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

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Abbreviations

5YA	Five-year average, the average for the four-month period from January to April for 2015-2019; one of the standard reference periods.
15YA	Fifteen-year average, the average for the four-month period from January to April 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 January and April 2020, a period referred to in this bulletin as the JFMA (January, February, March and April) period or just the "reporting period." The bulletin is the 117th 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 201 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 205 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 April 2020. It is prepared by an international team coordinated by the Aerospace Information Research Institute, Chinese Academy of Sciences.

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

In the Northern Hemisphere, wheat was the dominant crop that was in the field during this period. It had reached maturity in South Asia by April and was mostly in its vegetative growth phase in the other regions. Planting of spring wheat, soybean and rice started and was in full swing in most northern regions by late April. In the Southern Hemisphere, mainly in South America, maize and soybean were the key crops to be monitored. Harvest of the first crop and subsequent sowing of the second crop in Brazil took place in February, whereas harvest of the main crop in the other South American countries was well advanced by April. Closer to the Equator, this report covers the end tail of the harvest of the main season rice crop and production of the winter rice crops (Boro/Kharif) in South and South-East Asia.

The outbreak of COVID-19 and the impact of associated lock-downs on the agri-food chain are of major concerns for the whole world. So far, the impact on food production per se may have been limited according to CropWatch monitoring results, although there are reports that limited availability of farm-hands has caused delays in labor intensive rice harvest in India and there have been shortages of harvest labor for fruit and vegetable in Europe. This pandemic is also impacting the livestock sector.

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

Agro-climatic conditions

According to the analyses presented in Chapters 1 and 3.1, prevailing climate conditions during the current 2020 JFMA reporting period were dominated by record warm temperatures. Temperatures were 1.4ºC above the previous winter record, set in 2015-16. The Ukraine and the western half of Russia experienced 3.3ºC warmer - or less cold - temperatures than the average of the last 15 years. Warmer winter temperatures generally hasten spring green-up and phenological development of winter wheat. However, warmer temperatures do not prevent late season frosts. Untimely cold snaps in the Midsouth and Midwest of the USA caused some frost damage to wheat in mid-April and early May.

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

The following is a summary of the situation in key production regions and noteworthy anomalies:

- South Asia: This region experienced above-average rainfall and cooler temperatures. This was beneficial for wheat growth in India and Pakistan and boro rice production in India. Especially Indian farmers benefitted from the increased availability of stored water in reservoirs for irrigation during the dry winter season. This allowed them to increase the area of cultivated land and adequately irrigate their crops.

- West of North Africa (Maghreb): Morocco and Algeria suffered from a prolonged drought which lasted until March. It caused crop failures in Southern Morocco.

- Italy, South-East Europe and Ukraine: drier than normal conditions hampered winter wheat growth.

- South-East Asia: Dry season (Kharif) rice production suffered from drought due to below-average rainfall.

- Conditions in the key maize and soybean production regions in Argentina and Brazil were generally favorable, although in some parts short drought spells were observed. Southern Brazil also suffered from drier than normal conditions, which hampered soybean production mainly in the state of Parana.

- South Africa benefitted from generally favorable conditions after a severe drought a year ago.

- Conditions for winter wheat in North America, Europe, and Middle East were generally close to normal. Europe suffered from dry conditions in March and April.

- The situation for China was generally favorable. Winter wheat received above average rainfall and a production increase by 4% is expected. Planting of rice is on track.

2020 Production estimate

The production estimate proposed in Chapter 5.1 will be updated three times this year. Except for the Southern Hemisphere, it is currently based largely on a mix of actual crop and weather data for the JFMA period and estimates for May onward. The share of actual data monitored by remote sensing varies from approximately 21% for maize (Southern Hemisphere), 36% for rice (dry season of Southeast and South Asia), 77% for wheat (most of it being Northern Hemisphere winter wheat) and 46% for soybeans (Southern Hemisphere).

CropWatch predicts the global production of the major commodities at 1057 million tonnes of maize, and 755 million tonnes for rice, bothof which are teh same as 2019. Wheat and soybean productions are projected at 737 million tonnes, and 329 million tonnes, up by 3% and 1% from 2019, respectively. The outlook for the key countries is summarized below.

Two countries stand out for large increases in maize production: Kenya (+15%) and South Africa with (+27%). A larger production (+4%) is estimated for Bangladesh. Myanmar, which was affected by dry conditions, has its production reduced by 12%. In all other countries, the estimates are close to those for the previous years, in the range from +3% to -2%. This includes Argentina (+2%) and Brazil (-2%).

For rice, production increases are forecasted for Argentina (+5%) and Thailand (+6%). Considerable reductions were calculated for Bangladesh (-5%), and drought-stricken countries in South-East Asia: Cambodia (-5%), Myanmar (-4%) and Vietnam (-3%). A reduction by 4% is expected for Brazil.

Larger year to year fluctuations were estimated for wheat, which is mostly rainfed: Afghanistan (-17%), Belarus (-11%), Kyrgyzstan (12%) and the Ukraine (-22%) are the ones with lower yields as compared to last year. On the other hand, substantial increases were calculated for: China (+4%), Egypt (+8%), Hungary (+7%), India (+14%), Mexico (+23%), Pakistan (+10%) and Russia (+6%). Production for the other countries is expected to be close to those from last year. It is also noteworthy that the top wheat producers (China, India, Russia) all present an increased wheat production, by 4%, 14% and 6% respectively, which contribute to a 20.54 million tonnes of production increase.

