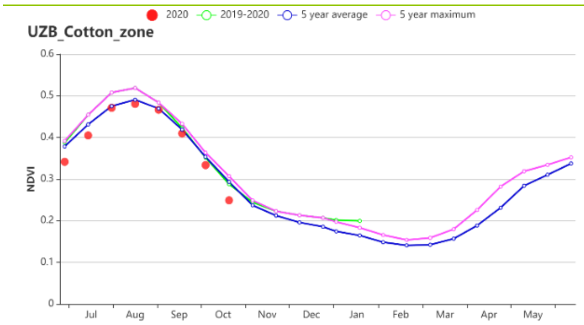


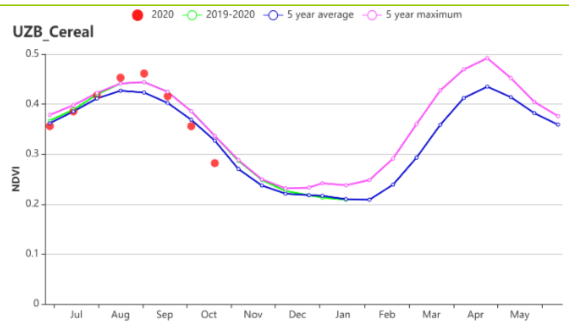
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



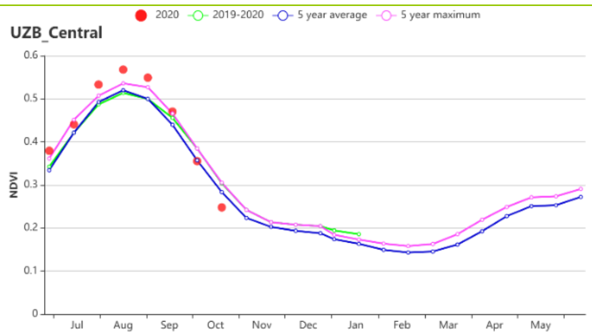


(f) Rainfall profiles (g) Temperature profiles





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



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

Table 3.78 Uzbekistan's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2020

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Central region with sparse crops	4	-68	22.6	-1.2	1296	-3	293	5
Eastern hilly cereals zone	39	7	20.4	-1.6	1307	-5	382	38

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Aral Sea cotton zone	3	-82	22.5	-0.8	1261	-3	279	-11

Table 3.79 Uzbekistan's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2020

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure (%)	Current (%)	Departure (%)	Current
Central region with sparse crops	85	13	100	0	0.96
Eastern hilly cereals zone	68	24	125	7	1.00
Aral Sea cotton zone	75	4	100	0	0.83

[VNM] Vietnam

This report summarizes the rice production conditions in Vietnam in the reporting period. Summer and autumn rice harvesting has been completed, while late rice is still in its growing season. Precipitation for the country was nearly 13% higher as compared to the 15YA. South Central Coast (+25%) and Northern Vietnam (+21%) are the two regions that received the highest precipitation, alleviating the drought conditions which were observed during the previous reporting period. Apart from precipitation, temperature (+0.2 °C) and RADPAR (-1%) were slightly above average.

Crop condition development based on NDVI was significantly lower than the 5YA. Apart from the Red River Delta and the North West region, all the regions had a similar pattern of NDVI, starting close to but below average and staying below average until October. The drops in October might have been due to cloud cover in the satellite images or floods caused by typhoons. The VCIx was generally above 0.8, except for the South Central Coast and the coastal provinces of the Mekong Delta where VCIx was low. The CALF was stable as compared to the recent five-year average. Vietnam was hit by a series of typhoons in October. Most of the rice had been harvested by then. Overall, due to slightly unfavorable crop conditions and stable cropped areas, crop outputs are estimated to be slightly below normal.

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 rainy season rice crop cultivation in **the North Central Coast** passed through 3 phases: sowing, growing and harvesting. RAIN was 21% above average, while the temperature was 24.1°C, an increase by 0.5°C as compared to the 15YA. RADPAR was below average (-2%) and BIOMASS was above average (+ 6%). The crop conditions were below average from July to September. Overall, VCIx was 0.94 and CALF was close to average, indicating moderate conditions in this region.

In the **North West**, the average rainfall was 21% above average and TEMP was also higher (+0.2°C) as compared to the 15YA. RADPAR was below average (-4%). In general, the climate condition pattern showed a small departure from the 15-year baseline. BIOMSS was above average (+ 2%) and the VCIx was in the range of 0.8 to 1. The NDVI profiles in the region showed spatial variations, and the values of this indicator decreased between July and September. CALF reached 100%. Generally, the crop conditions were close to average.

In the R**ed River Delta**, RAIN (+9%) and TEMP (+0.1°C) were above average and the VCIx was 0.92. RADPAR (-6%) and BIOMSS (-6%) were below 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 had below average crop conditions.

In the **South East**, total rainfall was 1553 mm, 2% below 15YA. Temperature was 25.4°C (+0.3°C). RADPAR was higher than average (+2%). BIOMSS was above average (+2%) as well. The crop condition graph based on NDVI presented some below-average values. Overall, VCIx (0.95) and CALF (+1%) indicated normal conditions in this region.

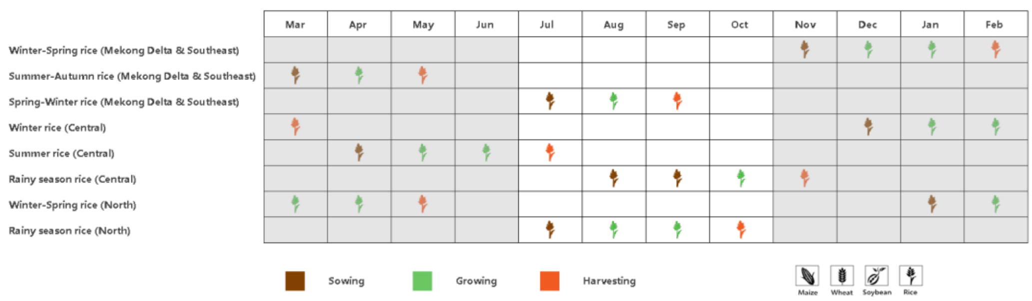
During this reporting period, the summer-autumn rice crop in the **South Central** Coast reached maturity. Most of the crop was harvested before the typhoons hit the region. RAIN was 25% above average, while

TEMP was 23.7°C (0.4°C) and RADPAR (+4%) were above average. BIOMSS was also above average (+4%). The crop conditions were below average from July to September. VCIx (0.89) and CALF (96%), in combination with the other CropWatch indicators, presented generally favorable crop conditions.

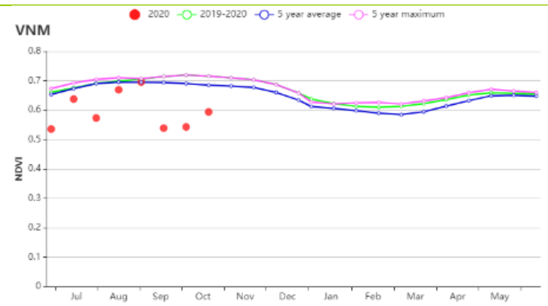
The summer-autumn rice crop in the **Central Highlands** passed through 2 phases: sowing and growing. RAIN was 3% above average and TEMP was 22.8°C (+0.2°C) as compared to the 15YA. RADPAR was above average (+12%). Despite the big reduction in rainfall, BIOMSS was above average (+9%). The crop conditions were below average. Overall, high VCIx (0.98) and stable CALF (100%) indicated normal conditions in this region.

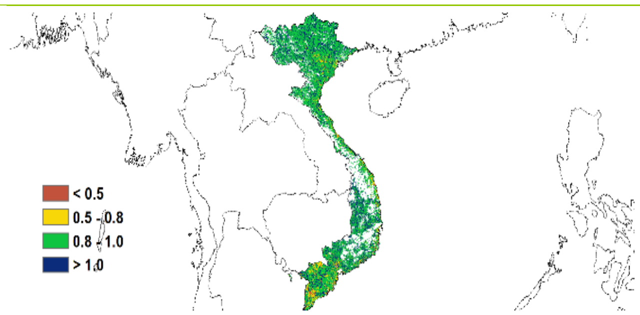
During this reporting period, the Spring-Winter rice crop in the **Mekong River Delta** had reached maturity and got harvested in October. RAIN (+7%) and TEMP (+0.1℃) were above average. RADPAR stayed near average (0%) and BIOMSS was slightly below average (-1%). The crop condition graph based on NDVI was below average during the previous monitoring period and stayed below average during this period as well. The poor water supply from the Mekong River continued to have a detrimental effect on rice production in the delta. VCIx (0.88) and CALF (86%) indicated unsatisfactory conditions in this region.

Figure 3.44 Vietnam's crop condition, July-October 2020



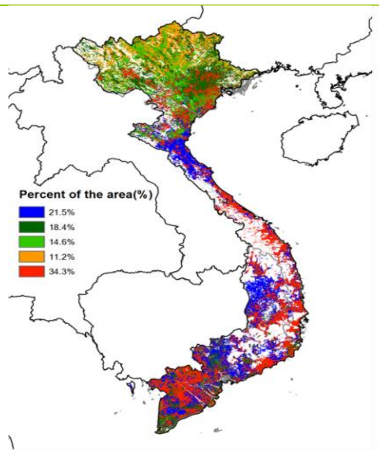
(a). Phenology of major crops

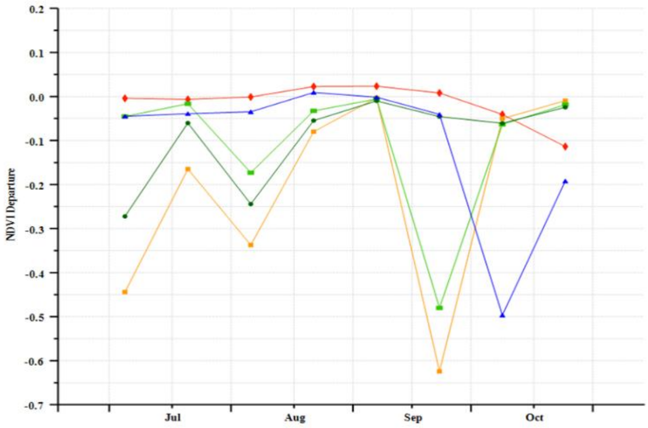




(b) Crop condition development graph based onNDVI

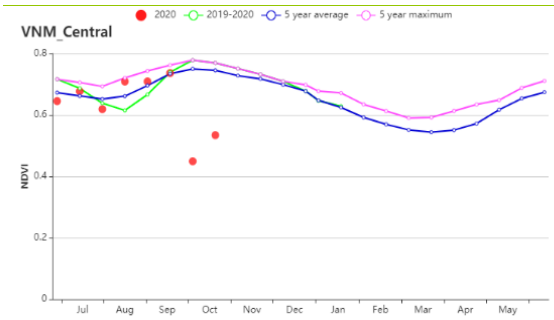
(c) Maximum VCI

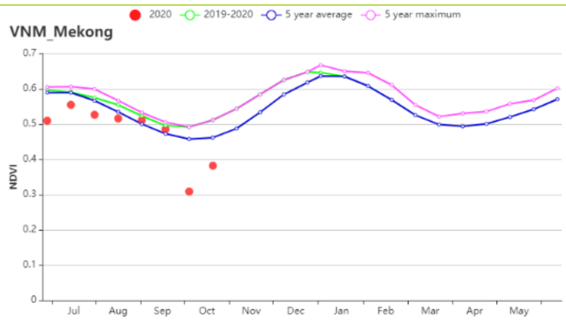




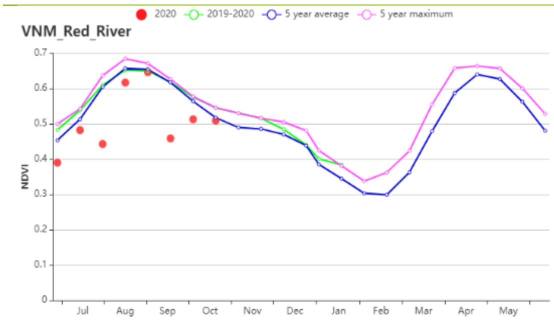
(d) Spatial NDVI patterns compared to 5YA

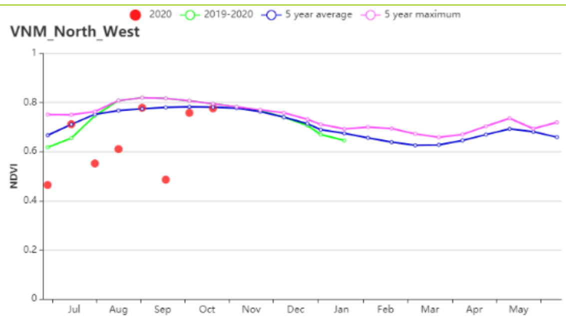
(e) NDVI profiles



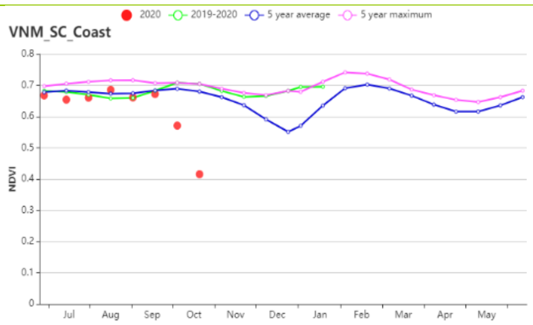


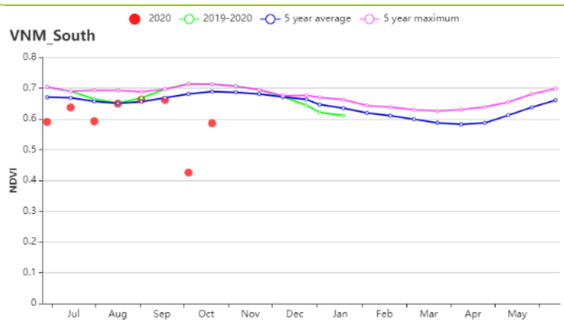
(f) Crop condition development graph based on NDVI Central Highlands Vietnam (left), and Mekong River Delta (right).



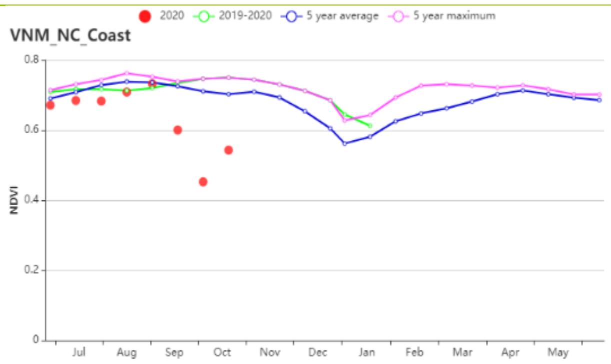


(g) Crop condition development graph based on NDVI North West Vietnam (left), and Red River Delta (right).





(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 3.80 Vietnam's agro-climatic indicators by sub-national regions, current season's values and departure from 15YA, July-October 2020

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure from 15YA (%)	Current (gDM/m^2)	Departure from 15YA (%)
Central Highlands	1555	3	22.8	0.2	1105	9	685	10
Mekong River Delta	1428	7	26.9	0.1	1194	0	818	-1
North Central Coast	1689	21	24.1	0.5	1041	-2	671	0
North East	1784	21	23.3	-0.1	1014	-8	641	-7
North West	1490	21	21.9	0.1	1016	-4	606	-3
Red River Delta	1587	9	26.4	0.1	1088	-6	735	-6
South Central Coast	1579	25	23.7	0.4	1097	4	701	4
South East	1553	-2	25.4	0.3	1160	2	781	2

Table 3.81 Vietnam's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July-October 2020

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current	Departure from 5YA (%)	Current(%)	Departure from 5YA(%)	Current
Central Highlands	100	0	108	-15	0.98
Mekong River Delta	86	-1	174	2	0.88
North Central Coast	98	0	131	-1	0.94
North East	100	0	138	10	0.97
North West	100	0	112	-8	0.98
Red River Delta	97	1	146	-4	0.92
South Central Coast	96	0	136	-4	0.89

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current	Departure from 5YA (%)	Current(%)	Departure from 5YA(%)	Current
South East	96	1	110	-16	0.95

[ZAF] South Africa

Wheat is planted mainly between mid-April and mid-June in the winter rainfall areas (Mediterranean zone), under rainfed conditions (no irrigation). In the Dry Highveld and Bushveld maize areas, which receive summer rains, it is planted between mid-May and the end of July. In that zone, wheat is grown under rainfed and irrigated conditions. Wheat in the Mediterranean zone reach maturity in September and harvest concludes in October. In the other zones, harvest takes place around December or January. Sowing of the summer crops, such as maize and soybeans starts in October, when the first significant rains start to fall.

This report covers the main growing period of wheat. Nationwide, rainfall was 90 mm, 20% below the 15YA. The average temperature was 14 °C, a decrease by 0.6 °C from the 15YA. The estimated biomass was 4% below the average. Total cropped area was 27%. It had declined by 2% and the maximum VCI was at 0.72. The NDVI development graph shows that at the national level, the values were close to the average for the whole monitoring period. The spatial distribution of NDVI profiles shows a mixed pattern among the regions: 6.7% of the cropland, mostly located in the Western Cape (blue area) had positive anomalies. In the Eastern Cape, negative anomalies were observed (red areas 8.5%) and hardly any NDVI departures were observed in the regions of Free State, Mpumalanga, Gauteng and Kwazulu Natal.

Regional analysis

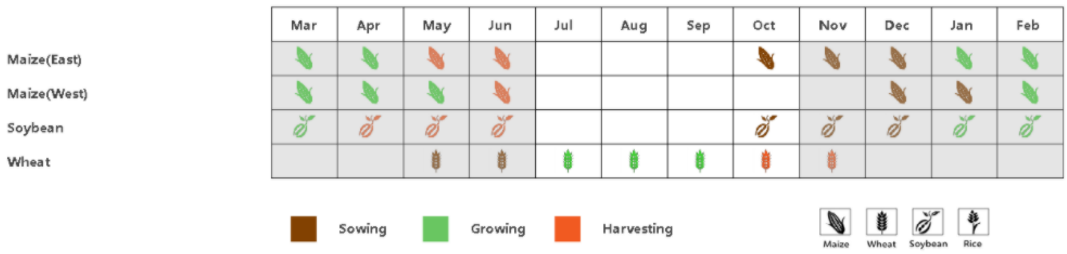
The analysis will focus on the main production zones: **Mediterranean**, **Humid Cape Fold Mountains and Dry Highveld**, **Bushveld maize zones**.

In the Mediterranean zone, the rainfall was 267mm, 25 % below the 15YA, the temperature was 12 °C with 0.6 °C of departure below the 15YA, and the radiation was 971 MJ/m^2 (+2%). This resulted in a biomass estimate of 339 gDM/m2 (-2%). CALF increased 3% and VCIx was 0.88. Moreover, this region is cultivated with a single cropping system, and cropping intensity was at the 5-year average (CI). From July up to October, the NDVI development trended above the 5year maximum. Crop conditions were favorable in this region.

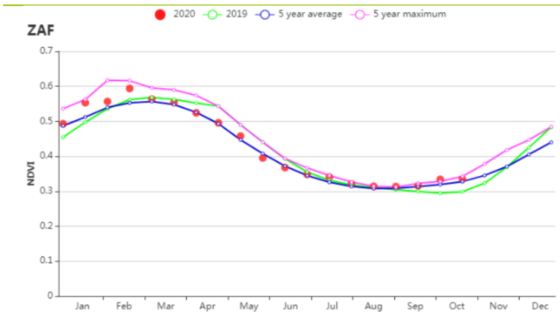
The **Humid Cape Fold mountain zone** recorded 142 mm of rainfall (-32%), and the temperature was 15 °C (-0.4°C). The observed radiation was slightly above average (+1%) and biomass slightly below (-3%). CALF remained stable at 73 (no departure). At the same time, this region is cultivated with a mixture of single and double cropping system, and cropping intensity was below the 5-year average (CI, -1%). The NDVI development graph shows that the condition remained close to the average for the whole period.

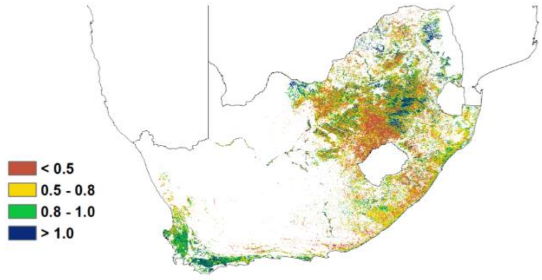
In the **Dry Highveld and Bushveld maize areas**, the rainfall was 67 mm (-25%), the temperature (-0.6 °C) and radiation (-2%) were below average. Accordingly, the estimated biomass was also below average (-4%). CALF increased by 4 %. Moreover, this region is cultivated with a single cropping system, and cropping intensity was lower than the 5-year average (CI, -1%). NDVI profile in this main maize production region was slightly below the average from July until October, while the maximum vegetation condition observed was at 0.72.