This monitoring period covers soybean in two important countries only: Production for Argentina is expected to increase by 2%, whereas for Brazil, it is expected to drop by 1%, due to drier-than- usual conditions in the south of that country.

The performance of major exporters and importers does not rise any concerns for the availability of maize, rice, wheat, and soybean.

China

During the current monitoring period, winter wheat and rapeseed were still at the growing stage while spring crops including spring maize and early rice were at the planting stage.

Climatic variables and the resulting crop conditions were generally favorable in the main winter crop producing areas. Both precipitation and temperature were above average (by 19.7% and 0.8°C, respectively). The cropping season is well underway in southern and central China. According to the spatial VCIx patterns favorable crop condition occurred widely all across China. Huanghuaihai benefitted most from the above-average precipitation (RAIN +51%).

CropWatch puts the total output of winter crops for China at 132.33 million tons, up by 3% or 4.29 million tons. The total winter wheat production in 2020 is estimated to reach 122.24 million tons, an increase of 4.44 million tons or 4% from 2019. The national winter wheat area is 23,898 thousand hectares, an increase of 3% over the same period of last year. The average winter wheat yield nationally is 5115 kg/ha, up by 1% compared to 2019. The increase in total production is mainly due to the two main winter wheat producing provinces of Henan and Shandong, which further expanded the winter wheat planted area by 5% and 3%, respectively. Decreases were observed in Hebei and Shanxi, down by 2% and 1% from 2019, respectively. The reduction of winter crops planted area might be a consequence of the water-saving and sustainable groundwater management policy. It is also noteworthy that after the end of the lockdown, winter crops in Hubei recovered from unfavorable conditions in March.

The results also show that COVID-19 had limited impacts on early rice cultivation at the national level. It is expected that the area of early rice in the eight main early rice producing provinces in 2020 will increase by 2.2% compared with 2019. In 2020, the total early rice area is estimated at 5101.4 thousand hectares, an increase of 109.7 thousand hectares or 2.2% up from 2019.

So far, conditions for the 2020 cereal production have generally been favorable not only for China, but for most of the important crop production regions on Earth.

Chapter 1. Global agroclimatic patterns

1.1 Introduction to CropWatch agroclimatic indicators (CWAIs)

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

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

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

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

1.2 Global overview

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

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

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

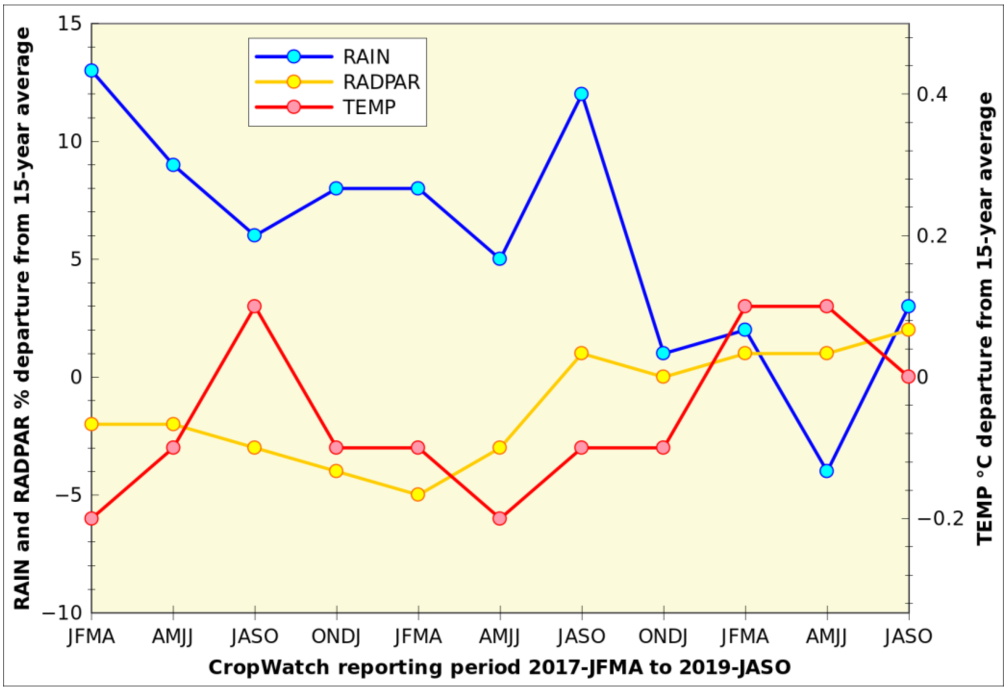


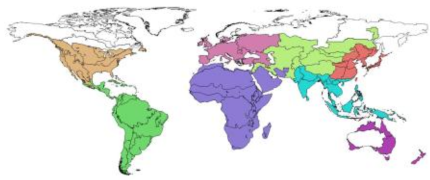
Figure 1.1 global departure from recent 15 year average of theRAIN, TEMP and RADPAR indicators since 2017 JASOperiod (average of 65 MRUs, unweighted)

Figure 1.1 shows unweighted averages of the CropWatch Agro-climatic Indicators, i.e. the arithmetic means of all 65 MRUs, which are relatively close to average. CWAIs are computed only over agricultural areas, and they display a relatively average situation, globally (RAIN +3%, TEMP average, RADPAR +2% and BIOMSS +1%, as result of the combined positive departures of RAIN and BIOMSS).

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

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

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



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

1.3 Rainfall (Figure 1.2)

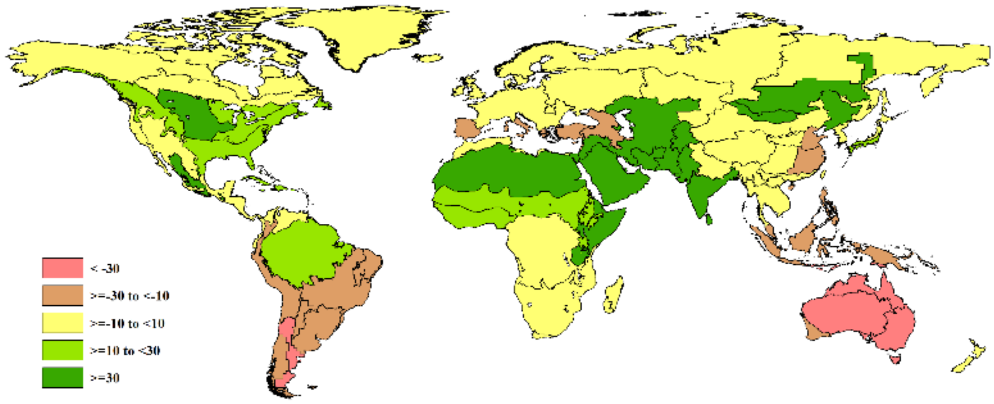


Figure 1.2 Global map of rainfall anomaly (as indicated by the RAIN indicator) by CropWatch Mapping and Reporting Unit: departure of January to April 2020 total from 2005-2019 average (15YA), in percent.

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

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

1.4 Temperatures (Figure 1.3)

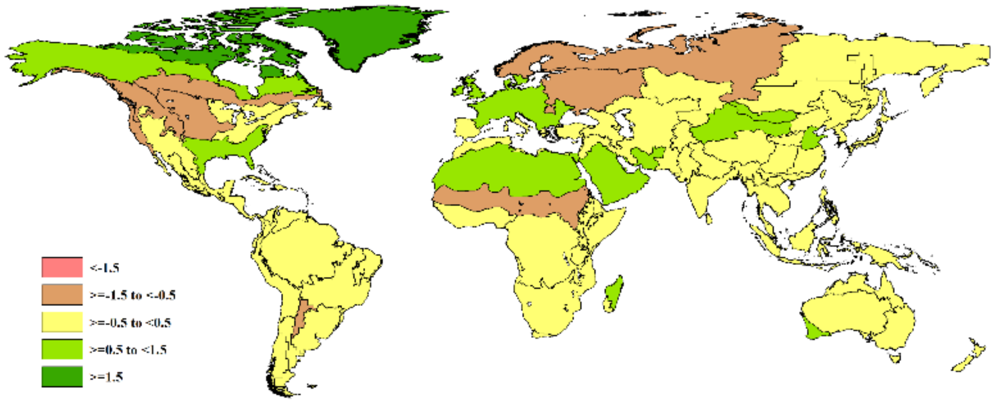


Figure 1.3 Global map of temperature anomaly (as indicated by the TEMP indicator) by CropWatch Mapping and Reporting Unit: departure of January to April 2020 average from 2005-2019 average (15YA), in °C .

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

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

1.5 RADPAR (Figure 1.4)

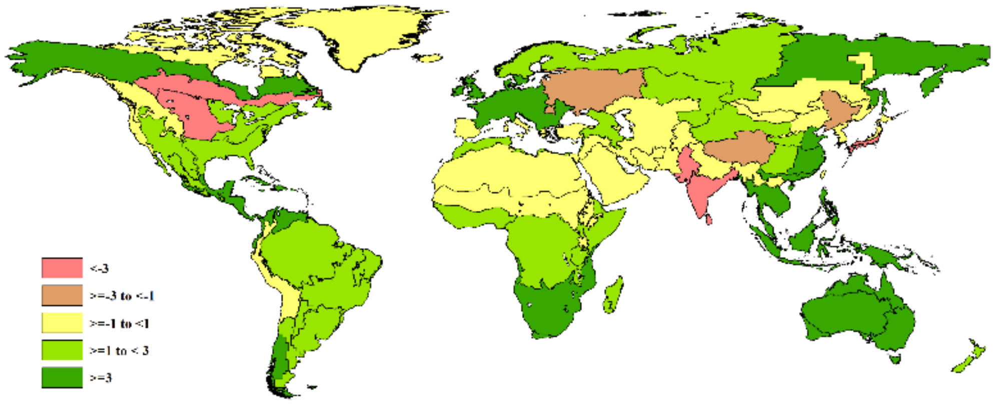


Figure 1.4 Global map of photosynthetically active radiation anomaly (as indicated by the RADPAR indicator) by CropWatch Mapping and Reporting Unit: departure of January to April 2020 total from 2005-2019 average (15YA), in percent.

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

1.5 BIOMSS (Figure 1.5)

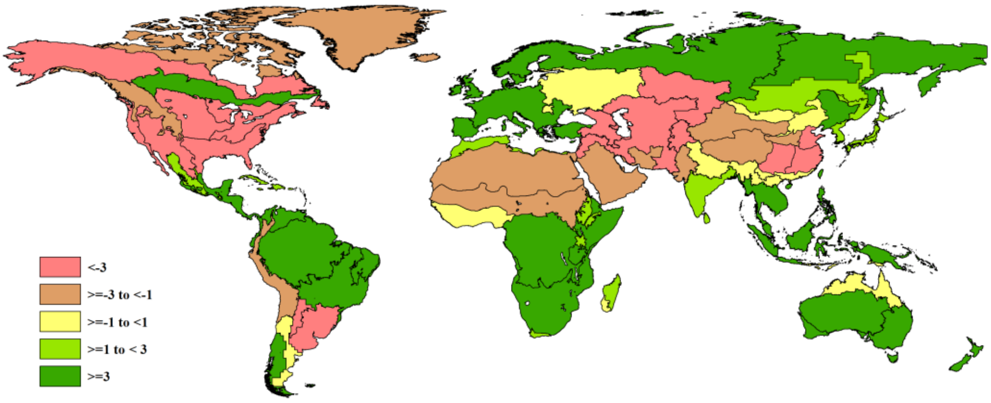


Figure 1.5 Global map of photosynthetically active vradiation anomaly (as indicated by the RADPAR indicator) by CropWatch Mapping and Reporting Unit (MRU), departure from 15YA between between January and April 2019