Figure 3.45 South Africa's crop condition, July - October 2020

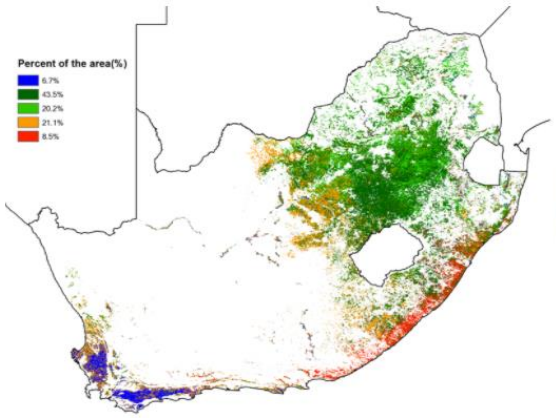


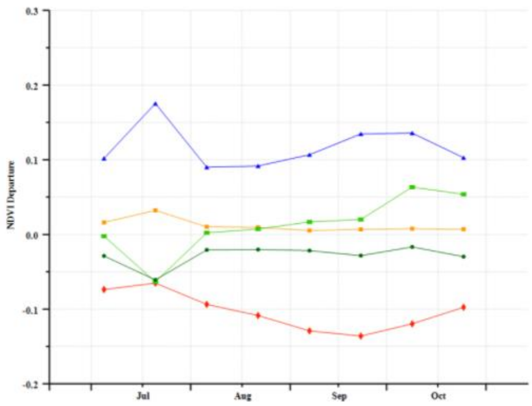
(a). Phenology of major crops



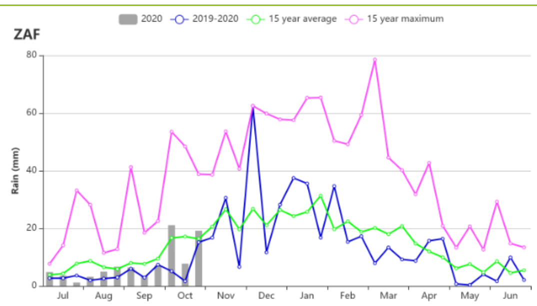


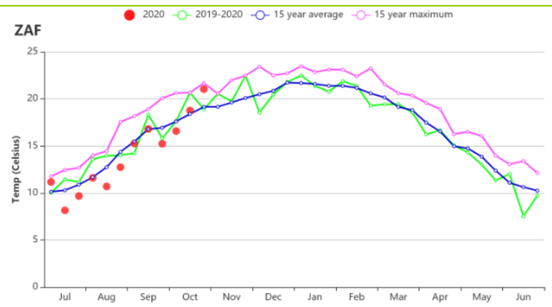
(b) Crop condition development graph based on NDVI (c) Maximum VCI



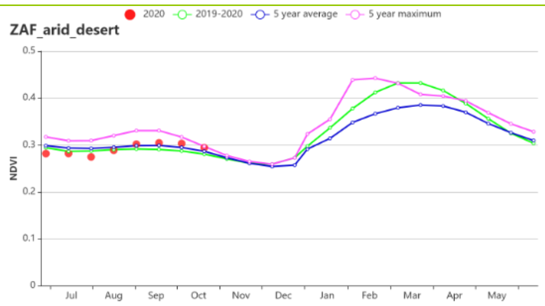


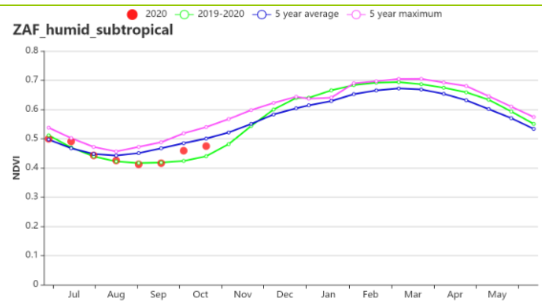
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



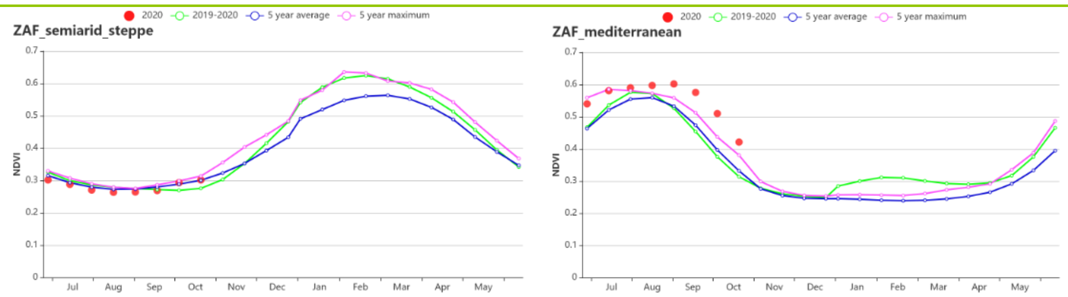


(f) Rainfall profiles (g) Temperature profiles





(h) Crop condition development graph based on NDVI (Arid desert (left) and Humid Cape Fold Mountains (right))



(i) Crop condition development graph based on (Dry Highveld and Bushveld (left) and Mediterranean Zone (right))

Table 3.82 South Africa's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2020

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Humid Cape Fold Mountains	142	-32	15.0	-0.4	965	1	379	-3
Mediterranean Zone	267	25	12.2	-0.6	971	2	339	-2
Dry Highveld and Bushveld	67	-25	14.0	-0.6	1145	-2	377	-4

Table 3.83 South Africa's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2020

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure (%)	Current (%)	Departure (%)	Current
Humid Cape Fold Mountains	73	0	103	-1	0.66
Mediterranean Zone	86	3	100	0	0.88
Dry Highveld and Bushveld	12	4	100	-1	0.72

[ZMB] Zambia

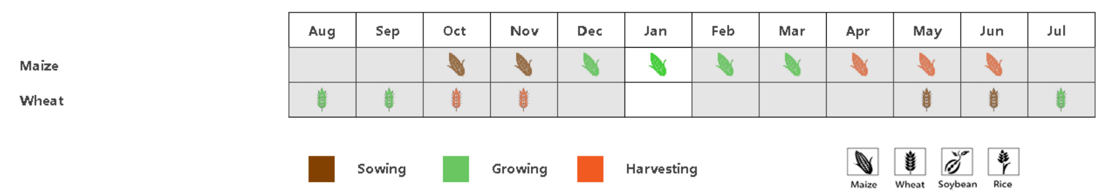
The period covers the end of the irrigated dry-season crops and the onset of the rainfed season. Key irrigated crops are predominately wheat, green maize, horticultural crops and vegetables. Irrigated wheat was harvested in late September into October. While the monitoring quarter is in the dry season, recorded rainfall was 19 mm (-3%). Average temperature of 21.5℃ and average radiation of 1339 MJ/m2 (-4%) caused a slight increase in biomass production estimates of 349 gDM/m2 (+3%). The cropped arable land fraction (CALF) was 39% resulting mainly from irrigated areas as indicated by the maximum VCI of 0.70. Overall, conditions for the irrigated crops were favorable.

Regional Analysis

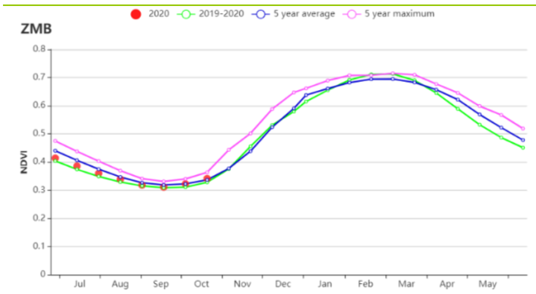
Based on regional analyses of the agro-ecological region, rainfall received in all the agro-ecological zones was above the 15 year average except for the western semi-arid zone where the departure was negative (-62%). The temperature varied from 21.2℃ to 22.0℃ with negligible departure from the 15YA. The radiation in all agro-ecological zones was more than 1300 MJ/m2 (+4%) and resulted in positive BIOMSS departures except in the Luangwa-Zambezi Rift Valley (-1%). A similar pattern was observed for the Cropped Arable Land Fraction (CALF) with highest CALF for Northern High Rainfall Zone (79%, +1%) and lower values in the other zones: Luangwa-Zambezi Rift Valley (14%, -53%), Central-East South and Plateau (26%, -14%) and the Western Semi-Arid Plateau (41%, -17%). The vegetation health index (max VCI) was lowest in Luangwa-Zambezi Valley (VCIx 0.53).

The weather outlook for the next quarter indicates a higher-than-normal probability of above-average cumulative rainfall, which portrays favourable yield prospects for the 2021 cereal crops.

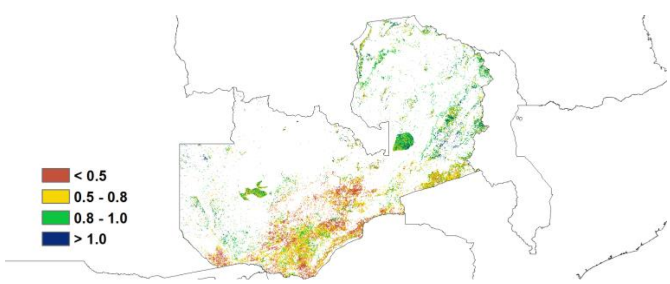
Figure 3.46 Zambia's crop condition, July - October 2020



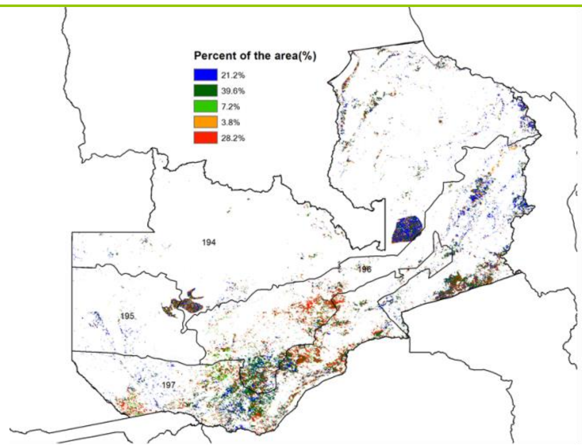
(a). Phenology of major crops

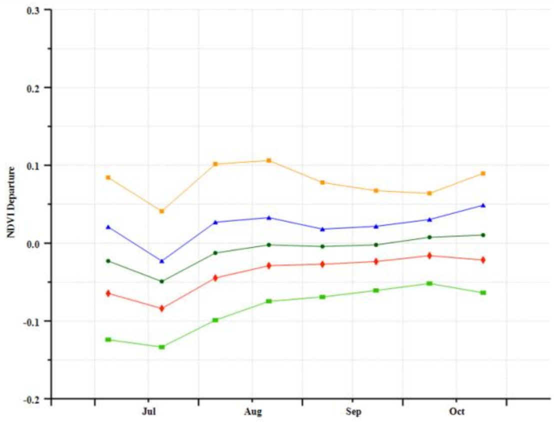


(b) Crop condition development graph based on NDVI

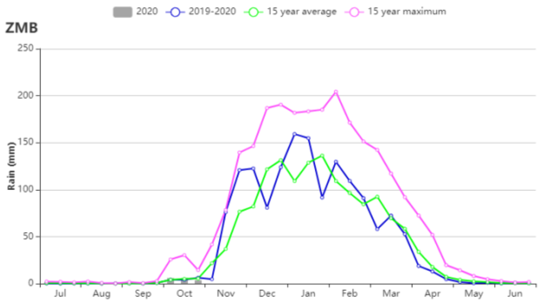


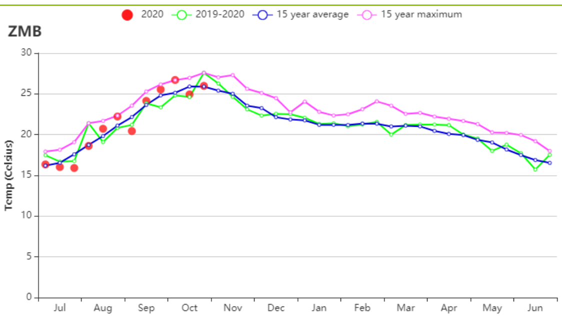
(c) Maximum VCI



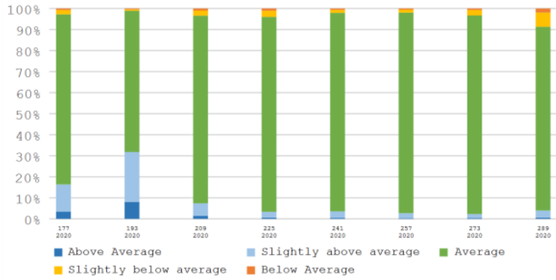


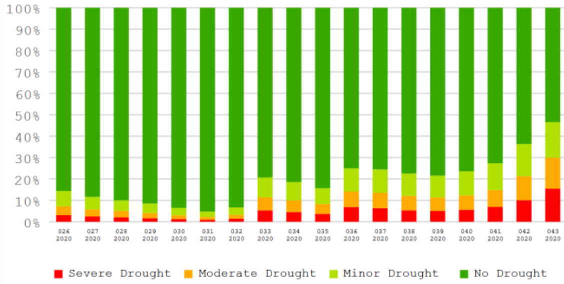
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles





(f) Rainfall profiles (g) Temperature profiles





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

Table 3.84 Zambia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July - October 2020

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Western semi-arid plain	4	-62	22	0.1	1348	-4	300	17
Northern high rainfall zone	32	1	21.2	-0.1	1361	-3	400	6
Central-Eastern and Outhern Plateau	14	24	21.5	0	1319	-4	359	0
Luangwa Zambezi Rift VAlley	10	33	21.5	0.1	1338	-4	291	-1

Table 3.85 Zambia's agronomic indicators by sub-national regions, current season's values and departure from 5YA, July - October 2020

Region	Cropped arable land fraction	Cropping intensity	Maximum VCI

	Current (%)	Departure (%)	Current (%)	Departure (%)	Current
Western semi-arid plain (AEZ IIb).	**41**	**-17**	**100**	**0**	**0.73**
Northern high rainfall zone (AEZ III).	**79**	**1**	**109**	**4**	**0.85**
Central-eastern and southern plateau (AEZ IIa).	**26**	**-14**	**100**	**0**	**0.7**
Luangwa Zambezi rift valley (AEZ I).	**14**	**-53**	**100**	**-1**	**0.57**

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 presents an updated estimate of major cereals and soybean production at provincial and national level as well as summer crops production and total annual outputs (4.2) and 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 (4.3). Additional information on the agro-climatic indicators for agriculturally important Chinese provinces are listed in table A.11 in Annex A.

4.1 Overview

From the perspectives of agroclimatic indicators, the overall conditions were generally favorable in China from July to October 2020, with rainfall increasing above average by 10%, temperature and radiation slightly down by 0.4°C and 10%, respectively. As a result, the maximum VCI was rather high at 0.95. Moreover, the mean of CALF for the whole country was 1% above average.

According to the spatial distribution of rainfall profiles, both above-average and below-average rainfall was observed during the monitoring period. Some provinces in middle China (most parts of Chongqing, Jiangsu, Anhui, southern parts of Henan, and some parts in Hubei, marked in dark green) received 120 mm/dekad more rainfall as compared to the average in mid-July, while some parts in Yunnan, Sichuan, Shaanxi, Shanxi, Henan, and Shandong (marked in light green) also experienced excessive rainfall (more than 90 mm/dekad as compared to the average) in Mid-August. All of the main agricultural regions of China recorded above-average rainfall, with the largest positive departure occurring in Northeast China (+46%).

Only one main agricultural region in China recorded above-average temperatures (Southern China, +0.1°C), while the other regions all recorded below-average temperatures with negative departures ranging from -0.7°C (Inner Mongolia and Loess region) to -0.1°C (Northeast China). The map with the spatial distribution of temperature profiles indicates that temperatures fluctuated during the monitoring period as follows: 10.1% of cultivated regions in northeast parts of China (western parts of Heilongjiang and Jilin, and some parts of Inner Mongolia) had positive temperature anomalies by more than 1.3°C, occurring in middle to late July, while 44% of the cropped areas in central, northern, and eastern China (covering 14 provinces) experienced negative temperature anomalies by more than 2.5°C in both mid-July and early October.

As for RADPAR, all AEZs in China received less radiation as compared to the 15YA, as a result of excessive rainfall, with the biggest negative anomaly in Southwest China (-18%), and the smallest in Huanghuaihai (-5%). In respect to BIOMSS, all of the AEZs in China had negative departures of BIOMSS, with the departures between -18% (South-west China) and -5% (Southern China), as a result of the relatively lower temperatures. As can be seen in the spatial distribution of potential biomass departure from the 15YA, negative departures by more than 20% were concentrated mainly in southwest China (some parts in Yunnan, Guizhou, Sichuan, and Tibet) and some parts in Hunan.

CALF increased in the Loess region (+4%) and Inner Mongolia (+2%) 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 largest departure of Cropping Intensity occured in Southwest China (+7%), while all the other AEZs in China had the CI departure ranging from -1% to 4%. The VCIx values were higher than 0.9 in all of the main producing regions of China, with values between 0.94 and 0.98. When combining VHIn with the rainfall profiles, droughts were estimated for some parts of Huang Huai Hai region in July only.

Table 4.1 CropWatch agroclimatic and agronomic indicators for China, July - October 2020, departure from 5YA and 15YA

Region	Agroclimatic indicators				Agronomic indicators		
	Departure from 15YA (2004-2018)				Departure from 5YA (2014-2018)		Current period
	RAIN (%)	TEMP (°C)	RADPAR (%)	BIOMSS (%)	CALF (%)	Cropping intensity (%)	Maximum VCI
Huanghuaihai	19	-0.4	-5	-6	0	-1	0.94
Inner Mongolia	24	-0.7	-7	-8	2	0	0.94
Loess region	1	-0.7	-6	-9	4	0	0.98
Lower Yangtze	6	-0.6	-10	-10	0	3	0.94
Northeast China	46	-0.1	-9	-6	0	0	0.97
Southern China	3	0.1	-6	-5	0	4	0.94
Southwest China	17	-0.4	-18	-18	0	7	0.96

Figure 4.1 China crop calendar

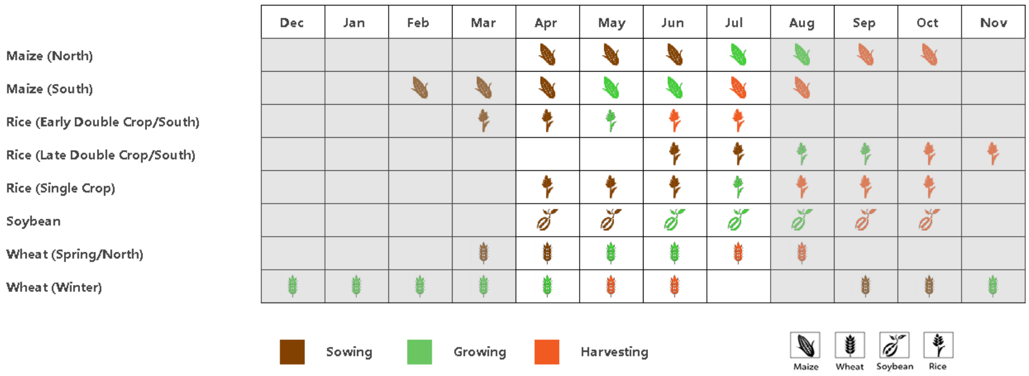


Figure 4.2 China spatial distribution of rainfall profiles, July to Oct 2020

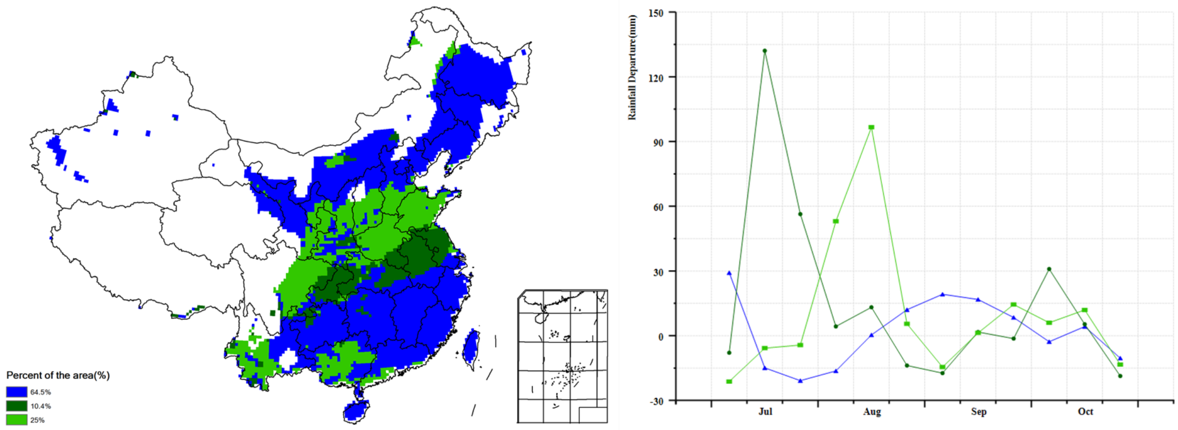


Figure 4.3 China spatial distribution of temperature profiles, July to Oct 2020

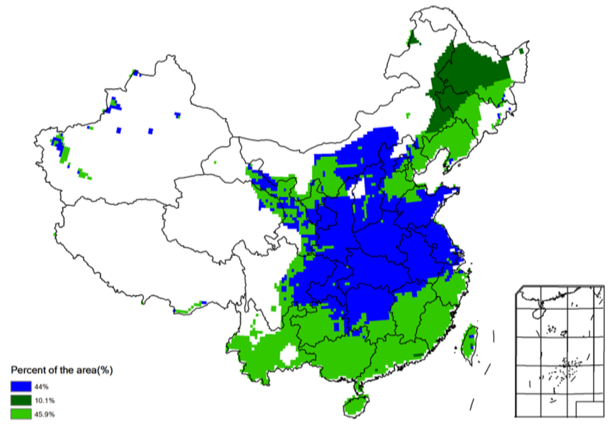


Figure 4.4 China cropped and uncropped arable land, by pixel, July to Oct 2020

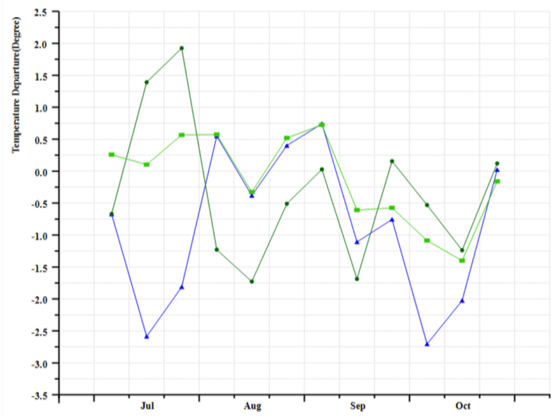


Figure 4.5 China maximum Vegetation Condition Index (VCIx), by pixel, July to Oct 2020