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

Chapter 2. Crop and environmental conditions in major production zones

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

2.1 Overview

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

Table2.1 Agroclimatic indicators by Major Production Zone, current value and departure from 15YA (January to April 2020)

	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
West Africa	113	-15	27.2	0.0	1334	1	404	-15
North America	418	24	5.5	0.7	706	-8	176	-6
South America	729	-16	22.7	0.0	1194	3	705	-3
S. and SE Asia	133	-5	23.1	-0.4	1175	-2	478	13
Western Europe	315	-2	6.2	1.5	614	5	147	2
C. Europe and W. Russia	253	-1	1.8	2.9	486	-1	95	-2

*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 (January-April) for 2005-2019.*

Table2.2 Agronomic indicators by Major Production Zone, current season values and departure from 5YA (January to April 2020)

	CALF (Cropped arable land fraction)		Maximum VCI
	Current (%)	5A Departure (%)	Current
West Africa	55	3	0.94
North America	44	-3	0.80
South America	99	0	0.92

S. and SE Asia	87	22	1.02
Western Europe	97	2	0.91
Central Europe and W Russia	57	-10	0.83

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

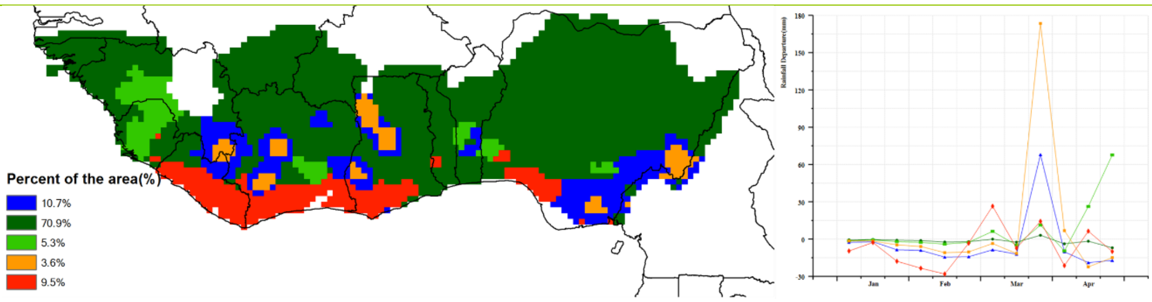
2.2 West Africa

This reporting period covers the onset of the main cropping season for cereals and tuber crops in West Africa. Active cropping activities occurred mainly along the coastal areas of the MPZ while the northern parts are currently uncropped. In the north, farmers are awaiting the onset of the rains which are progressing northwards from the coastal areas. Main farming activities occurred in the south (February/March) and were related to planting of main maize, yams and rainfed rice. For Nigeria, harvesting activities of rainfed and irrigated cereal crops were completed by the end of January. Fall Armyworm infestations on maize crops early in the season had affected the yields.

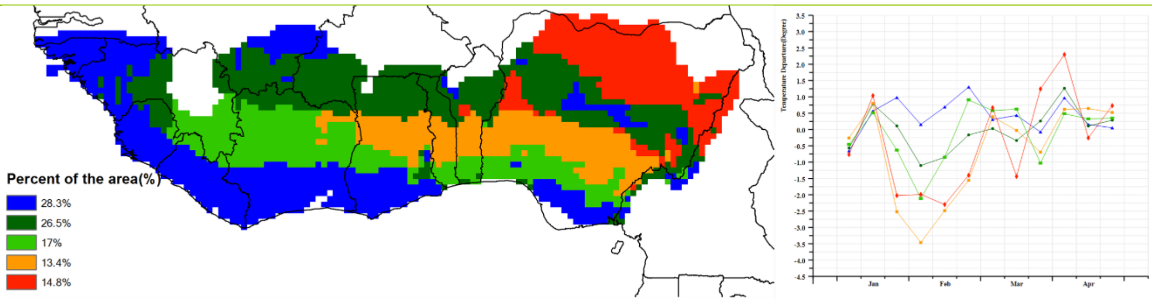
Between January and April, the MPZ received below normal rainfall (113 mm, -15%) covering 70.9% of the region. The highest rainfall amounts were received in Equatorial Guinea (1044 mm, -9%) and Gabon (989 mm, -11%) in the west equatorial rain-forest with a unique tropical warm and humid climate while most of the region received less than 200 mm during this dry season. The VHI map shows the severity of water stress throughout the region. The average temperature for the region was 27.2°C (0.0°C) and an increase in radiation was registered (RADPAR 1334 MJ/m², +1%). Most of the cropland along the coast was planted, while the northern areas remained uncropped in this dry season (CALF 55%, +3%). The observed potential biomass production was 404 gDM m-2 (-15%) and the VCIx of 0.94 is predominantly a result of the coastal areas of the region.

In summary, based on these CropWatch indicators, it is expected that the climatic conditions favor a stable onset of the main long growing season in the MPZ.

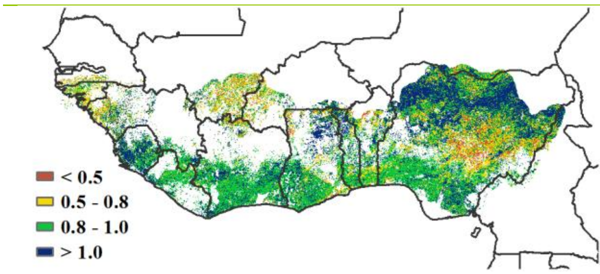
Figure 2.1 West Africa MPZ: Agroclimatic and agronomic indicators, January to April 2020



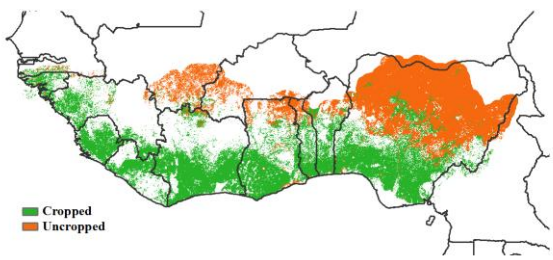
a. Spatial distribution of rainfall profiles b. Profiles of rainfall departure from average (mm)



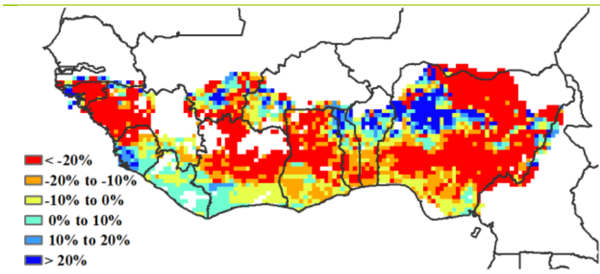
c. Spatial distribution of temperature profiles d. Profiles of temperature departure from average (mm)



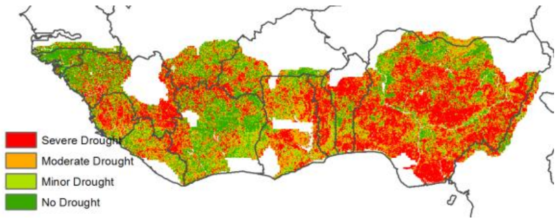
e. Maximum VCI



f. Cropped arable land



g. Biomass accumulation potential departure



h. VHI minimum

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

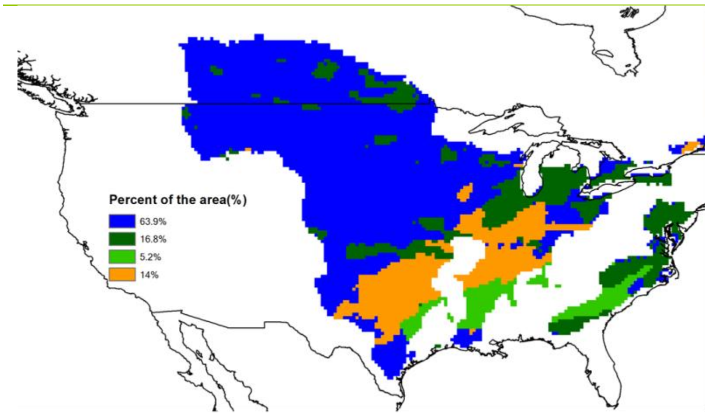
2.3 North America

The monitoring period from January to April 2020 covers the winter dormancy, green-up and flowering stages of winter wheat, depending on latitude. Abundant precipitation has produced generally favorable conditions. In April, a cold snap may have caused some local freeze damage to wheat in some parts. While temperatures were generally warmer than average from January to March, they were below average in April, which in turn may have slowed down growth and development of wheat. However, this has no negative impact on yield. Slow development prolongs the growth period and allows the crop to intercept more light for photosynthesis.

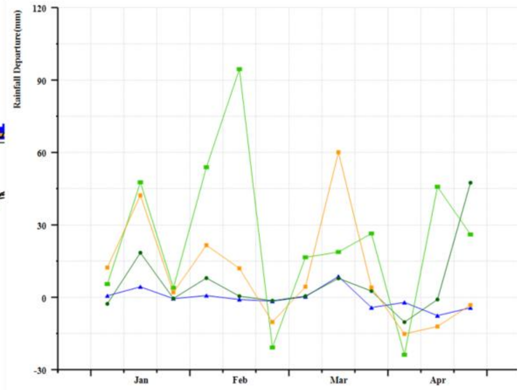
As a whole region, North America received abundant precipitation (+ 24%) and warm temperatures (+ 0.7 ° C), but photosynthetically active radiation was significantly lower than the average (-8%) for the same period over the past 15 years. Winter wheat reached heading and flowering stages in the south. In terms of the southern Great Plains, the most important growing area of winter wheat, precipitation in Oklahoma, Texas and Kansas was significantly above average, the peak of precipitation occurred in the middle of March and then gradually declined to below-average levels in April (Figure 1). During this monitoring period, the temperature fluctuated greatly in the southern Great Plains. It was above average in March, but dropped to a below-average level by 5 ℃ in April (Figure 2). This delayed crop development. Colorado and Western Kansas were affected by below-average rainfall. The effects are shown in Figure 5, where VCIx is below 0.5 for that region.

In general, conditions were close to average for winter wheat.