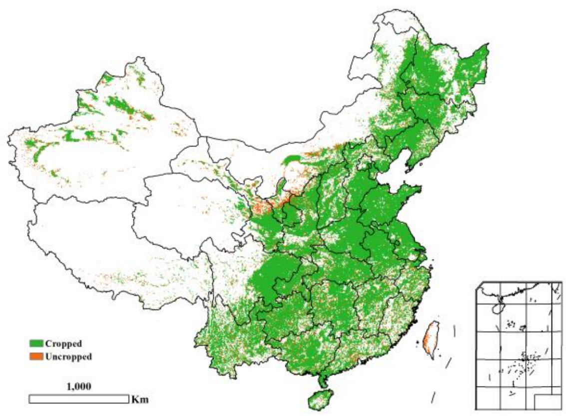
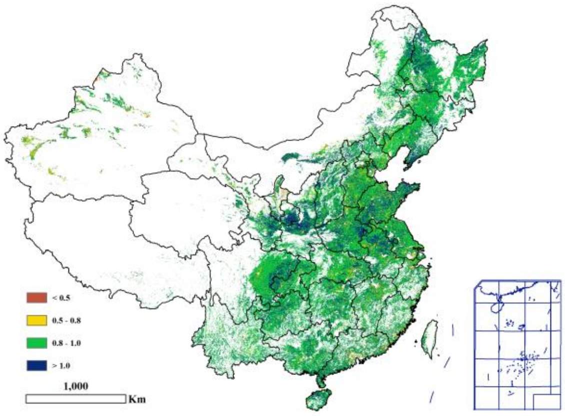
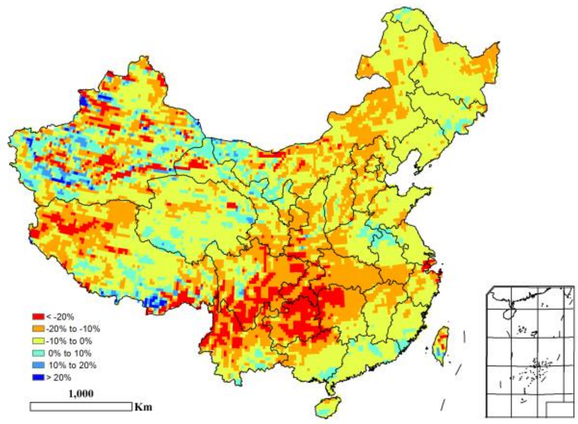
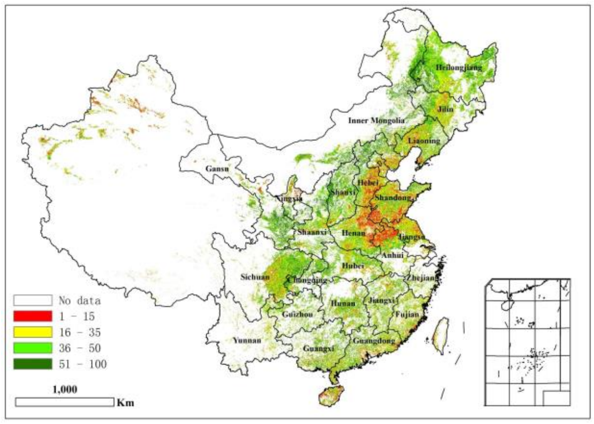


Figure 4.6 China biomass departure map from 15YA, by pixel, July to Oct 2020



F Figure 4.7 China minimum Vegetation Health Index (VHIm), by pixel, July to Oct 2020





4.2 China's winter crops production

Thousands of samples over more than 600 counties in Northeast China, North China and the middle and lower reaches of the Yangtze River from July to October in 2020 were collected and used as the trianing and validation samples. In support of the national 10 m resolution cultivated land data, the remote sensing index model, agrometeorological yield estimation model and crop area estimation method, the main grain and oil crops in China in 2020 (mainly including maize, rice, corn, rice, etc.) were quantitatively monitored and predicted. The results are as follows:

The latest remote sensing data was used to revise the total grain output in 2020 and it is expected to be 631.437 million tons, an increase of 5.06 million tons over the same period last year, an increase of 0.8%. Among them, the total output of autumn crops (including corn, mid-season rice, late rice, spring wheat, soybeans, tuber crops, and other minor crops) is expected to be 466.489 million tons, an increase of 0.3% over 2019 and an increase of 1.39 million tons (Table 4-2). In terms of provinces, the provinces with the highest year-on-year increase in autumn grain and total annual grain output are mostly distributed in the Northwest, North China and the Loess Plateau, including Shanxi, Ningxia, Henan, Shaanxi, Shandong, Hebei, Gansu, etc. The increase rate was more than 3%, and the total grain output increased by more than 2% in those provinces mentioned above. The provinces with the highest decline in autumn grain and total grain output included Jilin, Jiangxi, Jiangsu, Inner Mongolia, Heilongjiang, etc. The reduction of crops production was mainly due to extreme weather such as floods and typhoons.

Table 4.2 China 2020 winter crops, summer crops and total annual crop production and percentage difference from 2019, by province

	Winter crops		Early rice		Summer crops		Total#	
	2020	△(%)	2020	△(%)	2020	△(%)	2020	△(%)
Anhui	12042	2	1911	3	20544	-0.3	34497	0.5
Chongqing	2318	3			8172	0.6	10490	1.0
Fujian			1564	3	4718	-1.1	6282	0.0
Gansu	3605	0			6838	3.3	10443	2.3
Guangdong			5060	4	8283	2.0	13343	2.8
Guangxi			5137	5	9926	-0.4	15063	1.4
Guizhou					12360	-0.7	12360	-0.7
Hebei	12336	0			21356	3.5	33692	2.3
Heilongjiang					69889	-1.2	69889	-1.2
Henan	28081	4			26635	5.2	54716	4.7
Hubei	5492	2	2077	-11	18058	1.2	25627	0.3
Hunan			8399	1	19629	-1.0	28028	-0.4
Inner Mongolia					29385	-1.7	29385	-1.7
Jiangsu	10216	-1			19865	-1.8	30081	-1.4
Jiangxi			7206	-2	10227	-2.8	17433	-2.4
Jilin					37055	-3.3	37055	-3.3
Liaoning					23456	3.2	23456	3.2
Ningxia					3029	8.2	3029	8.2
Shaanxi	4223	6			6995	4.0	11218	4.6
Shandong	25638	3			20913	3.9	46550	3.3
Shanxi	2352	2			10041	8.5	12393	7.2
Sichuan	5785	-1			27250	0.4	33035	0.0
Yunnan					14786	-1.3	14786	-1.3
Zhejiang			801	1	6416	0.3	7217	0.4
Sub total	112087	2.2	32154	1	437096	0.5	581337	0.8
Other provinces*	19415	5.9	1292	-3	29393	-2.2	50100	0.7
China*	131502	2.7	33446	1	466489	0.3	631437	0.8

* Production of Taiwan province is not included.

Maize

The total national maize output in 2020 is 226.078 million tons, an increase of 1.73 million tons and 0.8% from 2019. The national maize planting area increased slightly by 0.2% on average, while the national average maize yield recovered from the year of reduced production in 2019, an increase of 0.5% on average (Table 4-3). Benefit from good rain and heat conditions, maize production in the Huanghuaihai Plain, the Loess Plateau, and the Northwest Region has increased significantly compared with last year, including Henan, Hebei, Shandong, Shanxi, Shaanxi, Ningxia, Gansu and Xinjiang. Maize yields increased by more than 2.0%. Prompt the increase in maize output in 8 provinces and regions increased above 3.0% on average. And the increase in maize output in Henan, Shandong and Hebei ranked the top three in China, with an increase of 0.85 million tons, 0.7 million tons and 0.63 million tons respectively.

Table 4.3 China 2020 production (thousand tons) of maize, rice, wheat, and soybean, and percentage change from 2019, by province

	Maize		Rice		Wheat		Soybean	
	2020	△(%)	2020	△(%)	2020	△(%)	2020	△(%)
Anhui	3604	1.5	17356	-0.4	11527	1.6	1066	1.3
Chongqing	2129	2.0	4698	0.0	1143	2.5		
Fujian			2823	1.3				
Gansu	5727	3.3			3131	2.2		
Guangdong			11448	2.9				
Guangxi			10672	2.2				
Guizhou	5173	0.4	5265	-1.8				
Hebei	18741	3.5			12032	0.3	188	4.6
Heilongjiang	40969	-2.3	21713	0.9	437	-0.5	5123	-1.0
Henan	15895	5.6	3836	3.2	27963	4.2	819	5.4
Hubei			15540	-0.7	3945	2.0		
Hunan			25265	-0.4				
Inner Mongolia	23088	-1.8			1898	-4.8	1185	-0.1
Jiangsu	2184	0.9	16081	-2.3	9990	-0.6	747	0.1
Jiangxi			16432	-2.4				
Jilin	29763	-3.8	5757	-0.8			796	-0.2
Liaoning	18129	3.7	4403	0.9			418	2.4
Ningxia	1730	8.6	441	7.1	758	-4.4		
Shaanxi	3973	5.2	1044	-0.6	4138	5.6		
Shandong	19007	3.8			25409	2.9	699	6.2
Shanxi	9260	8.6			2277	1.7	158	5.9
Sichuan	7160	0.4	14784	0.3	4941	-1.5		
Xinjiang	6690	5.3			5132	-2.3		
Yunnan	6351	-0.3	5730	-2.5				
Zhejiang			6523	0.4				
Sub total	219571	0.9	189809	-0.1	114721	1.8	11198	0.6
China*	226078	0.8	201176	-0.2	127052	2.9	14574	0.9

* Production of Taiwan province is not included.

In combination of remote sensing data during the whole growth period with meteorological data, the maize yields of four northeastern provinces were revised. The results showed that maize lodging caused 950 thousand tons and 1.18 million tons drop of maize production in Heilongjiang province and Jilin province, respectively, the decreasing rate of which are 2.3% and 3.8%. Inner Mongolia was affected by the lack of rainfall during the maize tasseling period, and the maize production decreased by 420 thousand tons. The agro-meteorological conditions in Liaoning province were generally normal with sufficient rain and heat during the key growth period of maize, and the maize production increased by 650 thousand tons year-on-year. With the impact of typhoons, the total maize output of the four northeastern provinces decreased by 1.9 million tons year-on-year. On the other hand, the increase of maize yield in the Huanghuaihai plain, the Loess Plateau and the Northwest region compensated the impact of the reduced maize production in the Northeastern provinces. The typhoon-induced maize lodging and yield decrease in some parts of the Northeast provinces did not result in the decrease of the national maize production.

Rice

The total rice production of China was 201.176 million tons, with a decrease of 0.2% and a reduction of 440 thousand tons when compared to last year. The continuous heavy rainfall and floods in the rice-producing zones from June to August significantly affected the production of mid-season rice, which resulted in a decline of 740 thousand tons compared to 2019 and the total production of 132.452 million tons. Late rice benefitted from favorable agro-climatic conditions in the late growing season , the total production of late rice was 35.278 million tons, with an increase of 0.3% than 2019(Table 4-4). Though the Northeast China suffered from continuous typhoons, the rice production was rarely affected. A decrease of 50 thousand tons for the rice production was observed in Jilin Province, while Heilongjiang and Liaoning provinces both increased.

Table 4.4 China 2020 early rice, single rice/semi-late rice, and late rice production and percentage difference from 2019, by province.

	Early rice		Single rice		Late rice	
	2020	△(%)	2020	△(%)	2020	△(%)
Anhui	1911	3.2	13720	-0.8	1725	-0.8
Chongqing			4698	0.0		
Fujian	1564	3.4			1259	-1.1
Gansu						
Guangdong	5060	4.1			6388	2.0
Guangxi	5137	5.0			5535	-0.4
Guizhou			5265	-1.8		
Hebei						
Heilongjiang			21713	0.9		
Henan			3836	3.2		
Hubei	2077	-11.5	10584	1.2	2879	1.3
Hunan	8399	1.0	8678	-1.0	8188	-1.0
Inner Mongolia						
Jiangsu			16081	-2.3		
Jiangxi	7206	-1.9	3006	0.0	6220	-4.0
Jilin			5757	-0.8		
Liaoning			4403	0.9		
Ningxia			441	7.1		
Shaanxi			1044	-0.6		
Shandong						
Shanxi						
Sichuan			14784	0.3		
Xinjiang						
Yunnan			5730	-2.5		
Zhejiang	801	0.9	4848	0.5	874	-0.9
Sub total	32154	0.8	124587	-0.2	33068	-0.7
China*	33446	0.6	132452	-0.6	35278	0.3

* Production of Taiwan province is not included.

Soybean

The total soybean production of China continued to increase following the same trends as the past 5 years and reached 14.574 million tons this year, with an increase of 130 thousand tons and an increase of 0.9% when compared to 2019. Across the country, the cropping area of soybean increased by 0.5% than average. For provinces of ShanXi, Inner Mongolia, Shandong, Liaoning and HeBei, the planted area of soybean increased by more than 1%. The agro-climatic conditions in North China are favorable, and soybean production increased by more than 4% in Hebei, Henan, Shanxi and Shandong provinces. The drought in July in Northeast China affected soybean during the pod and seedling season, which leads to the decreases of 1.0%, 0.1% and 0.2% for soybean production in Heilongjiang, Inner Mongolia and Jilin decreased respect.

4.3 Regional analysis

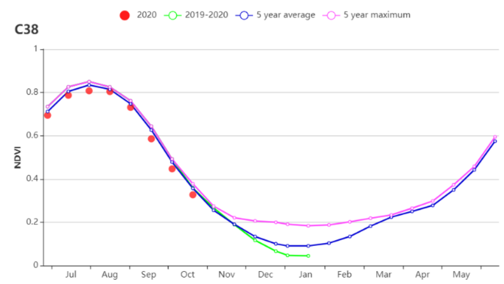
Figures 4.10 through 4.16 present crop condition information for each of China's seven agricultural regions. The provided information is as follows: (a) Phenology of major crops; (b) Crop condition development graph based on NDVI, comparing the current season up to October 2020 to the previous season, to the five-year average (5YA), and to the five-year maximum; (c) Spatial NDVI patterns for July to October 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 July to October 2020. Additional information about agro-climatic indicators and BIOMSS for China is provided in Annex A.

Northeast region

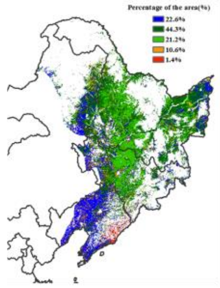
The current monitoring season (July to October) covers the harvest of all spring crops in Northeast China. Maize, rice, and soybeans reached maturity in August and September in Heilongjiang, Jilin and Liaoning Provinces, and the harvest had been completed by the end of October. CropWatch Agroclimatic Indicators (CWAIs) have shown that the precipitation greatly deviated from the average level (46% above average) and the temperature was slightly lower than the average level (-0.1°C). The photosynthetically active radiation was lower by 9%. Affected by typhoon Bawi, Maysak and Haishen, the precipitation in late August to September was significantly higher than the average especially in Heilongjiang and Jilin provinces. As for biomass, it was below the average level in most areas in Northeast China mainly due to below-average solar radiation. Only few areas in Jilin and Liaoning were slightly above average, and the overall potential biomass was 6% below average.

In general, the crop conditions during the monitoring period were below the 5YA. VCIx was above 0.8 in most areas in Northeast China during the current monitoring season. But affected by typhoons Bawi, Maysak and Haishen, the crop conditions in most areas of Heilongjiang and Jilin provinces were below average from August to October, especially those areas affected by flooding and lodging due to excess precipitation.

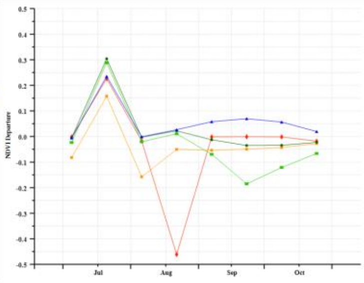
Figure 4.8 **Crop condition China Northeast region, July - October 2020**



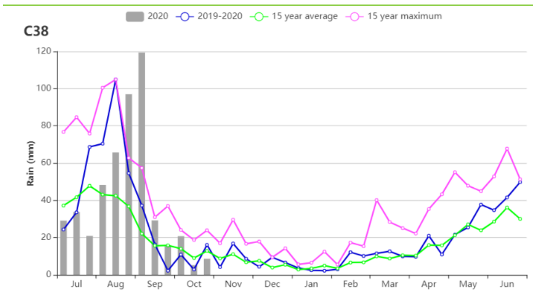
(a) Crop condition development graph based on NDVI



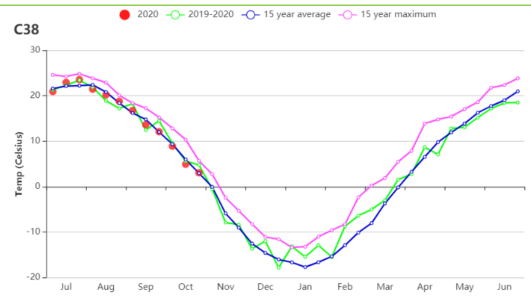
(b) Spatial NDVI patterns compared to 5YA



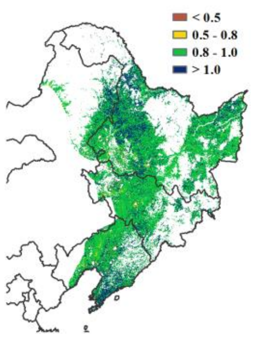
(c) NDVI profiles



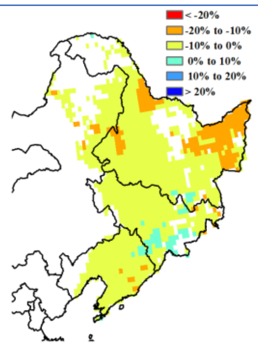
(d)Time series rainfall profile



(e)Time series temperature profile



(f) Maximum VCI



(g) Biomass departure

Inner Mongolia

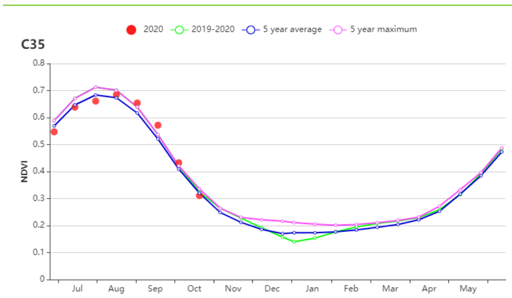
During this monitoring period, maize and soybean are the main summer crops in Inner Mongolia. Generally, the conditions were average.

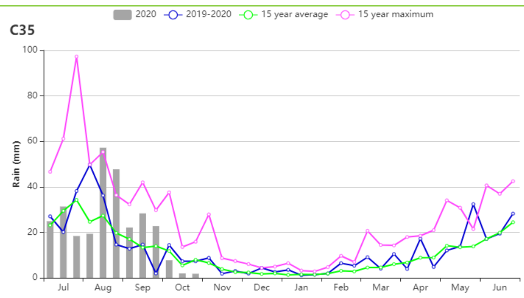
Overall RAIN was above average (+24%). However, there was a 20 day period of below-average rainfall in late July and early August. That period is critical for the pollination of maize and soybean. TEMP was below average by 0.7°C, and RADPAR was below average by 7%. The resulting BIOMSS dropped to below average as well (-8%).