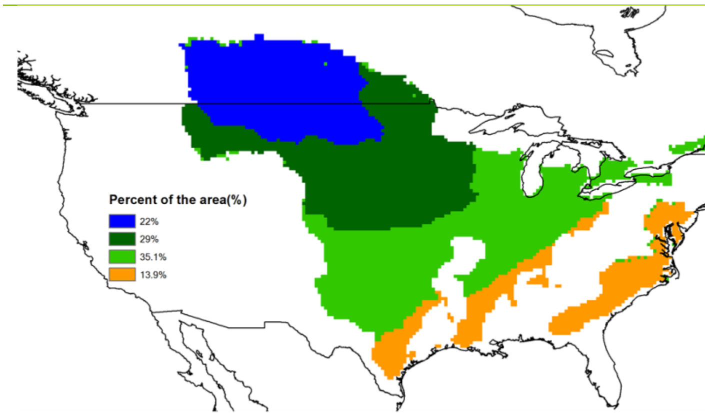
Figure 2.2 North America MPZ: Agroclimatic and agronomic indicators, January to April 2020.



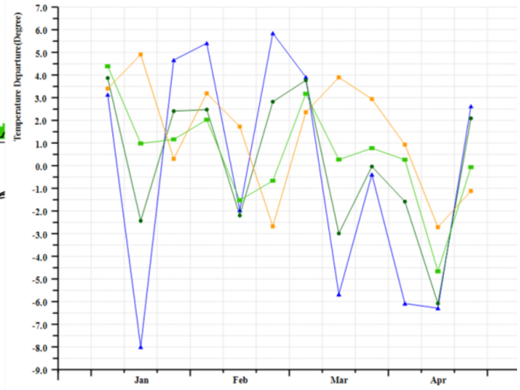
a. Spatial distribution of rainfall profiles



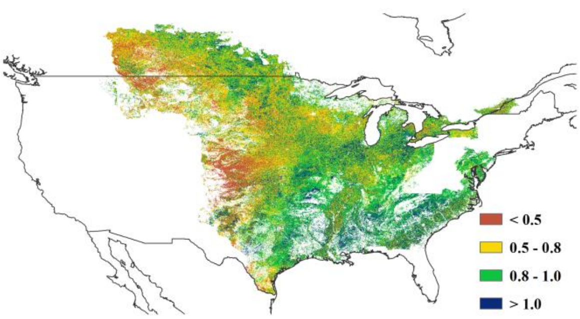
b. Profiles of rainfall departure from average (mm)



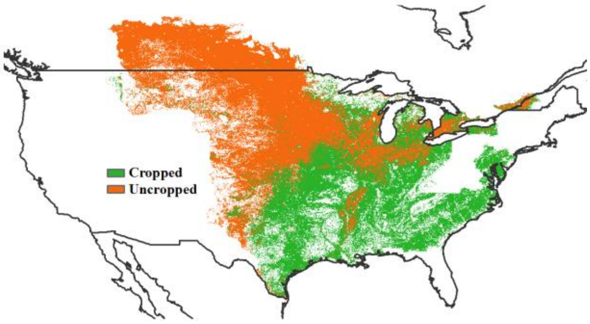
c. Spatial distribution of temperature profiles



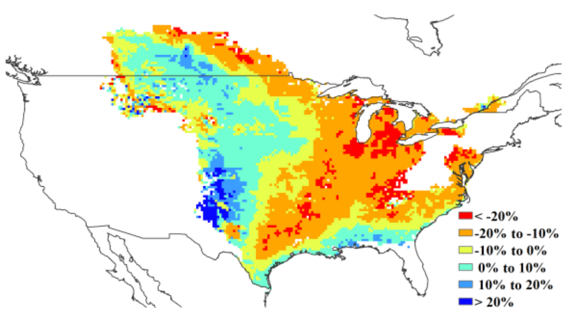
d. Profiles of temperature departure from average (mm)



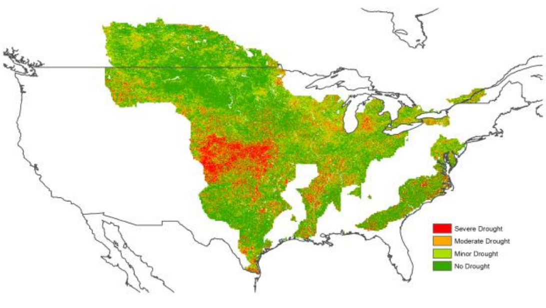
e. Maximum VCI



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

The reporting period covers the main growing period of summer crops, as well as the harvest of earlier planted crops. Overall, the situation for South America is near average.

RAIN showed four homogeneous patterns distributed along a South-North direction. Argentina and Uruguay were dominated by a nearly stable rainfall profile with slight positive anomalies in March and April (light green area). Southern Brazil and Paraguay showed a slightly negative anomaly pattern that decreased over time. The northern area of Brazil was mixed with two profile patterns. Both had high positive anomalies in February. The blue area shows a relevant negative anomaly in March and the dark green area shows a positive spike in precipitation departure from the mean in April.

Despite the fact that several homogeneous regions were defined for TEMP, it is difficult to find clear differences among the temperature profiles. Most of the profiles showed a high positive deviation, i.e., warmer conditions than usual, during March and a negative anomaly followed by a positive anomaly during April. For the North of the Brazilian agricultural region (red area), a more stable pattern with a slight variation in anomaly values around zero was observed.