The NDVI development graph indicates below-average crop condition from June to mid-August. In early July and August, about 30.4% of the region was below average, particularly in central and eastern Inner Mongolia, central Ningxia, northern Shaanxi and western Liaoning, which suffered from different degrees of drought. Thereafter, crop conditions improved and reached— and sometimes exceeded — the maximum of the 5YA from late August to September. Favorable rainfall in mid-August boosted crop growth, clearly shown by above-average NDVI and confirmed by the spatial NDVI patterns and profiles in most of the areas mentioned above. Unfavorable condition persisted on 14.5% of the region until the end of September. This is also confirmed by lower maximum VCI values in those regions. After September, as crops were reaching maturity, weather conditions had limited effects on crop yield. CALF in this region reached 97%, which was above average by 2%, as compared to the 5YA.

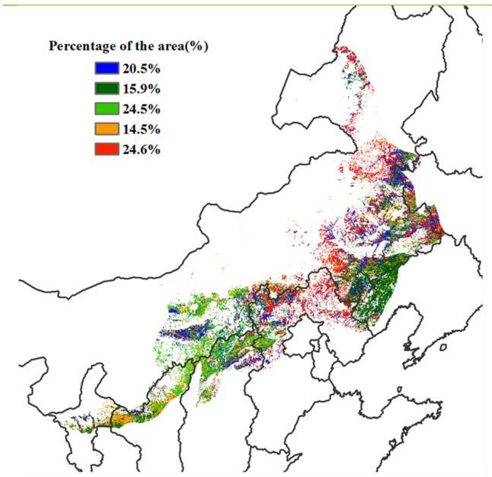
Overall, the Inner Mongolia is expected to have average or slightly below-average crop production.

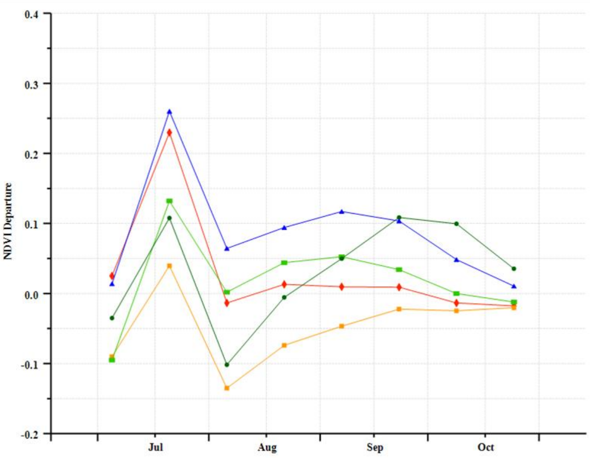
Figure 4.9 **Crop condition China Inner Mongolia, July - October 2020**



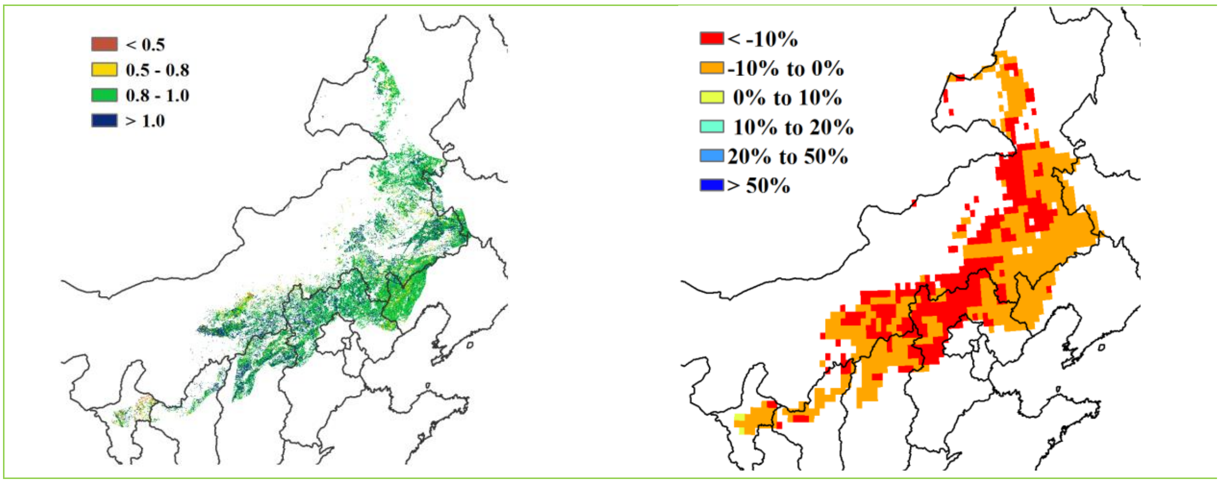


(a) Crop condition development graph based on NDVI (b)Time series rainfall profile





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



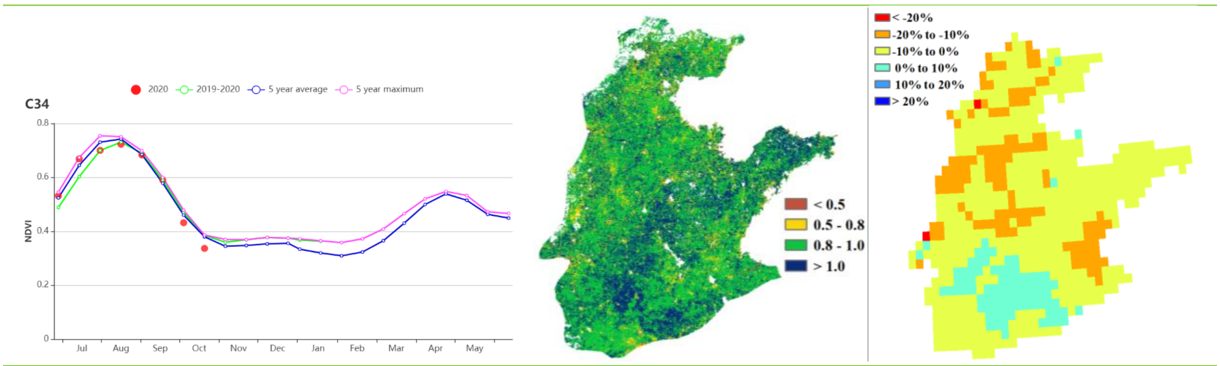
(e) Maximum VCI (f) Biomass departure

Huanghuaihai

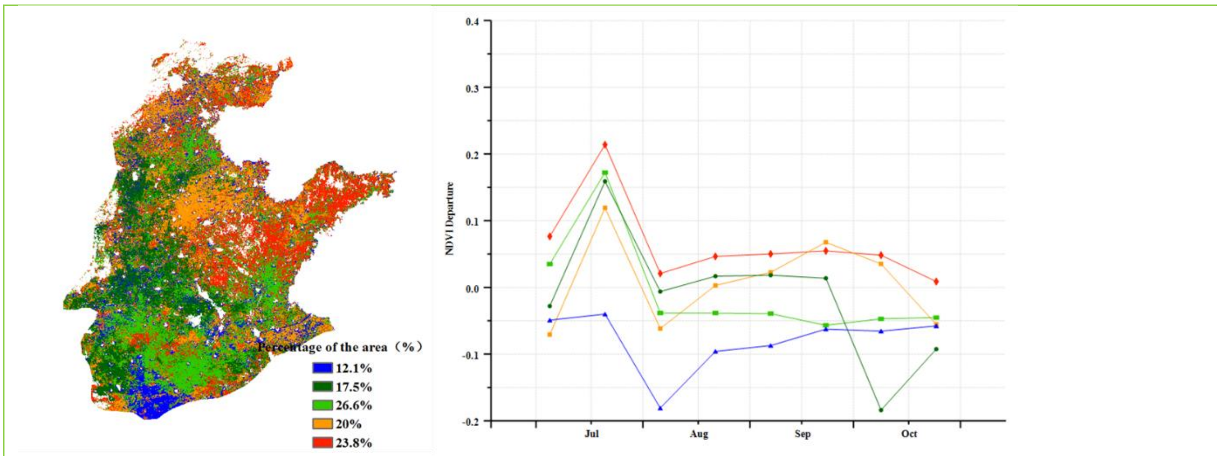
The main crop in Huanghuaihai region are summer maize and winter wheat. This monitoring period covers the whole cycle of summer maize from July to late September. The winter wheat sowing period started in early October. Crop conditions in Huanghuaihai region during the monitoring period were more favorable in the northern half and less favorable in the southern half.

The NDVI values were above the 5YA in July but fell slightly below the 5YA in early and mid-August. In September the crop condition kept pace with 5YA and then dropped to below average levels in October. Agro-climatic indicators show that precipitation increased by 19% while temperature and radiation fell by 0.4℃ and 5% compared to the 15YA, which led to 6% drop in BIOMSS compared to 15YA. Wet and cold weather may be responsible for the reduction of maize yield. The maximum VCI value for Huanghuaihai was 0.94. As shown by NDVI clusters and profiles, 12.1% of cropland over northern Anhui and some scattered areas across the whole region, displays below-average condition during most of this monitoring period. 23.8% of cropland over the eastern and central areas of Shandong show above-average conditions. 17.5% of cropland in southern Hebei and northern Henan departed a lot from average in late September and early October. This pattern is confirmed by the distribution maps of VCIx map and the biomass departure map.

Figure 4.10 **Crop condition China Huanghuaihai region, July - October 2020**



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



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

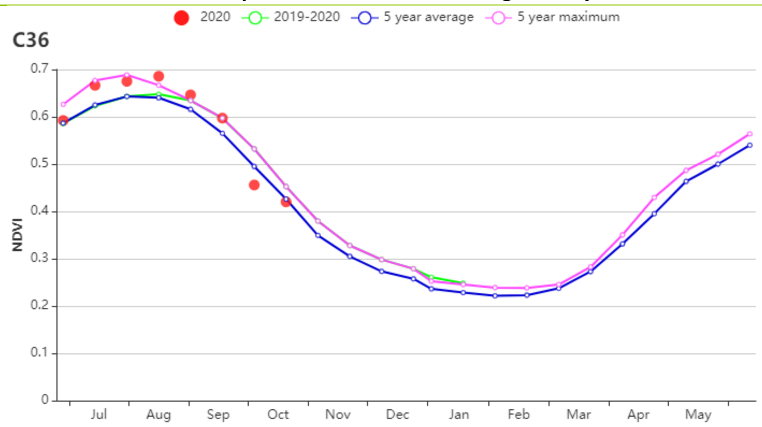
Loess region

During the reporting period, maize was harvested in late September and early October, and winter wheat was planted in October. The CropWatch Agroclimatic Indicators (CWAIs) show that the weather conditions in this region were close to the 15YA: Rainfall (RAIN) exceeded the average by 1%, temperature (TEMP) was below average by 0.7°C, and radiation (RADPAR) dropped by 6%. The potential biomass (BIOMSS) was 9% below average as a result of reduced radiation and lower temperature.

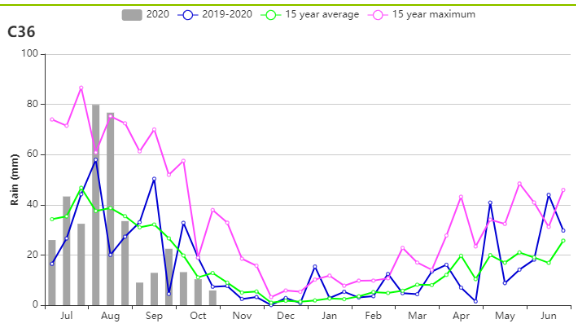
According to the regional NDVI development graph, crops started maturing from August to early September, after which they were harvested from mid-September until the end of the monitoring period. The overall crop conditions were slightly above or close to the 5-year average from July to September.

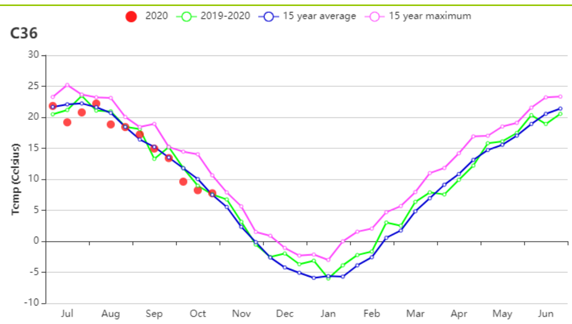
In most of the region, spatial patterns of NDVI departure clustering and the profiles show that the crop conditions were close to the five-year average from July to September. About 9.6% of the cropped area was below the 5-year average in October, which occurred mainly in the northwest of Henan province, and the south of Shannxi and Ningxia. The Maximum VCI map shows high values of VCIx (0.98) in most cropped areas of the region. Almost 99% of the farmland was cultivated according to CALF (+4%) as compared to the 5YA, showing favorable crop prospects for this region.

Figure 4.11 **Crop condition China Loess region, July - October 2020**



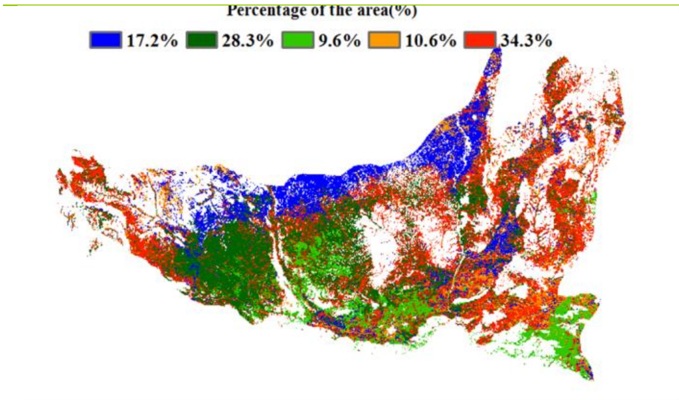
(a) Crop condition development graph based on NDVI



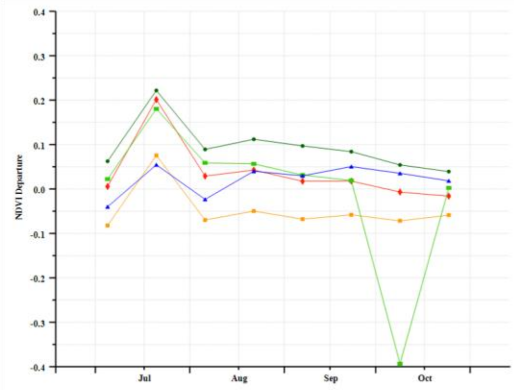


(b) Rainfall profiles

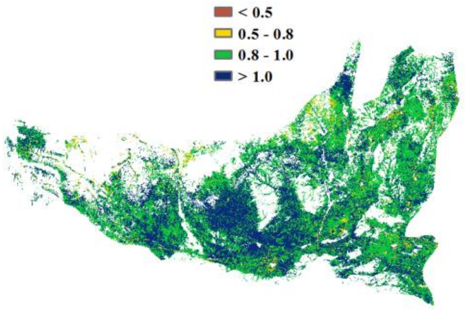
(c)Time-series temperature profile



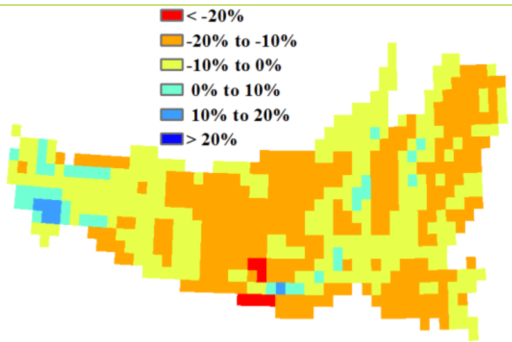
(d) Spatial NDVI patterns compared to 5YA



(e) NDVI profiles



(f) Maximum VCI



(g) Biomass departure

Lower Yangtze region

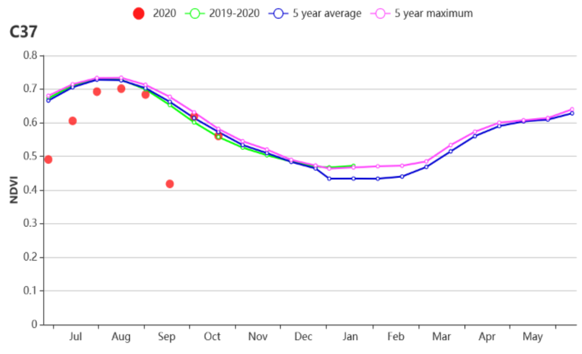
By October, the late rice matured in the center of Lower Yangtze region including Hubei, Hunan, Jiangxi and Fujian provinces, while semi-late rice and maize had been harvested in Jiangsu, Anhui and Zhejiang provinces.

The comparison of the current crop NDVI development curve with the 5YA indicates that the crop conditions were slightly below average. According to CropWatch agro-climatic indicators, the accumulated precipitation was 6% higher, while the photosynthetically active radiation and temperature were 10% and 0.6℃ lower as compared to the fifteen-year averages, respectively. Reduced solar radiation throughout this monitoring period resulted in a decrease in potential biomass (BIOMASS, -10%).

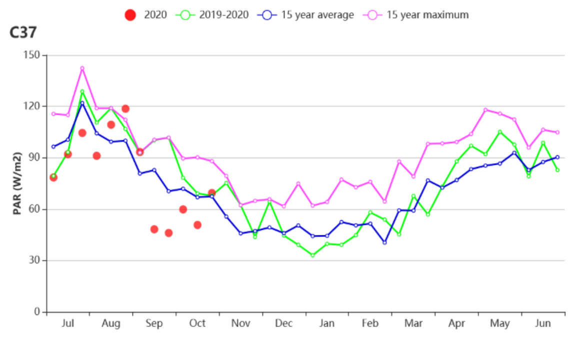
According to the BIOMASS map, the potential biomass production in most areas was lower than the 15YA. As shown in spatial NDVI patterns, 37.9% of the area, mostly distributed in the north of this region including Jiangsu, Anhui and Hubei provinces, presented average crop conditions compared to the five-year average. The crops in the remaining areas suffered from unfavorable conditions, which coincides with the situation depicted by the VCIx patterns. The average VCIx of this region is 0.94, and most area had VCIx values ranging from 0.8 to 1.

Overall, the continuously rainy and cloudy weather was detrimental to crop growth during this monitoring period, and the production of crops in the Lower Yangtze region is anticipated to be below average level.

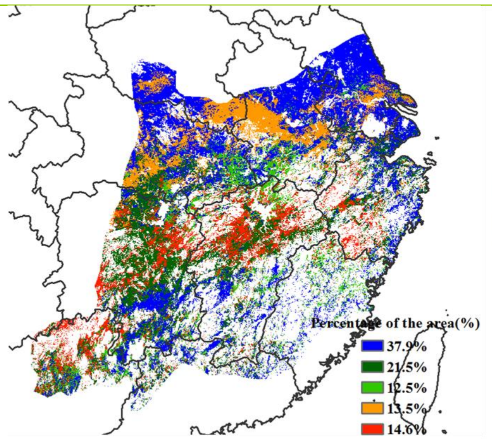
Figure 4.12 **Crop condition China Lower Yangtze region, July - October 2020**



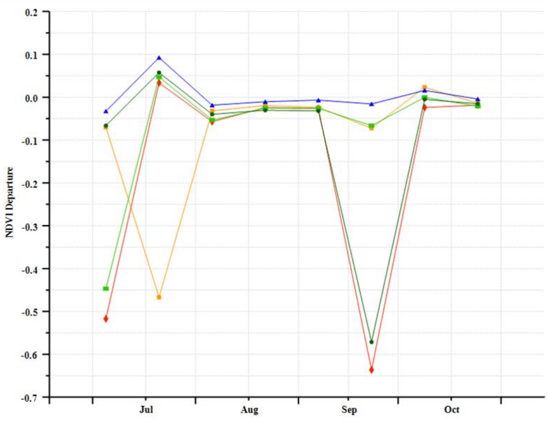
(a) Crop condition development graph based on NDVI



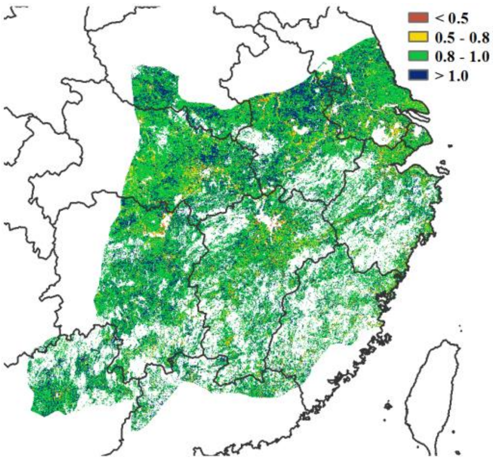
(b) Time series PAR profile



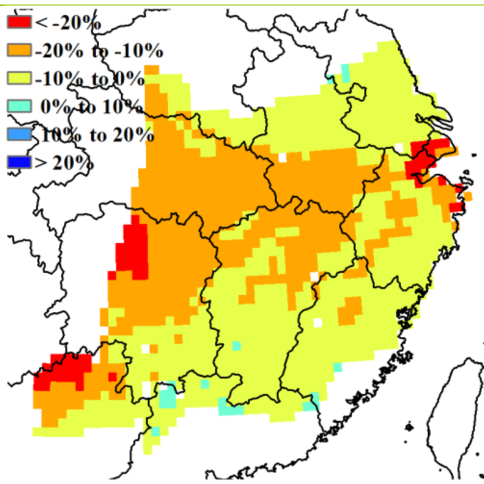
(b) Spatial NDVI patterns compared to 5YA



(c) NDVI profiles



(d) Maximum VCI



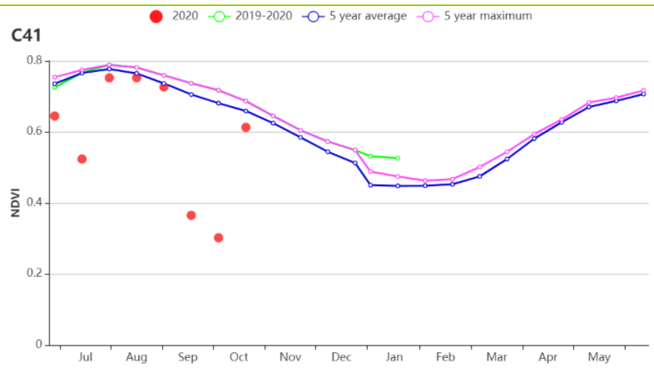
(e) Biomass departure

SouthWest region

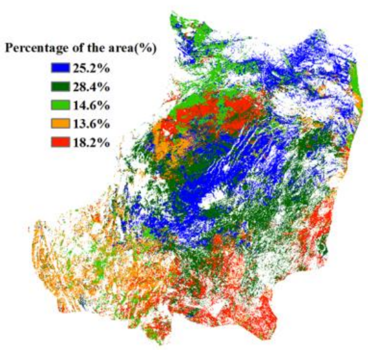
The reporting period covers the sowing of winter wheat in southwestern China, at a time when summer crops (including semi-late rice and maize) have reached maturity. According to the regional NDVI profile, crop condition was generally below the 5-year average, but close to average in late-August. On average, rainfall was above the fifteen-year average (RAIN +17%), whereas radiation was below (RADPAR -18%). Temperature was close to average (TEMP -0.4 °C). The resulting BIOMSS was 18% 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.