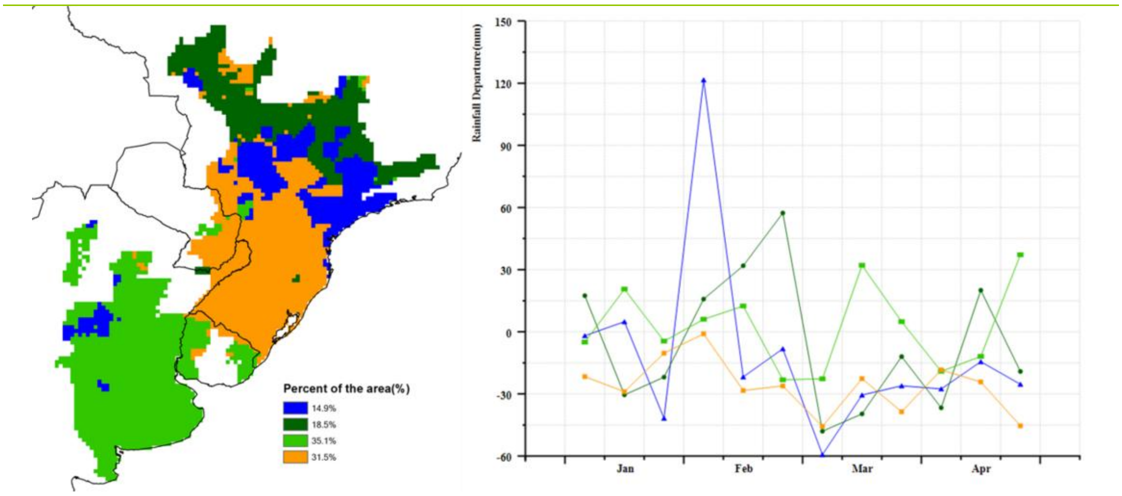
Most BIOMSS anomalies were in the range of -10% to =10%. Positive deviations were observed in the Southern Pampas and South and North West of Brazilian agricultural regions. Negative anomalies were mostly observed in the North East. Almost all cropland was farmed (CALF = 1), except for small areas in the South West Pampas.

Maximum VCI showed good conditions (values higher than 0.8) in most of the zones. Values higher than one were mostly observed in the North of Brazil. Lower values were observed in areas of uncropped farmlands in the South West Pampas and in South Brazil.

The statistical analysis of the proportions of different categories of drought showed drought conditions were getting more severe starting in early March, when the maximum proportion of cropland suffering from drought reached 30%. This coincided with the below-average rainfall in that month. The drought might also be a result of positive anomaly in temperature and sunshine.

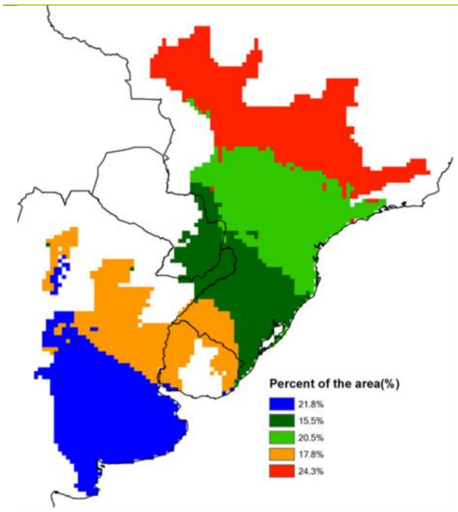
In general, South America show good conditions for crop production with near-average rainfall, although some positive and negative anomalies in rainfall and temperatures were observed. BIOMSS trends tended to be positive and near optimum values of VCIx were observed.

Figure 2.3 South America MPZ: Agroclimatic and agronomic indicators, January to April 2020.

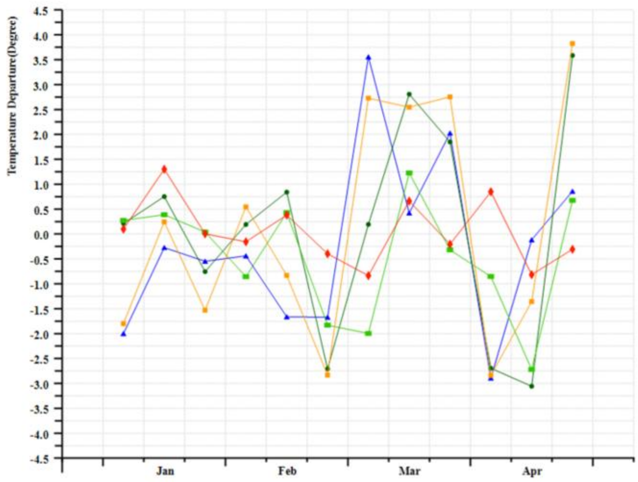


a. Spatial distribution of rainfall profiles

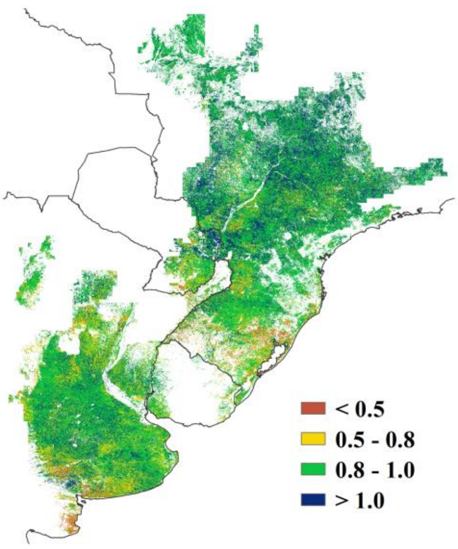
b. Profiles of rainfall departure from average (mm)