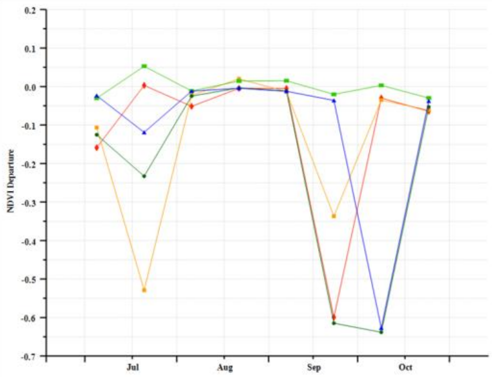
According to the NDVI departure clustering map and the profiles, values were close to average in July, except in Yunnan and neighboring areas in north-western Guizhou. In August, the overall NDVI in the region was close to the average level. RADPAR was below average for Guizhou (-21%) and Yunnan (-15%). Average NDVI throughout the monitoring period was observed in northern Sichuan and Chongqing, where radiation was below average and precipitation above average (See Annex A.11). The maximum VCI reached 0.96, 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 and low radiation 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 4.13 **Crop condition China SouthWest region, July-October 2020**

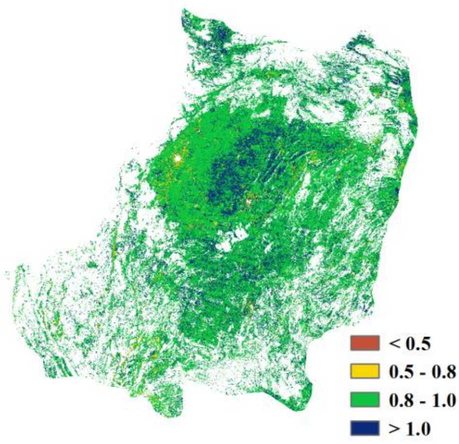


(a) Crop condition development graph based on NDVI

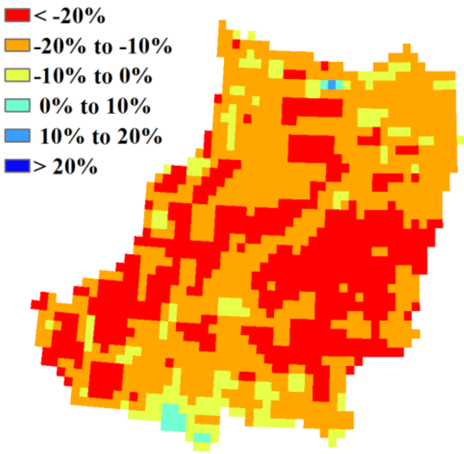




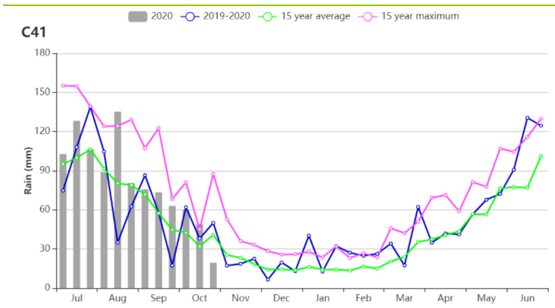
(b) Spatial NDVI patterns compared to 5YA (c) NDVI profiles



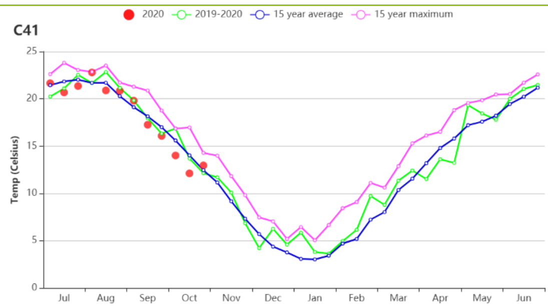
(d) Maximum VCI



(e) Biomass departure



(f) Time series rainfall profile



(g) Time series temperature profile

Southern region

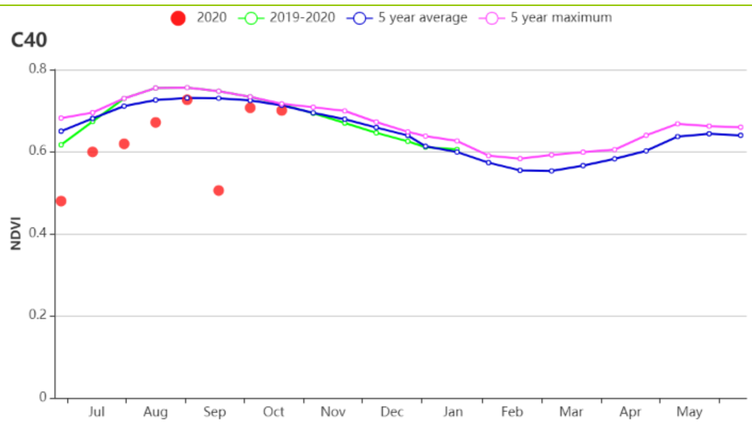
By October, late rice was maturing in Southern China. According to the regional NDVI profile, crop condition was generally below the 5-year average, but reached close to average levels by October.

On average, rainfall reached 1235 mm, which was 3% higher than the average; provincial departures were as follows: +26% in Yunnan, +5% in Guangxi, -17% in Guangdong, and -22% in Fujian. In Yunnan and Guangxi, RAIN exceeded 1100 mm, while in Fujian it was less than 800 mm. The average temperature during the monitoring period in Southern China was 22.7 °C, which was above average by 0.1°C. The average VCIx of the Southern China region during the monitoring period was 0.94, and almost all regions presented above 0.80 VCIx during this monitoring period. BIOMSS was 5% below average. The biomass indices of Yunnan, Guangxi, Guangdong, and Fujian were below average by 12%, 9% 2%, and 5%, respectively. At the provincial level, biomass changes followed RADPAR patterns. Abundant sunshine during rice heading and grain filling stages is conducive for high yields, whereas excessive rainfall increases the risk of pest and disease damage.

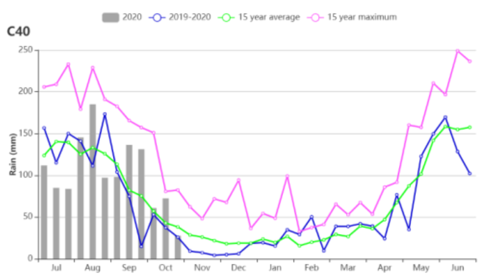
NDVI departure clustering analysis reveals that the continuously below-average crop conditions were mostly located in Yunnan, Guangxi, and Guangdong Province, covering 62.2% of the total cropland area. The above-mentioned patterns are also confirmed by the BIOMASS map. Only a few areas in Guangdong and Fujian were slightly higher than the average.

Overall, the crop conditions during the monitoring period were below average for this region.

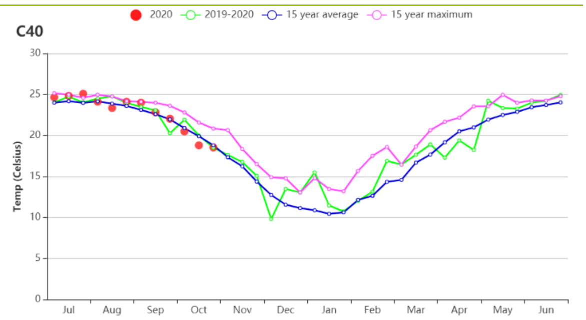
Figure 4.14 **Crop condition China Southern region, July - October 2020**



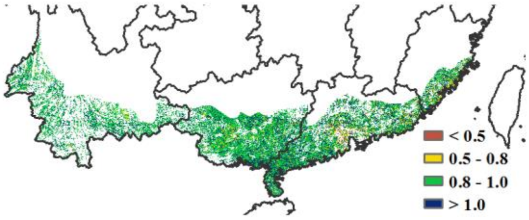
(a) Crop condition development graph based on NDVI

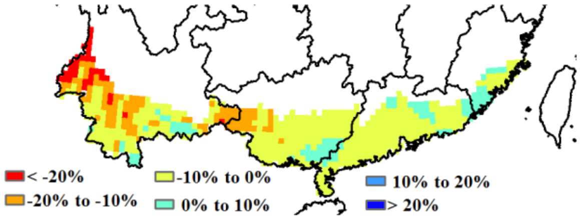


(b) Rainfall profiles



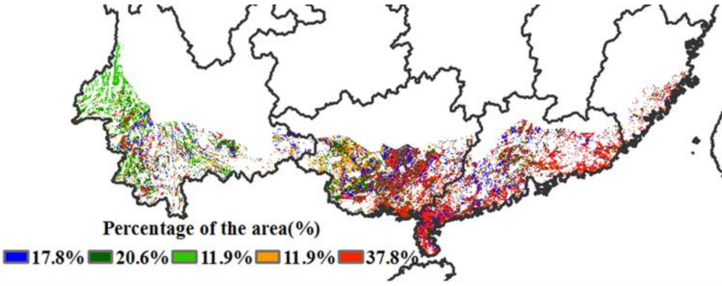
(c) temperature profiles

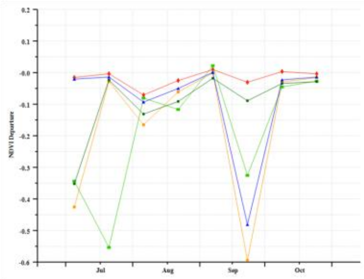




(d) Maximum VCI

(e) Biomass departure





(f) Spatial NDVI patterns compared to 5YA

(g) NDVI profiles

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 2019 (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 CropWatch global agro-climatic and agronomic indicators as well as meteorological data from over 20,000 meteorological weather stations around the world. The major grain crops (maize, rice, wheat) and soybean production of 43 major producers and exporters are estimated and predicted for 2020. The results are as follows.

Production estimates

In 2020, global maize production is expected to be 1.070 billion tons, an increase of 1.4% or equivalent to 15.15 million tons; global rice production is expected to be 760 million tons, an increase of 0.9% or an increase of 6.80 million tons; global wheat production is 738 million tons, a 3.1% increase of 21.98 million tons; global soybean production is expected to be 323 million tons, a slight decrease of 0.2%. In 2020, the global production of major cereals and oil crops will be generally stable. COVID-19 has limited impact on global food production. (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	-22		
Angola	2961	7	46	2				
Argentina	54054	2	1938	5	14866	-16	52587	2
Australia					27942	44		
Bangladesh	2386	1	46010	-5				
Belarus					3091	6		
Brazil	87502	2	11578	-1	4204	3	101040	0
Cambodia	982	6	10120	1				
Canada	11938	0			33947	5	7669	0
China	226078	1	201176	0	127053	3	14574	1
Egypt	6121	3	6795	2	12060	2		
Ethiopia	6933	-4			3691	-4		

	Maize		Rice		Wheat		Soybean	
	2020	**Δ%**	**2020**	**Δ%**	**2020**	**Δ%**	**2020**	**Δ%**
France	14436	-1			34839	-2		
Germany	4830	1			26639	-4		
Hungary	6337	7			5212	7		
India	18602	1	180275	7	95806	6	11653	3
Indonesia	16653	2	64916	1				
Iran			2937	4	16436	2		
Italy	6445	2			7818	1	1616	2
Kazakhstan					12872	1		
Kenya	2889	6			317	4		
Kyrgyzstan	707	6			626	6		
Mexico	23756	7			4311	3	865	13
Mongolia					279	3		
Morocco					6303	-5		
Mozambique	2020	-3	382	0				
Myanmar	1877	1	25591	-7				
Nigeria	10083	-12	4190	-9				
Pakistan	5615	7	11485	6	27502	4		
Philippines	7149	2	20739	1				
Poland					10753	6		
Romania	12802	-4			7406	-4		
Russia	13813	4			55658	4	3757	3
South Africa	11763	1			1483	8		
Sri Lanka			2514	5				
Thailand	4200	-2	40625	3				
Turkey	6534	-5			19337	4		
Ukraine	27934	1			22139	6		
United Kingdom					12726	-5		
United States	374266	2	11687	2	53324	-3	104519	2
Uzbekistan					9114	12		
Vietnam	5403	4	46834	2				
Zambia	1969	5			86	7		
Total	**979036**	**1**	**689840**	**2**	**663043**	**3**	**298281**	**1**
Others	**91226**	**3**	**70638**	**-6**	**75075**	**4**	**25094**	**-16**
Global	**1070263**	**1**	**760478**	**1**	**738118**	**3**	**323375**	**0**

Maize

The global maize production supply situation is generally favorable. Maize production of the world's top five maize producers increased by 0.8% to 2.5%, and the total maize production of the top five maize producing countries increased by 10.72 million tons. The United States, as the world's largest maize producer, maize production increased by 1.6% to 374.266 million tons. More than 5.0% year-on-year production increase were observed in 8 countries (Pakistan, Mexico, Angola, Hungary, Cambodia, Kenya, Kyrgyzstan, and Zambia) . Nigeria, Turkey, Romania, and Mozambique experienced drought impact during the critical maize growth period and maize production decreased by 12.1%, 5.1%, 3.5% and 3.1%, respectively. Ethiopia was affected by the desert locust and other unfavorable factors, and its maize production decreased by 3.8%. The overall maize production of other countries is close to last year.

Rice

Compared with the other three major crops, rice is mostly grown in areas with abundant rainfall or well-developed irrigation facilities. Therefore, the inter-annual variation of rice production is generally smaller than the other three crops. However, some countries still experienced large inter-annual changes due to the extreme weather. Affected by the drought in 2020, Bangladesh, Myanmar, and Nigeria have the largest reduction in rice production by 4.6%, 7.3%, and 8.6% respectively; Brazil, Mozambique, and China also saw a slight decrease in rice production, with a decrease of 0.6%, 0.3% and 0.2% respectively. The rest of the main rice-producing countries all achieved increased production compared to 2019. India as the world's second largest rice producer, rice production increased by 7.2%, or 12.13 million tons, reaching 182.75 million tons. The increase in production was mainly due to favorable agro-meteorological conditions. Pakistan, Argentina, Sri Lanka and Iran's rice production increased by more than 4%. In general, the global rice production and supply situation is in overall stable.

Wheat

The wheat in most major producing countries in the northern hemisphere was harvested in June to July 2020. The agro-meteorological conditions in late growing stage of spring wheatare generally conducive to the formation of crop yields. CropWatch revised spring wheat production in many countries up from 2020 August prediction. The wheat production in United States, France, Germany and Romania decreased 2.5%, 2.1%, 4.1% and 4.4% respectively, with smaller inter-annual changes compared with August 2020. Among the southern hemisphere countries, wheat in Argentina was affected by severe drought and the wheat production fell sharply by 15.7% at 14.866 million tons. In contrast, Australia recieved abundant rainfall in the wheat-producing area, which provides sufficient water for rain-fed wheat. Wheat output increased by 8.57 million, an increase of 44.3% from 2019, the largest production increase among the 43 countries. At the same time, the total wheat output of the world's top ten wheat producing countries increased by 20.63 million tons, an increase of 4.3%, ensuring the stability of the global wheat supply situation.

Soybean

In 2020, the production of the world's top 9 soybean producing countries increase at different degrees: the top 3 producing countries, the United States, Brazil, and Argentina, have production of 104.519 million tons, 101.04 million tons and 52.587 million tons, respectively, achieving a slight increase in production. China, India, Canada and Russia ranked 4-7 in soybean production also achieved minor increased production, mainly attributed to both increases in soybean planted area and yield. However, the soybean cultivation in other minor soybean producing countries decreased and the total soybean production of all other none major producing countries is only 25.095 million tons, a sharp decrease of 16.1%. This might be a trade-off due to the restriction of agriculture practices caused by the Covid-19 Pandemic. In general, the global soybean market is stable.

5.2 Disaster events

Introduction

The achievement of Sustainable Development Goal 2 (Zero Hunger) became harder in 2020, particularly after the global spread of the new coronavirus (COVID-19). The new pandemic overlapped with other disasters and put more pressure on the local and national organizations in their fight against hunger. As a result, the UN expects an increase of the number of hungry people by at least 83 to 132 million people by the end of 2020, instead of a decrease. Hence, the 2020 setback in the fight against hunger may hamper the achievement of the Zero Hunger target of the Sustainable Development Goals by 2030. More efforts by the global community will be needed in the upcoming years. The current report highlights the major disasters that threaten global health and food security.

Extreme conditions by type

COVID-19

As of October 31, up to 50 million people were infected, and more than one million people lost their lives in the fight with the new virus around the globe. Despite the high rate of recovering people, there is growing concern about the second wave of COVID-19, which already started in Europe and the USA. Many countries had started to ease the restrictions on people and goods movements after July, but with the current rise of infection rate, several countries are back to the initial emergency level of restrictions on movement and social distancing, such as in Germany.

The new pandemic has a profound impact on the food supply chain at its all stages, including agricultural production, postharvest handling, processing, and consumption. A large number of farmers and food packaging workers were identified as COVID-19 positive in several countries such as USA, Brazil, England, Ghana and Germany. Besides, the production capacity of pork facilities decreased by approximately 25% in Europe in late April. However, new hygiene standards have been put in place by now and the slaughter houses are working at full capacity again. As a result of illness, physical distancing requirements and travel restrictions, there was a considerable shortage of farm workers which forced some countries, such as France and the United Kingdom, to call unemployed people to work in the agriculture fields.

Furthermore, dairy farmers in the USA and England were forced to dump a million liters of milk due to interrupted supply chain. The restrictions on people's movement impacted consumer's demand: They cannot go to restaurants and they prepare their meals at home.

The impacts of COVID-19 on food supply chain may continue due to the second winter wave of COVID-19 that already started in Europe. Fortunately, several countries already announced that vaccines have been successfully tested in people and the companies are now ramping up production. With the availability of Covid-19 vaccines, the restrictions could be alleviated gradually until COVID-19 is under full control.

Desert locust

Ethiopia remains the epicenter of the locust movement in Africa. Despite of intensive control operations conducted in October, numerous swarms moved from central parts in Ethiopia to the northern highlands and reached Eritrea, Sudan, and southeastern Egypt. The swarms' movement towards Somalia, in the south of Ethiopia, during October was even more extensive. This could form another epicenter of locust shifting towards the South African countries in the coming months. Red locust hoppers already reached Angola, Botswana, Namibia, Zambia, and Zimbabwe by the end of October, and could potentially disrupt the 2020/2021 agricultural season that is due to start in October/November and thereby affect household and national food security.

Winter breeding areas in Africa are mainly clustered in Sudan, Chad, and Mauritania. Along both sides of the red sea, the breeding continued particularly in Yemen and Saudi Arabia while the situation was calm in the other Asian countries.

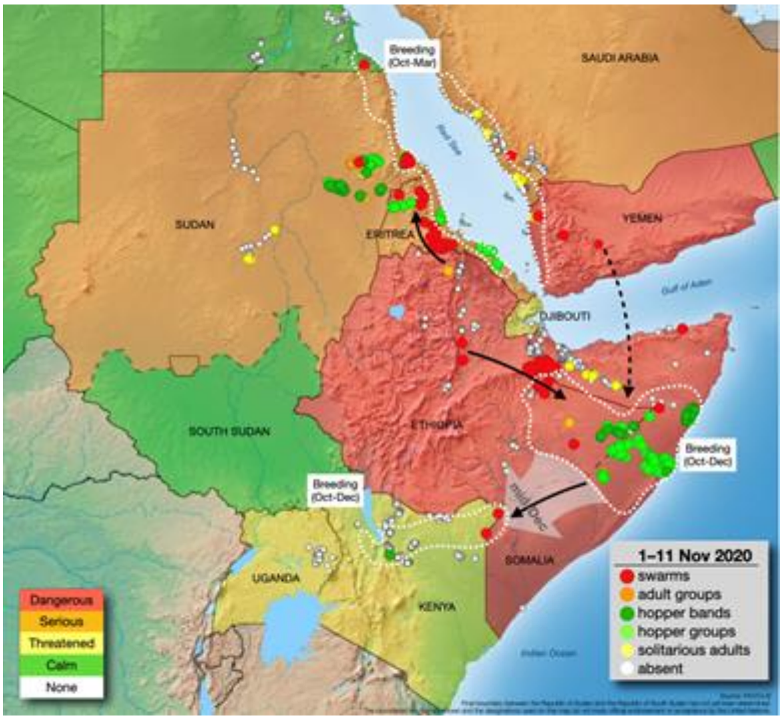


Figure 5.1 FAO desert locust bulletin, the current situation during Novemebr 2020. Source: http://www.fao.org/ag/locusts/common/ecg/75/en/201112DLupdate.jpg

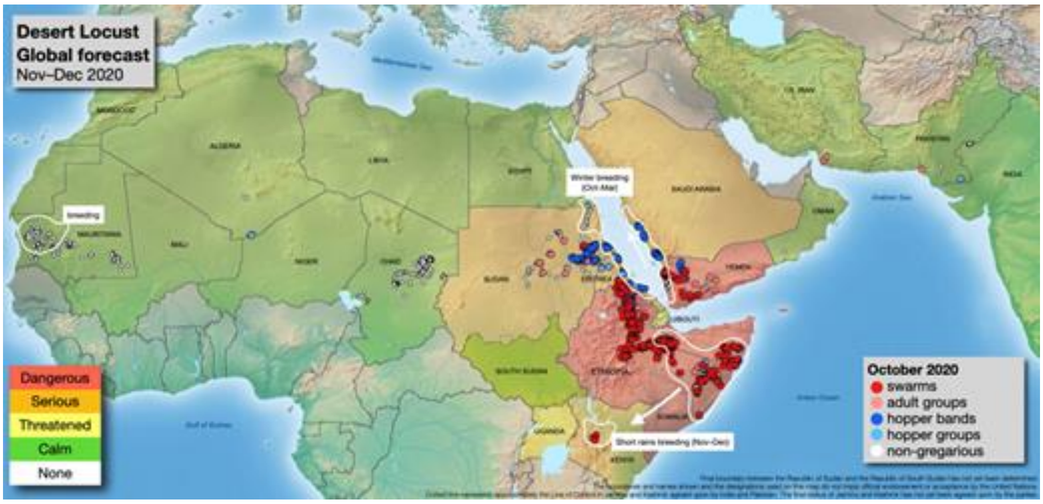


Figure 5.2 FAO desert locust bulletin, forecast until mid-December 2020.
Source: http://www.fao.org/ag/locusts/common/ecg/75/en/201101forecast.jpg

Wind storms

In Iowa, USA, an extreme Derecho occurred on August 10. The intense, widespread, and fast-moving windstorms caused extensive damage to homes, power lines and businesses. It damaged about one third of its maize crop. According to an USDA report, about 10% of the corn fields could not be harvested. USDA reduced its estimate of harvested acres from 13.6 to 12.7 million acres for Iowa.

Figure 5.3 The massive damage of the maize fields in Iowa, USA, after the Derecho on August 10, 2020.
(Source: https://agfax.com/2020/08/12/iowa-field-reports-derecho-devastates-state-infrastructure-crops/)

From the end of August to mid-September in 2020, three typhoons Pravit, Maysak and Poseidon continuously invaded northeast China, which caused large areas of maize lodging in Daqing, Suihua, Harbin in Heilongjiang province and Changchun, Songyuan and Jilin in Jilin Province

(Figure 4-8). The total area of lodging maize is 1,103 thousand hectares. Lodging area accounts for 23.8% of the total maize area of the six aforementioned cities and 10.4% of the total corn area of the two aforementioned provinces. Maize in other regions was hardly affected by the typhoon. UAV images were also used in maize lodging monitoring. The high-resolution aerial imageries and satellite remote sensing monitoring results were overlaid for comparison, reflecting the high accuracy of lodging monitoring results (Figure 4-9).

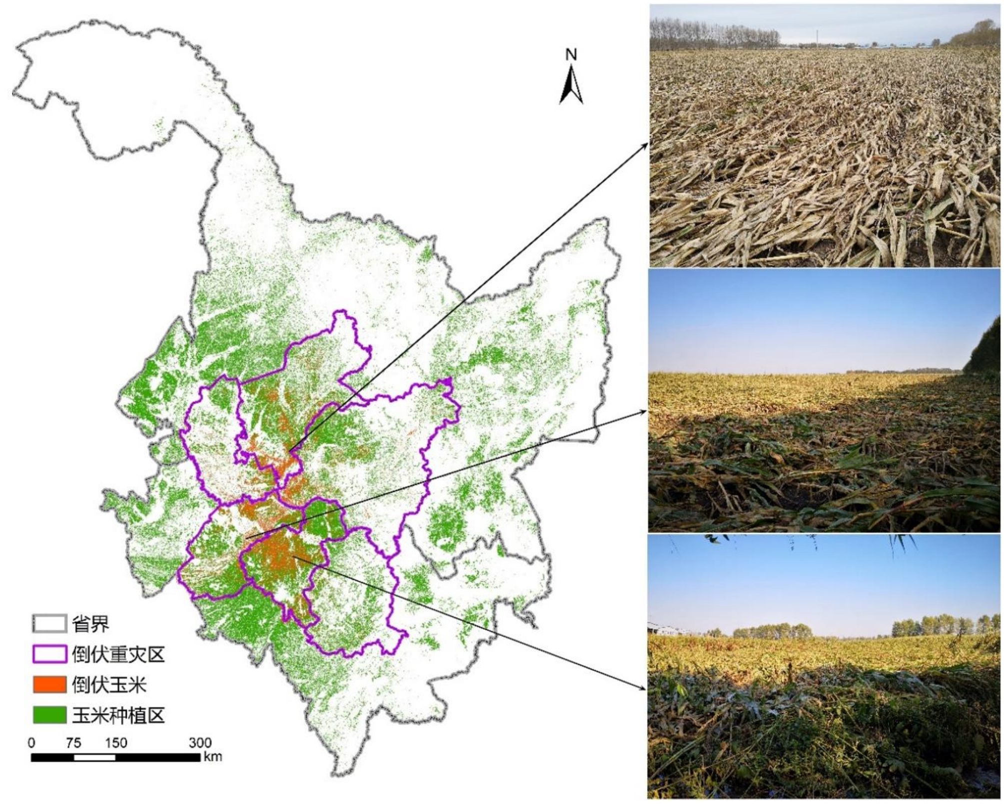


Figure 5.4 Remote sensing monitoring results of maize lodging in Heilongjiang and Jilin provinces of China in 2020

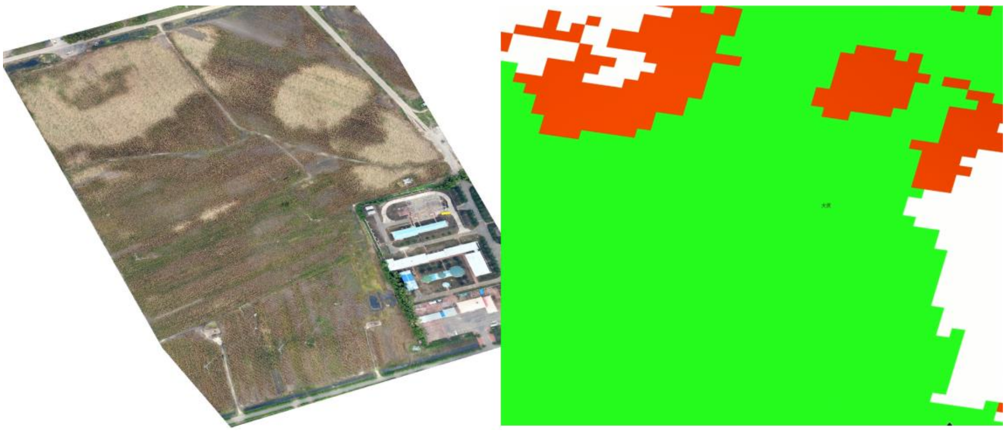


Figure 5.5 Comparison between UAV aerial imagery and remote sensing monitoring of maize lodging area in Zhaodong, Heilongjiang province

(Note: The bright yellow area in the left image represents the lodging maize, while the green area in the right image represents normal maize fields and the red area presents lodging maize identified by satellite)

Floods & Typhoons

In Africa, a record rainfall has been marked in August over central and southern provinces of Chad. In the provinces the Lac and N'Djaména 388,000 people were affected. These heavy rains were followed by massive floods that destroyed 150,000 hectares of cultivated land and washed away 10,000 cattle. Also, the heavy rainfall affected central and eastern states in South Sudan and caused the overflow of the White Nile and Akobo Rivers. This impacted the lives and livelihoods of over 600,000 people. In September, severe floods following the heavy rains affected thousands of people and inundated large farmland areas in Senegal, Genua, Burkina Faso and Mauritania. In October, flash floods triggered by Deyr seasonal rains (October-December) in Somalia affected nearly 20,000 people, especially in the Banadir region and the capital of Mogadishu, Galmudug, and South West and Jubaland states. These floods have inundated swathes of farmland, damaged property and disrupted livelihoods. Also in October, floods have affected North Kivu Province (the eastern Democratic Republic of the Congo) following heavy rain on October 2. According to media reports, at least 15 people died in Sake Town after the overflow of the Mutahyo River. Dozens of people have been displaced, several houses flooded and schools and health centres were damaged.

In Asia, the flash floods that occurred in August over Afghanistan were responsible for the death of 145 people and injured 167 people. Also, agricultural land and public infrastructure were impacted. Over Pakistan, severe monsoon rains caused urban flooding on August 25. It resulted in 409 deaths, 402 injured and 305,151 fully or partially destroyed homes. In October, many regions in Laos and Cambodia were hit by severe floods which affected thousands of people.

Both the Philippines and Vietnam faced several strong typhoons in October and November. They caused the displacement of several hundred thousands of people. In the Philippines, the authorities confirmed 67 deaths, 21 injured and 15 missing persons. In Vietnam, five people have been injured, and more than 325,000 people have been evacuated. In China, the historic amounts of rains received by the 2020 summer monsoon season were the main reason behind at least 21 large scale floods reported over the country. The massive floods started in September where Typhoon Maysak brought persistent rainfall to the Heilongjiang Province and flooded nearby areas. The rains submerged buildings in Harbin, the provincial capital, and caused rivers to overflow (e.g. Songhua River). Flood waves from the Mudan River also broke a dam located on the outskirts of Harbin.

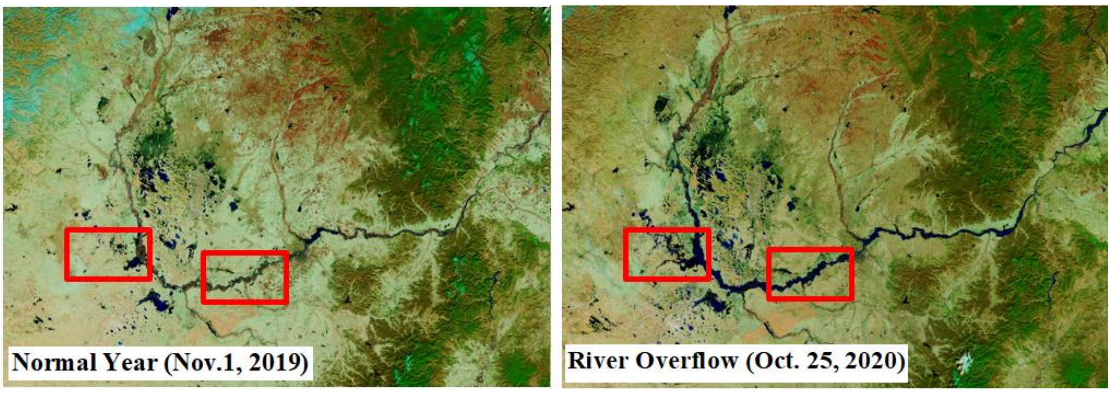


Figure 5.6 The overflow in Songhua River located in the Heilongjiang Province of northeast China on October 25, 2020 (right) compared to normal year (November 1, 2019, on the left). The river overflow was captured by two MODIS Terra satellite images displayed in false-color using infrared and visible light (bands 7-2-1) to better distinguish water from land. Vegetation appears green, water appears dark blue, and bare land appears brown (https://earthobservatory.nasa.gov/images/147471/chinas-unrelenting-season-of-flooding#).

Drought

Severe drought conditions were observed in eastern Romania, eastern Bulgaria, and southern Ukraine, with further negative impacts mainly on maize and sunflowers. The drought conditions were also observed in north-eastern Greece, which is the main region of sunflower production. In central Ukraine, a prolonged precipitation deficit started to impact maize in September. The continuing deficit in precipitation in Western Europe (large parts of France, Belgium, Luxembourg, western Germany and the southern Netherlands) negatively affected the production of summer crops, mainly maize, sugar beet and potatoes in this region. In Ireland and parts of the United Kingdom, frequent and abundant precipitation since mid-August negatively affected the ripening and harvesting of spring and winter cereals. In Russia, the dry and hot conditions throughout July and August over the main growing region of sunflowers impacted the crop's yield despite its tolerance to drought. Furthermore, moderate to extreme drought impacted the western United States. Record setting wild fires destroyed houses and 3.3 million hectare of forests. In Argentina, South America, drought conditions in August-September impacted the seeding of sunflower and maize.

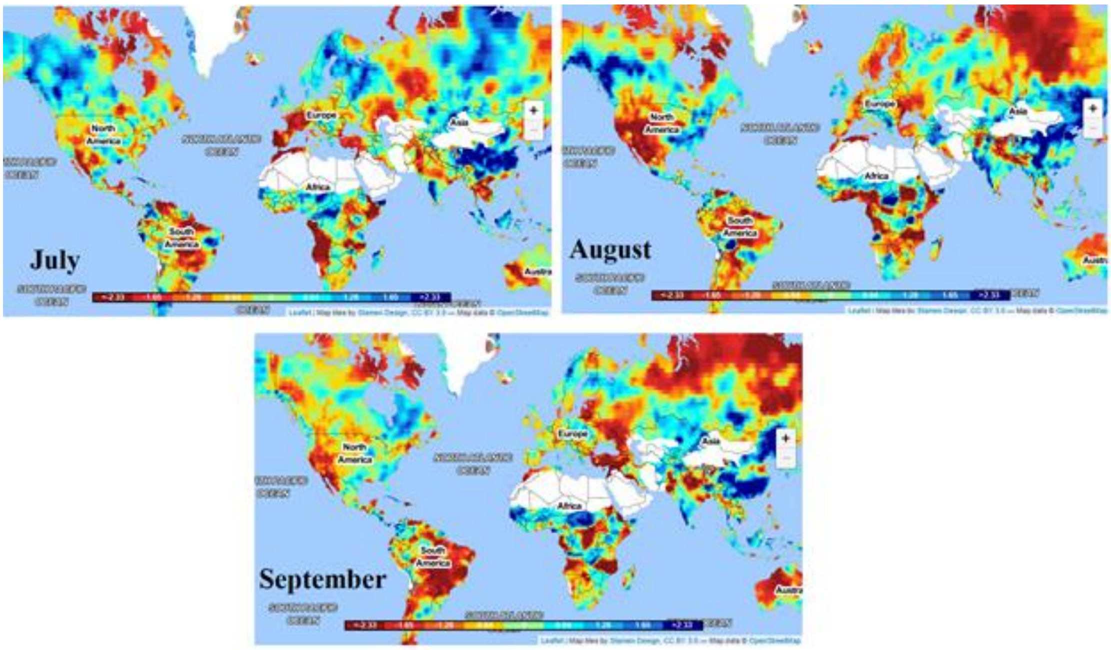


Figure 5.7 The Standardized Precipitation-Evapotranspiration Index (SPEI) estimated globally for the months; July to September of 2020, https://spei.csic.es/map/maps.html#months=1#month=8#year=2020**.**

5.3 Update on El Niño

La Niña 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 October 2019 to October 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 4.2 in July to 9.8 in July, then increased to 10.5 in September, then decreased to 4.2 in October, indicating a La Niña has developed.

The sea surface temperature anomalies in October 2020 for NINO3, NINO3.4, and NINO4 regions were -0.8°C, -1.0°C, and -0.5°C, respectively, somewhat warmer than the 1961-1990 average according to BOM (see Figure 5.4 and Figure 5.5). La Niña has developed and is expected to last into next year, affecting temperatures, precipitation and storm patterns in many parts of the world, according to the World Meteorological Organization (WMO). CropWatch will keep monitoring the situation (Figure 5.6).

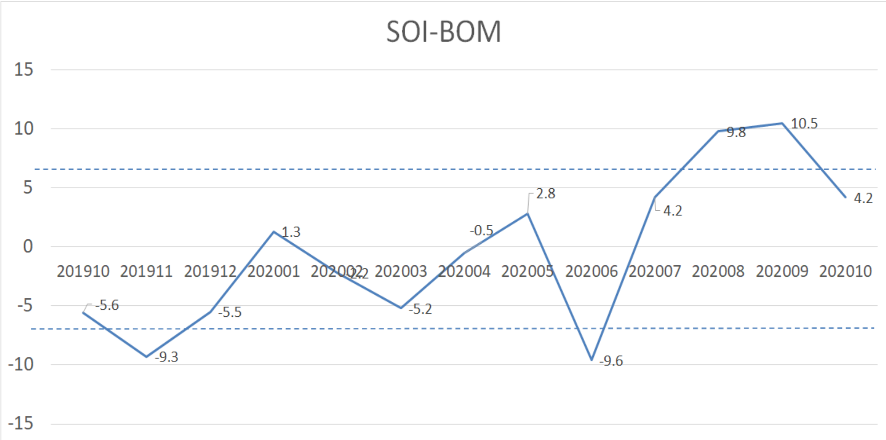


Figure 5.8 **Monthly SOI-BOM time series from July 2019 to July 2020 (Source: http://www.bom.gov.au/climate/current/soi2.shtml)**

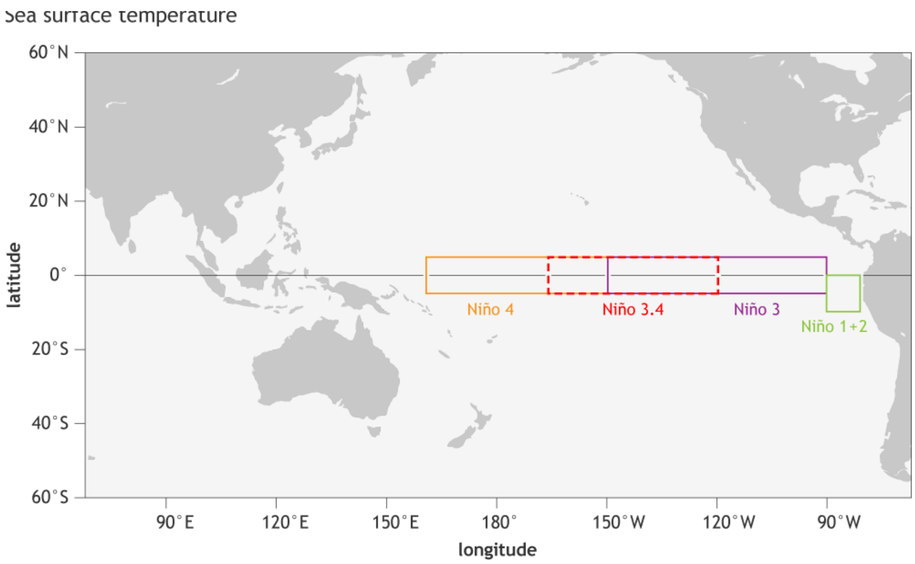


Figure 5.9 **Map of NINO Region (Source: https://www.climate.gov/sites/default/files/Fig3_ENSOindices_SST_large.png)**

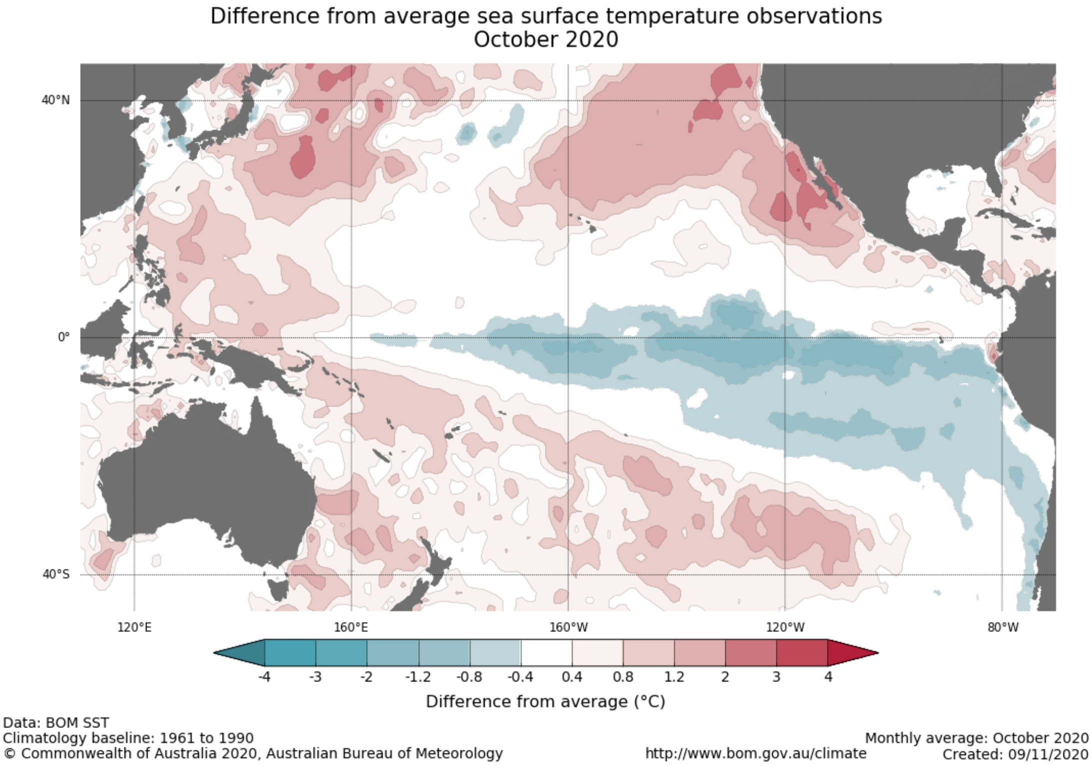


Figure 5.10 October 2020 sea surface temperature departure from the 1961-1990 average

(Source:http://www.bom.gov.au/climate/enso/wrap-up/archive/20201110.ssta_pacific_monthly.png?popup**)**

Annex A. Agroclimatic indicators

Table A.1 Jul 2020 - Oct 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/m^2)	RADPAR 15YA dep. (%)	BIOMSS Current (gDM/m^2)	BIOMSS 5YA dep. (%)
C01	Equatorial central Africa	701	-8	22.6	-0.2	1172	-2	599	-2
C02	East African highlands	841	10	17.3	-0.4	1122	-5	472	-8
C03	Gulf of Guinea	767	-22	24.8	0.1	1064	-1	688	-3
C04	Horn of Africa	221	29	21.0	-0.1	1211	-3	549	-5
C05	Madagascar (main)	162	-2	19.7	0.0	1092	-3	490	-6
C06	Southwest Madagascar	21	-42	22.1	-0.1	1217	0	471	-2
C07	North Africa-Mediterranean	55	-36	23.3	0.0	1331	-1	521	-9
C08	Sahel	596	3	26.6	-0.6	1156	-3	704	-5
C09	Southern Africa	67	-8	19.5	-0.2	1179	-4	439	-2
C10	Western Cape (South Africa)	236	13	12.2	-0.6	958	1	333	-2
C11	British Columbia to Colorado	249	-8	12.7	0.3	1149	1	405	-5
C12	Northern Great Plains	224	-17	18.0	-0.6	1139	2	582	0
C13	Corn Belt	341	-6	17.4	-0.3	1032	-1	509	1
C14	Cotton Belt to Mexican Nordeste	466	5	23.9	-0.1	1173	-2	709	-3
C15	Sub-boreal America	314	1	10.9	-1.0	845	-2	317	-4
C16	West Coast (North America)	98	-30	19.1	1.2	1285	1	376	-14
C17	Sierra Madre	1154	-7	19.9	0.3	1234	2	604	-2
C18	SW U.S. and N. Mexican highlands	190	-36	22.0	0.9	1334	3	546	-15
C19	Northern South and Central America	1233	-7	23.7	0.1	1202	0	750	-1
C20	Caribbean	800	7	26.6	0.3	1346	0	910	0
C21	Central-northern Andes	469	-6	14.5	0.1	1181	-1	363	-4
C22	Nordeste (Brazil)	94	-4	24.4	0.2	1240	2	638	-1
C23	Central eastern Brazil	210	-16	24.1	0.9	1150	2	492	-9
C24	Amazon	330	-18	26.3	0.6	1194	1	620	-8
C25	Central-north Argentina	133	-10	18.1	0.6	1062	2	442	1
C26	Pampas	324	-24	15.7	0.4	908	3	363	2
C27	Western Patagonia	584	-17	6.3	-0.3	762	4	163	-6
C28	Semi-arid Southern Cone	84	-19	10.6	-0.1	1054	3	222	-15
C29	Caucasus	150	-26	19.1	0.5	1232	-1	459	4

C30	Pamir area	208	24	16.6	-1.1	1323	-5	419	9
C31	Western Asia	65	8	22.7	-0.4	1294	-3	317	6
C32	Gansu-Xinjiang (China)	216	13	14.9	-1.1	1121	-4	492	-4
C33	Hainan (China)	992	-25	26.5	0.7	1131	-5	776	-4
C34	Huanghuaihai (China)	502	19	21.6	-0.4	1009	-5	569	-6
C35	Inner Mongolia (China)	284	24	15.4	-0.7	1025	-7	460	-8
C36	Loess region (China)	365	1	16.0	-0.7	1016	-6	453	-9
C37	Lower Yangtze (China)	869	6	22.5	-0.6	962	-10	586	-10
C38	Northeast China	493	46	15.6	-0.1	919	-9	430	-6
C39	Qinghai-Tibet (China)	1179	8	11.5	0.2	913	-9	278	-9
C40	Southern China	1235	3	22.7	0.1	1010	-6	609	-5
C41	Southwest China	983	17	18.4	-0.4	791	-18	408	-18
C42	Taiwan (China)	424	-60	27.1	1.1	1181	-1	727	-4
C43	East Asia	797	25	16.7	-0.2	860	-9	398	-10
C44	Southern Himalayas	1368	0	24.3	0.5	1038	-2	580	-4
C45	Southern Asia	1381	9	25.8	0.2	1049	-1	680	1
C46	Southern Japan and Korea	1035	13	21.5	0.0	963	-7	556	-8
C47	Southern Mongolia	193	18	5.6	-1.5	1079	-5	311	-8
C48	Punjab to Gujarat	811	21	29.2	0.2	1144	-1	629	3
C49	Maritime Southeast Asia	1220	8	24.4	0.1	1133	-2	743	0
C50	Mainland Southeast Asia	1439	0	25.3	0.3	1085	0	722	0
C51	Eastern Siberia	436	21	11.2	0.1	735	-10	273	-11
C52	Eastern Central Asia	416	59	9.7	-0.5	866	-10	301	-12
C53	Northern Australia	171	-8	24.3	0.4	1222	-3	604	-5
C54	Queensland to Victoria	242	21	13.0	0.0	866	-6	322	-3
C55	Nullarbor to Darling	187	-21	13.5	0.5	873	2	343	8
C56	New Zealand	309	-19	8.7	0.5	686	0	190	3
C57	Boreal Eurasia	421	6	10.6	-0.1	689	-4	239	-7
C58	Ukraine to Ural mountains	238	-11	15.0	0.6	827	0	367	-1
C59	Mediterranean Europe and Turkey	138	-18	20.0	0.4	1249	0	505	-4
C60	W. Europe (non Mediterranean)	356	10	15.9	0.3	905	-3	408	-2
C61	Boreal America	410	-14	7.8	0.0	639	4	185	3
C62	Ural to Altai mountains	281	21	12.9	-0.1	852	-4	368	0
C63	Australian desert	167	32	15.0	0.1	923	-4	358	-3
C64	Sahara to Afghan deserts	33	46	28.2	-0.2	1420	-3	230	1
C65	Sub-arctic America	176	0	-0.5	0.4	630	0	115	0

Table A.2 Jul 2020 - Oct 2020 agroclimatic indicators and biomass 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 5YA Departure (%)
ARG	Argentina	208	-20	14.5	0.1	933	2	341	0
AUS	Australia	217	12	14.0	0.2	901	-5	335	-1
BGD	Bangladesh	2106	8	27.3	0.5	1055	-3	718	-2
BRA	Brazil	238	-21	24.2	0.7	1153	2	529	-7
KHM	Cambodia	1311	-2	25.6	0.2	1091	1	735	1
CAN	Canada	321	-4	12.3	-0.6	902	-1	341	-1
CHN	China	806	10	19.5	-0.4	942	-10	487	-9
EGY	Egypt	3	-62	26.3	0.8	1365	-2	159	-19
ETH	Ethiopia	955	6	17.4	-0.5	1114	-7	469	-9
FRA	France	324	6	16.3	0.4	964	-2	444	1
DEU	Germany	321	-1	15.1	0.4	838	-4	361	-3
IND	India	1306	5	26.1	0.3	1057	0	642	1
IDN	Indonesia	1082	10	24.2	0.1	1125	-2	726	-1
IRN	Iran	46	-13	21.9	-0.6	1370	-4	275	18
KAZ	Kazakhstan	212	23	14.5	-0.7	971	-4	428	1
MEX	Mexico	986	-6	22.8	0.3	1268	1	677	-5
MMR	Myanmar	1589	-4	24.1	0.6	979	-3	621	-2
NGA	Nigeria	708	-27	25.1	0.0	1080	-1	667	-5
PAK	Pakistan	302	-2	24.7	-0.3	1310	-3	525	-1
PHL	Philippines	1623	-2	25.7	0.4	1233	3	831	3
POL	Poland	325	13	15.6	0.5	824	-3	365	-5
ROU	Romania	277	16	17.9	0.7	1039	-1	491	-2
RUS	Russia	281	0	13.7	0.3	819	-2	346	-3
ZAF	South Africa	90	-20	14.0	-0.6	1107	-1	369	-4
THA	Thailand	1324	12	25.0	0.1	1076	-2	713	-1
TUR	Turkey	65	-54	20.1	1.1	1304	2	437	-6
GBR	United Kingdom	505	12	12.6	-0.4	579	-12	215	-13
UKR	Ukraine	198	-3	17.8	1.1	967	2	471	2
USA	United States	328	-6	20.1	-0.1	1149	0	570	-3
UZB	Uzbekistan	35	4	20.6	-1.5	1302	-5	360	27
VNM	Vietnam	1577	13	24.0	0.2	1082	-1	698	0
AFG	Afghanistan	49	29	18.1	-1.2	1410	-3	180	17
AGO	Angola	145	-8	21.7	0.0	1305	-2	448	7
BLR	Belarus	260	-7	15.2	1.0	766	-3	336	-3
HUN	Hungary	295	39	18.3	0.3	1003	-2	521	0
ITA	Italy	389	15	18.8	0.0	1133	-1	545	-2
KEN	Kenya	405	21	19.5	-0.2	1156	0	596	0
LKA	Sri_Lanka	840	-23	26.4	0.2	1191	-3	782	-3
MAR	Morocco	53	-39	23.1	0.4	1345	-1	587	-3
MNG	Mongolia	398	67	8.6	-1.2	967	-8	301	-14
MOZ	Mozambique	79	15	21.8	-0.4	1083	-7	583	-4
ZMB	Zambia	19	3	21.5	0.0	1339	-4	349	3

*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 Jul 2020 and Oct 2020.*

Table A.3 Argentina, Jul 2020 - Oct 2020 agroclimatic indicators and biomass (by province)

	RAIN Current (mm)	RAIN 15YA Departure (%)	TEMP Current (°C)	TEMP 15YA Departure(°C)	RADPAR Current (MJ/m^2)	RADPAR 15YA Departure (%)	BIOMSS Current (gDM/m^2)	BIOMSS 5YA Departure (%)
Buenos Aires	204	-18	11.1	-0.5	865	3	266	-3
Chaco	202	-27	19.2	1.2	949	4	478	11
Cordoba	93	-28	14.0	-0.1	1001	1	327	-6
Corrientes	320	-30	17.0	0.5	862	1	396	5
Entre Rios	287	-21	14.2	0.0	867	1	319	-5
La Pampa	188	18	11.8	-0.5	904	1	271	-9
Misiones	412	-32	18.0	0.6	939	6	437	6
Santiago Del Estero	120	-20	17.6	0.2	1020	0	443	6
San Luis	87	-13	12.5	-0.2	1024	3	297	-8
Salta	195	22	16.7	0.7	1140	1	475	10
Santa Fe	201	-21	15.8	0.2	903	-1	370	0
Tucuman	66	-25	14.3	0.5	1185	2	390	6

Table A.4 Australia, Jul 2020 - Oct 2020 agroclimatic indicators and biomass (by state)

	RAIN Current (mm)	RAIN 15YA Departure (%)	TEMP Current (°C)	TEMP 15YA Departure(°C)	RADPAR Current (MJ/m^2)	RADPAR 15YA Departure (%)	BIOMSS Current (gDM/m^2)	BIOMSS 5YA Departure (%)
New South Wales	266	56	12.6	0.0	886	-9	332	-3
South Australia	236	16	13.1	-0.1	766	-7	286	-9
Victoria	296	6	10.7	0.0	692	-7	228	-8
W. Australia	167	-22	14.8	0.5	923	2	330	5

Table A.5 Brazil, Jul 2020 - Oct 2020 agroclimatic indicators and biomass (by state)

	RAIN Current (mm)	RAIN 15YA Departure (%)	TEMP Current (°C)	TEMP 15YA Departure (°C)	RADPAR Current (MJ/m^2)	RADPAR 15YA Departure (%)	BIOMSS Current (gDM/m^2)	BIOMSS 5YA Departure (%)
Ceara	48	-16	26.7	0.0	1396	2	720	-7
Goias	207	-10	25.1	0.5	1251	3	357	-22
Mato Grosso Do Sul	211	-27	25.1	1.8	1113	4	512	-9
Mato Grosso	176	-22	26.9	0.9	1201	3	372	-25
Minas Gerais	245	-6	21.6	0.6	1108	-1	502	-7
Parana	390	-27	19.2	1.3	1014	5	473	6
Rio Grande Do Sul	493	-23	15.4	0.2	856	2	347	1
Santa Catarina	474	-27	15.9	0.8	910	6	372	7
Sao Paulo	239	-33	22.1	1.6	1081	3	539	4

Table A.6 Canada, Jul 2020 - Oct 2020 agroclimatic indicators and biomass (by province)

	RAIN Current (mm)	RAIN 15YA Departure (%)	TEMP Current (°C)	TEMP 15YA Departure (°C)	RADPAR Current (MJ/m^2)	RADPAR 15YA Departure (%)	BIOMSS Current (gDM/m^2)	BIOMSS 5YA Departure (%)
Alberta	234	-4	11.4	-0.6	945	-1	361	-2
Manitoba	219	-23	13.1	-0.9	947	3	413	3
Saskatchewan	236	1	12.6	-1.0	964	1	407	-1

Table A.7 India, Jul 2020 - Oct 2020 agroclimatic indicators and biomass (by state)

	RAIN Current (mm)	RAIN 15YA Departure (%)	TEMP Current (°C)	TEMP 15YA Departure (°C)	RADPAR Current (MJ/m^2)	RADPAR 15YA Departure (%)	BIOMSS Current (gDM/m^2)	BIOMSS 5YA Departure (%)
Andhra Pradesh	1351	51	25.7	-0.7	1031	-5	680	-5
Assam	2656	3	25.1	0.3	836	-11	548	-9
Bihar	1392	3	27.3	0.1	1083	-2	690	-4
Chhattisgarh	1181	-4	25.9	0.7	1089	3	680	3
Daman and Diu	2302	50	27.9	0.3	1102	-3	757	13
Delhi	439	-24	29.4	0.6	1201	3	644	-1
Gujarat	1615	51	27.9	0.2	1068	0	684	17
Goa	3351	17	24.9	-0.1	912	-11	630	-10
Himachal Pradesh	324	-68	20.2	0.9	1312	12	439	-10
Haryana	274	-52	30.0	1.0	1229	6	618	-3
Jharkhand	1357	7	26.2	0.6	1151	3	767	7
Kerala	1711	-22	24.0	0.0	1037	0	675	0
Karnataka	1242	10	23.3	-0.2	902	-4	583	-4
Meghalaya	2123	-19	25.0	0.9	897	-3	586	1
Maharashtra	1588	29	25.0	0.2	984	0	652	6
Manipur	2240	16	22.0	0.6	821	-8	483	-5
Madhya Pradesh	1036	-4	26.3	0.8	1088	5	638	8
Mizoram	1759	-12	23.9	0.4	967	-3	613	-1
Nagaland	2909	41	22.0	0.3	729	-19	427	-17
Orissa	1309	-7	26.3	0.5	1100	1	722	2
Puducherry	1516	-7	27.2	-0.4	1095	-2	750	-3
Punjab	226	-65	30.0	1.1	1240	5	593	-14
Rajasthan	583	-6	29.3	0.5	1125	-1	603	6
Sikkim	625	-29	17.7	0.5	1122	5	420	-1
Tamil Nadu	729	-20	26.1	-0.2	1056	-2	690	-2
Tripura	1669	-14	26.5	0.6	1005	-2	684	0
Uttarakhand	528	-52	21.3	1.0	1238	11	455	-6
Uttar Pradesh	913	-7	28.1	0.5	1135	2	627	-6
West Bengal	1889	5	27.2	0.5	1117	0	741	0

Table A.8 Kazakhstan, Jul 2020 - Oct 2020 agroclimatic indicators and biomass (by oblast)

	RAIN Current (mm)	RAIN 15YA Departure (%)	TEMP Current (°C)	TEMP 15YA Departure (°C)	RADPAR Current (MJ/m^2)	RADPAR 15YA Departure (%)	BIOMSS Current (gDM/m^2)	BIOMSS 5YA Departure (%)
Akmolinskaya	202	28	13.5	-0.6	886	-5	398	-3
Karagandinskaya	180	30	12.6	-1.1	955	-6	400	-4
Kustanayskaya	246	47	14.4	-0.3	894	-1	423	1
Pavlodarskaya	197	10	13.9	-0.2	848	-7	396	-3
Severo kazachstanskaya	209	-3	13.3	0.2	803	-3	366	4
Vostochno kazachstanskaya	283	24	12.0	-1.5	1009	-6	390	-10
Zapadno kazachstanskaya	125	0	17.8	-0.2	1026	2	513	2

Table A.9 Russia, Jul 2020 - Oct 2020 agroclimatic indicators and biomass (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 5YA Departure (%)
Bashkortostan Rep.	319	10	12.6	0.0	779	-2	330	0
Chelyabinskaya Oblast	314	26	12.9	0.2	799	0	348	2
Gorodovikovsk	123	-37	21.3	1.1	1094	2	570	0
Krasnodarskiy Kray	261	-16	16.1	0.8	956	0	426	2
Kurganskaya Oblast	235	-4	13.3	0.7	752	0	347	9
Kirovskaya Oblast	316	-3	12.2	0.4	687	0	281	0
Kurskaya Oblast	151	-36	15.7	0.9	893	4	395	2
Lipetskaya Oblast	123	-48	15.4	0.6	882	6	372	-4
Mordoviya Rep.	167	-41	14.0	0.3	850	8	354	1
Novosibirskaya Oblast	329	25	12.2	0.3	725	-6	314	0
Nizhegorodskaya O.	224	-27	13.5	0.4	770	4	319	-2
Orenburgskaya Oblast	218	17	14.9	-0.3	911	0	433	1
Omskaya Oblast	249	2	12.8	0.8	714	-4	329	7
Permskaya Oblast	357	6	11.7	0.4	650	-3	268	-1
Penzenskaya Oblast	154	-41	14.3	0.2	906	9	377	2
Rostovskaya Oblast	106	-40	20.1	1.1	1064	3	542	1
Ryazanskaya Oblast	163	-41	14.6	0.4	824	5	348	-3
Stavropolskiy Kray	168	-41	20.5	1.0	1105	3	603	5
Sverdlovskaya Oblast	304	1	12.1	0.8	705	2	304	10
Samarskaya Oblast	172	-30	14.6	-0.1	859	1	394	1
Saratovskaya Oblast	109	-43	16.1	0.0	983	6	451	2
Tambovskaya Oblast	110	-52	15.5	0.4	909	6	380	-4
Tyumenskaya Oblast	253	-1	12.8	1.1	713	1	331	14
Tatarstan Rep.	270	-10	13.2	0.1	776	3	331	2
Ulyanovskaya Oblast	189	-33	14.0	0.0	864	7	377	6
Udmurtiya Rep.	328	5	12.3	0.2	689	-1	286	-1
Volgogradskaya O.	86	-45	18.3	0.6	1037	5	472	-4
Voronezhskaya Oblast	105	-48	16.9	0.8	959	5	433	-1

Table A.10 United States, Jul 2020 - Oct 2020 agroclimatic indicators and biomass (by state)

	RAIN Current (mm)	RAIN 15YA Departure (%)	TEMP Current (°C)	TEMP 15YA Departure (°C)	RADPAR Current (MJ/m^2)	RADPAR 15YA Departure (%)	BIOMSS Current (gDM/m^2)	BIOMSS 5YA Departure (%)
Arkansas	431	12	22.7	-0.8	1142	-3	697	-2
California	9	-85	21.7	1.6	1417	1	329	-24
Idaho	91	-32	15.6	0.4	1268	2	501	-1
Indiana	285	-8	19.5	-0.2	1123	1	629	2
Illinois	341	8	19.4	-1.0	1106	-2	613	-3
Iowa	244	-22	18.5	-0.7	1143	2	621	2
Kansas	263	-20	21.9	-0.6	1214	2	707	-1
Michigan	275	-15	16.4	-0.3	1010	1	498	4
Minnesota	209	-30	15.8	-0.7	1067	4	532	6
Missouri	360	8	20.4	-1.1	1136	-3	655	-3
Montana	171	-4	15.2	0.0	1172	1	527	-1
Nebraska	229	-13	19.9	-0.2	1216	3	684	3
North Dakota	159	-34	16.3	-0.6	1106	5	549	2
Ohio	245	-19	19.2	0.2	1084	0	603	4
Oklahoma	393	20	23.4	-1.1	1195	-2	731	-2
Oregon	100	-36	16.6	0.9	1216	1	457	-5
South Dakota	150	-39	18.8	-0.1	1176	3	654	5
Texas	334	-10	25.6	-0.3	1237	-1	721	-6
Washington	194	-7	16.0	0.4	1110	0	409	-11
Wisconsin	251	-13	15.8	-0.9	1048	1	516	2

Table A.11 China, Jul 2020 - Oct 2020 agroclimatic indicators and biomass (by province)

	RAIN Current (mm)	RAIN 15YA Departure (%)	TEMP Current (°C)	TEMP 15YA Departure (°C)	RADPAR Current (MJ/m^2)	RADPAR 15YA Departure (%)	BIOMSS Current (gDM/m^2)	BIOMSS 5YA Departure (%)
Anhui	948	39	22.4	-0.6	939	-8	566	-7
Chongqing	964	15	20.1	-0.8	807	-19	463	-20
Fujian	755	-22	22.6	-0.1	1022	-5	638	-5
Gansu	419	0	13.3	-0.6	952	-7	389	-9
Guangdong	1035	-17	24.9	0.1	1119	-3	733	-2
Guangxi	1181	5	23.1	-0.4	1023	-9	638	-9
Guizhou	953	10	18.9	-0.5	768	-21	416	-20
Hebei	301	3	18.5	-0.5	1045	-5	504	-10
Heilongjiang	486	64	14.8	-0.3	883	-10	410	-8
Henan	525	19	21.4	-0.7	970	-8	561	-6
Hubei	943	39	20.6	-1.0	885	-14	506	-15
Hunan	869	13	21.6	-0.9	900	-15	545	-15
Jiangsu	739	6	22.8	-0.4	966	-5	577	-6
Jiangxi	844	5	23.0	-0.5	979	-9	610	-9
Jilin	527	40	16.0	0.0	963	-7	459	-4
Liaoning	444	13	18.1	0.0	984	-6	510	-5
Inner Mongolia	305	47	14.8	-0.6	991	-8	441	-9
Ningxia	255	9	15.6	-0.8	1051	-5	487	-7
Shaanxi	491	-8	17.1	-0.7	941	-9	467	-11
Shandong	534	25	21.4	-0.4	1015	-5	573	-6
Shanxi	334	7	16.1	-0.8	1048	-4	467	-9
Sichuan	1101	22	17.2	-0.3	780	-18	372	-18
Yunnan	1251	26	17.9	0.4	791	-15	376	-12
Zhejiang	753	-17	22.1	-0.5	943	-8	559	-11

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**.**

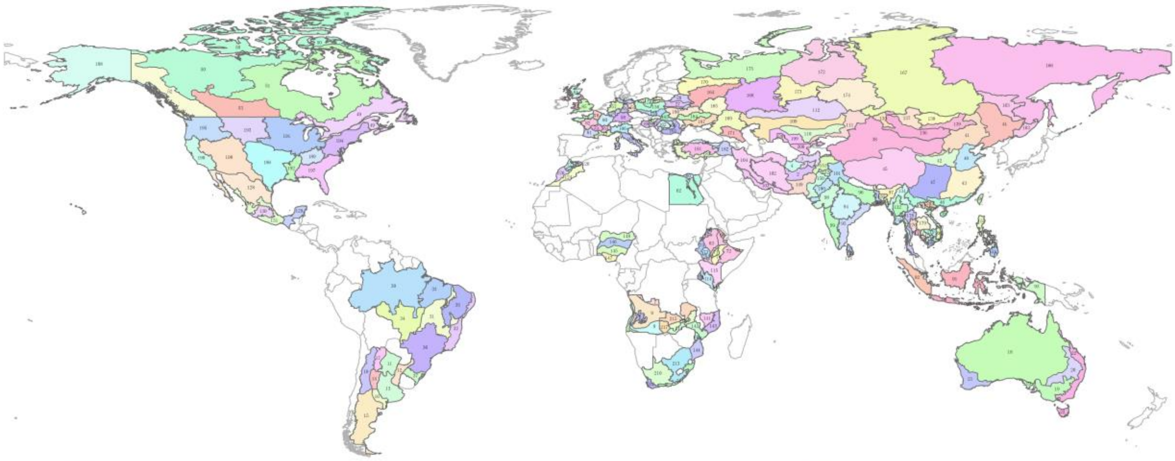
Agroecological zones for 43 key countries

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.



001. Central region with sparse vegetation
002. Dry region
003. Mixed dry farming and irrigated cultivation region
004. Mixed dry farming and grazing region
005. Arid Zone
006. Central Plateau
007. Humid zone
008. Semi-Arid Zone
009. Sub-humid zone
010. Andes
011. Chaco
012. Mesopotamia
013. Humid Pampas
014. Pampas hills
015. Arid part of Patagonia
016. Dry Pampas
017. Subtropical highlands
018. Arid and semiarid zone
019. Southeastern wheat area
020. Subhumid subtropical zone
021. Southwestern wheat area
022. Wet temperate and subtropical zone
023. Coastal region
024. Gangetic plain
025. Hills
026. Sylhet basin
027. Center
028. North
029. South-west
030. Amazonas
031. Central Savanna
032. Coast
033. Northeastern mixed forest and farmland
034. Mato Grosso
035. Nordeste
036. Parana basin
037. Southern subtropical rangelands
038. Gansu-Xinjiang
039. Hainan
040. Huang Huaihai
041. Inner Mongolia
042. Loess region
043. Lower Yangtze rtegion
044. North East China
045. Qinghai-Tibet
046. Southern China
047. South-West China
048. China Taiwan
049. Saint Lawrence basin
050. Arctic
051. Hudson Bay
052. Western Canada
053. Prairies
054. East-German lake and Heathland sparse crop area
055. Central wheat zone of Saxony and Thuringia
056. Wheat zone of Schleswig-Holstein and the Baltic coast
057. Mixed wheat and sugarbeets zone of the north-west
058. Bavarian Plateau
059. Western sparse crop area of the Rhenish massif
060. Nile Delta and Mediterranean coastal strip
061. Nile Valley
062. Desert
063. Central-northern maize-teff highlands
064. Eastern arid area
065. Great Rift region
066. Northern Arid area
067. North-western cereal-root-sesame lowlands
068. North-western sesame irrigated lowlands
069. North-western semi-arid lowlands
070. South-eastern mixed maize zone
071. South-eastern Mendebo highlands
072. Semi-arid pastoral areas
073. South-western coffee-enset highlands
074. Western mixed maize zone
075. Massid Central dry zone
076. Alpes region
077. Mediterranean zone
078. Northern barley zone
079. Maize_barley and livestock zone along the English Channel
080. Rapeseed zone of eastern France
081. Southwest maize zone
082. Mixed maize_barley and rapessed zone from the Centre to the Atlantic Ocean
083. North England, Wales and North Ireland sparse crops area
084. Barley area in Scotland
085. South English mixed wheat and Barley zone
086. Central Hungary
087. Puszta
088. North Hungary
089. Transdanubia
090. Java
091. Kalimantan and Sulawesi
092. Sumatra
093. West Papua
094. Deccan Plateau
095. Eastern coastal region
096. Gangatic plain
097. Assam and north-eastern regions
098. Agriculture areas in Rajastan and Gujarat
099. Western coastal region
100. North-western dry region
101. Western Himalayan region
102. Central and Eastern wasteland region
103. Arid Red Sea coastal low hills and plains
104. Semi-arid to sub-tropical western and northern hills
105. East coast
106. Po Valley
107. Islands
108. Western Italy
109. Central non-agriculture region
110. South zone
111. Eastern plateau and southeastern zone
112. Northern zone
113. Coast
114. Highland agriculture zone
115. nothern rangelands
116. South-west
117. Tonle-sap
118. Mekong valley between Tonle-sap and Vietnam border
119. Northern plain and northeast
120. Southwest Hilly region
121. Dry Zone
122. Intermediate Zone
123. Wet zone
124. Desert
125. Sub-humid northern highlands
126. Warm semiarid zones
127. Warm subhumid zones
128. Arid and semi-arid regions
129. Humid tropics with summer rainfall
130. Sub-humid temperate region with summer rains
131. Sub-humid hot tropics with summer rains
132. Central plain
133. Delta and southern-coast
134. Hills
135. Altai
136. Gobi Desert
137. Hangai Khuvsgul Region
138. Selenge-Onon Region
139. Central and Eastern Steppe
140. Buzi basin
141. Northern high altitude areas
142. Low Zambezia River basin
143. Northern coast
144. Southern region
145. Derived savanna zone
146. Guinean savanna
147. Humid forest zone
148. Soudano-Sahelian zone
149. Balochistan
150. Lower Indus basin in south Punjab and Sind
151. Northern highlands
152. Northern Punjab
153. Forest islands
154. Negros and central Visayas Islands
155. Northern lowlands of Mindanao to western Visayas
156. Central rye and potatoes area
157. Northern oats and potatoes areas
158. Northern-central wheat and sugarbeet area
159. Southern wheat and sugarbeet area
160. Central mixed farming and pasture Carpathian hills
161. Eastern and southern maize wheat and sugarbeet plains
162. Western and central maize wheat and sugarbeet plateau
163. Amur and Primorsky Krai
164. Central Russia
165. Central black soils area
166. Eastern Siberia
167. Middle Siberia
168. Middle Volga
169. Northern Caucasus
170. Northwest Region including Novgorod
171. South Caucasian
172. Subarctic region
173. Ural and wetsrn Volga region
174. Western Siberia
175. West subarctic region
176. Central double and triple-cropped rice lowlands
177. South-eastern horticulture area
178. Western and southern hill areas
179. Single-cropped rice north-eastern region
180. Black Sea region
181. Central Anatolia region
182. Eastern Anatolia region
183. Marmara Agean Mediterranean lowland region
184. Central wheat area
185. Eastern Carpathian hills
186. Northern wheat area
187. Southern wheat and maize area
188. Alaska and Hawaii
189. Blue Grass region
190. California
191. Corn Belt
192. Lower Mississippi
193. Northern Plains
194. North-eastern areas
195. Northwest
196. Southern Plains
197. Southeast
198. Southwest
199. Central region with sparse crops
200. Eastern hilly cereals zone
201. Aral Sea cotton zone
202. North Central Coast
203. North East
204. Red River Delta
205. South East
206. South Central Coast
207. North West
208. Central Highlands
209. Mekong River Delta
210. Arid and desert zones
211. Humid Cape Fold mountains
212. Mediterranean zone
213. Dry Highveld and Bushveld maize areas
214. Luanguwa Zambezi rift valley
215. Northen high rainfall zone
216. Central-eastern and southern plateau
217. Western semi-arid plain

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 selected 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 sunshine (RADPAR) 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 15 years (2005-2019), with departures expressed in percentage.
CALF			
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),

INDICATOR			
			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 and satellite	Liters/m^2, CWSU	The spatial average (for a CWSU) of rainfall accumulation over agricultural pixels, weighted by the production potential.	RAIN is shown as the percent departure of the RAIN value for the reporting period, compared to the recent fifteen-year average (2005-2019), 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 (2005-2019), 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 calculated based on time series NDVI during the monitoring period and the same period during the past five years. Peak NDVI during the monitoring period was compared with the maximum NDVI during the same period for the previous five years. VCIx 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 16km/week for MPZs and 1km/dekad for China.

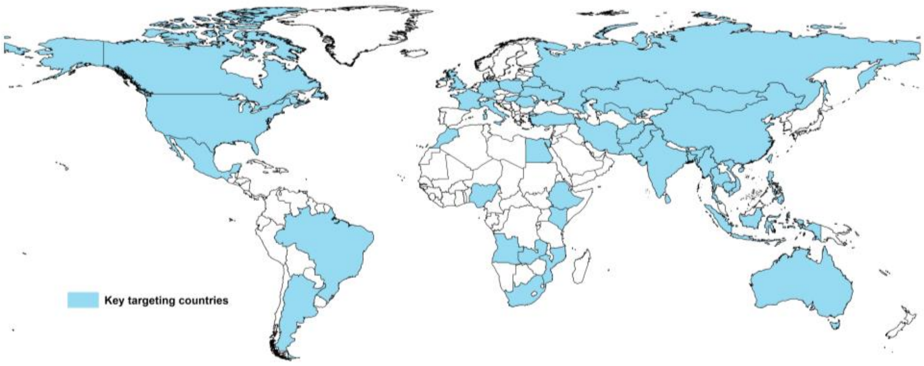
Note: Type is either "Weather" or "Crop"; source specifies if the indicator is obtained from ground data, satellite readings, or a combination; units: in the case of ratios, no unit is used; scale is either pixels or large scale CropWatch spatial units (CWSU). Many indicators are computed for pixels but represented in the CropWatch bulletin at the CWSU scale.

CropWatch spatial units (CWSU)

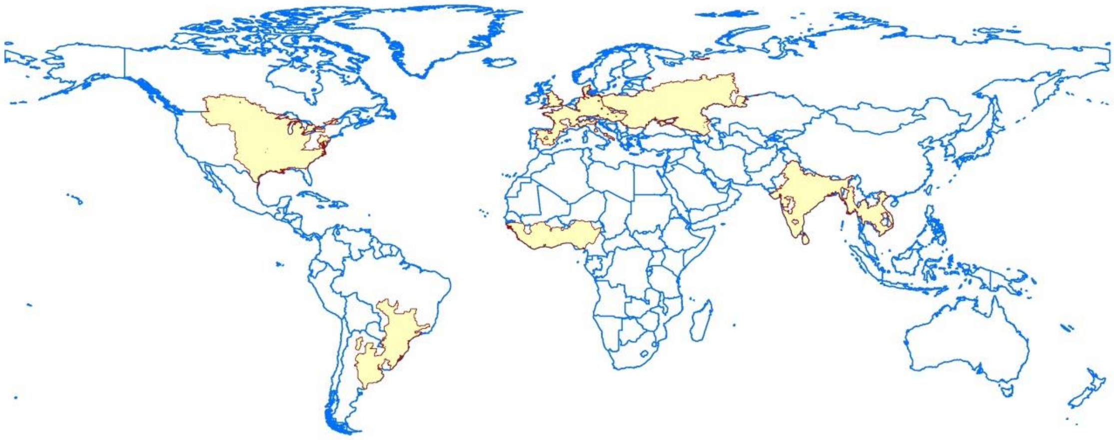
CropWatch analyses are applied to four kinds of CropWatch spatial units (CWSU): Countries, China, Major Production Zones (MPZ), and global crop Monitoring and Reporting Units (MRU). The tables below summarize the key aspects of each spatial unit and show their relation to each other. For more details 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.

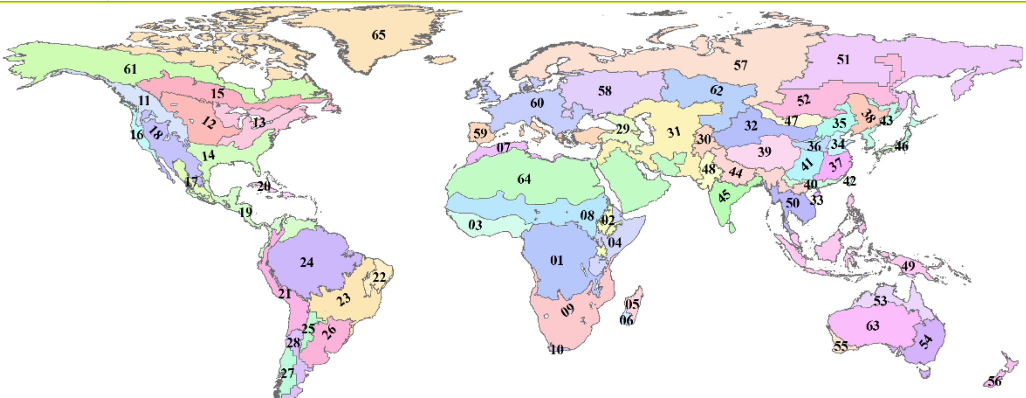
Countries (and first-level administrative districts, e.g., states and provinces)	
Overview	*Description*
"42+1" countries to represent main producers/exporters and other key countries.	CropWatch monitored countries together represent more than 80% of the production of maize, rice, wheat and soybean, 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*
Six 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 Monitoring 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** .



01:Equatorial central Africa
02:East African highlands
03:Gulf of Guinea
04:Horn of Africa
05:Madagascar (main)
06:Southwest Madagascar
07:North Africa Mediterranean
08:Sahel
09:Southern Africa
10:Western Cape (South Africa)
11:British Columbia to Colorado
12:Northern Great Plains
13:Corn Belt
14:Cotton Belt to Mexican Noreste
15:Sub-boreal America
16:West Coast (North America)
17:Sierra Madre
18:Southwest U.S. and north Mexican highlands
19:Northern South and Central America
20:Caribbean
21:Central-northern Andes
22:Nordeste (Brazil)
23:Central eastern Brazil
24:Amazon
25:Central-north Argentina
26:Pampas
27:Western Patagonia
28:Semi-arid Southern Cone
29:Caucasus
30:Pamir area
31:Western Asia
32:Gansu-Xinjiang (China)
33:Hainan (China)
34:Huanghuaihai (China)
35:Inner Mongolia (China)
36:Loess region (China)
37:Lower Yangtze (China)
38:Northeast China
39:Qinghai-Tibet (China)
40:Southern China
41:Southwest China
42:Taiwan (China)
43:East Asia
44:Southern Himalayas
45:Southern Asia
46:Southern Japan and Korea
47:Southern Mongolia
48:Punjab to Gujarat
49:Maritime Southeast Asia
50:Mainland Southeast Asia
51:Eastern Siberia
52:Eastern Central Asia
53:Northern Australia
54:Queensland to Victoria
55:Nullarbor to Darling
56:New Zealand
57:Boreal Eurasia
58:Ukraine to Ural mountains
59:Mediterranean Europe and Turkey
60:W. Europe (non Mediterranean)
61:Boreal America
62:Ural to Altai mountains
63:Australian desert
64:Sahara to Afghan deserts
65:Sub-arctic America

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):

$$Area_i = a + b * CALF_i$$

Data notes and bibliography

Notes

[1] Although Yemen is not part of the Horn of Africa (HoA), it is geographically close and maintains close links to the region. The countries of the HoA are grouped in the regional development association IGAD (Inter-governmental Authority on Development, with headquarters in Djibouti). IGAD has recently established the IGAD Drought Disaster Resilience and Sustainability Initiative (IDDRSI, 2016).

[2] Under-investment in agriculture was one of the main drivers of the 2008 crisis of high food prices (Mittal 2009, ATV 2010), even if several other local and global triggering factors can be identified (Evans 2008).

[3] Previous large humanitarian crises were those of the West African Sahel (from the early sixties to the mid eighties), the Ethiopian droughts of the mid-eighties, the Indian Ocean tsunami of 2004, several large earthquakes (for example, Haiti, 2010), and floods and medical emergencies (such as the West African Ebola outbreak, 2013-16).

[4] http://www.agrhymet.ne/eng/index.html

[5] http://www.icpac.net/

[6] Belg is harvested before or during October.

[7] "Purely man-made disasters" is, however, a concept that deserves a closer look, as many wars and insurgencies are partially triggered by shortages of natural resources, including land. As such, most “man-made disasters” do have an environmental component.

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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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