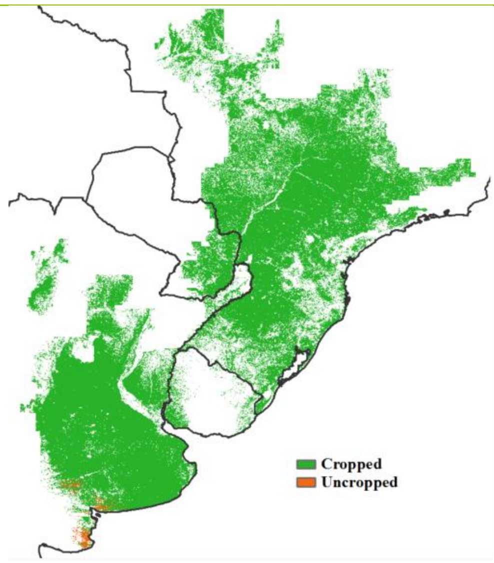
c. Spatial distribution of temperature profiles



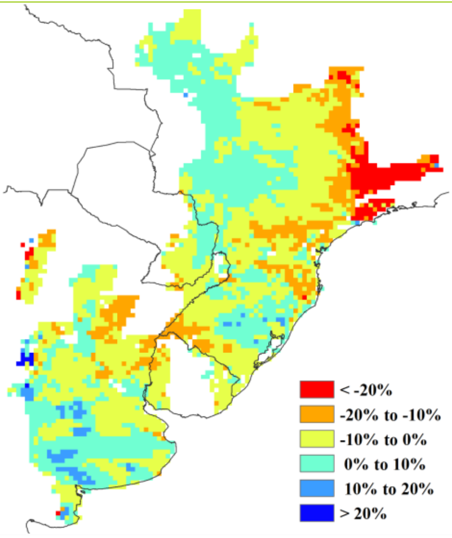
d. Profiles of temperature departure from average (mm)



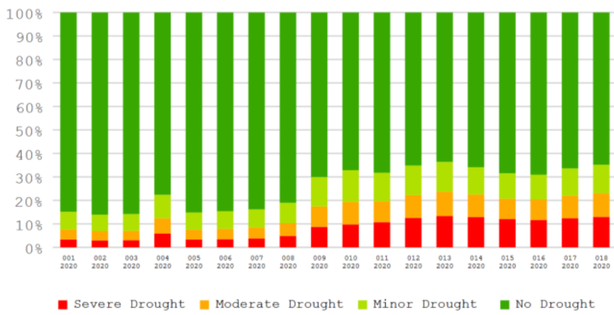
e. Maximum VCI



f. Cropped arable land



g. Biomass departure



h. Proportion of different drought categories from January to April 2020

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

2.5 South and Southeast Asia

The South and Southeast Asia MPZ spans a large geographic area, including India, Bangladesh, Cambodia, Myanmar, Nepal, Thailand, Laos and Vietnam. Rice is the main crop in most countries, but wheat, maize, soybean and other crops are also grown. During this monitoring period, this MPZ experienced close to average agroclimatic conditions: Rainfall was slightly lower than the average by 5%, temperature remained at the average level and RADPAR was slightly reduced by 2%. Meanwhile, the MPZ had a high value for VCIx (1.02). However, the situation was quite different within this MPZ: South-Asia experienced favorable conditions, whereas most of Southeast Asia suffered from much drier than normal weather, which caused unfavorable conditions.

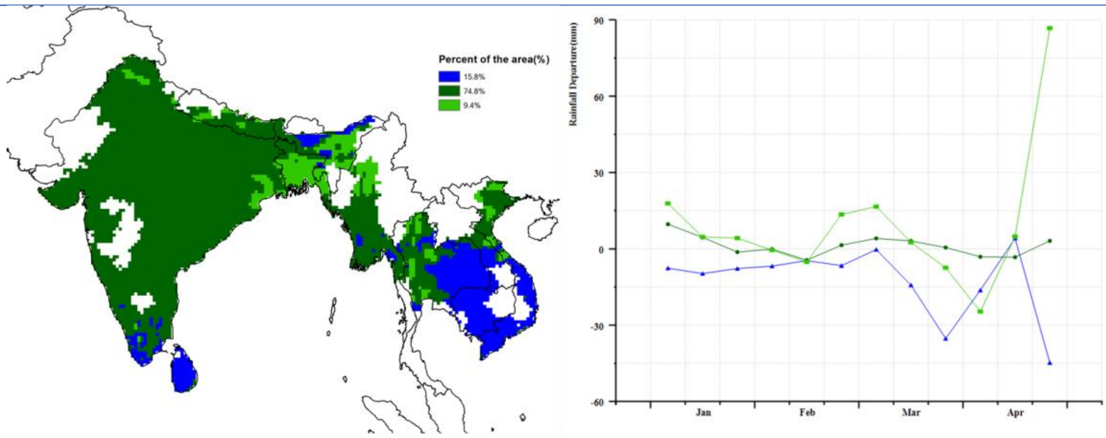
This monitoring period falls into the dry months. Nevertheless, rainfall is an important agroclimatic parameter. In this period, 74.8% of cultivated areas experienced average rainfall, they are located mainly in India, southern Myanmar, and northern Vietnam. Cambodia, southern Vietnam, Laos and eastern Thailand experienced below average rainfall. The severe drought conditions for Thailand, Cambodia, Laos and southern Vietnam were shown according to the VHI minimum map. The remaining 9.4% of crop land, mainly in Bangladesh, experienced heavy rainfall in late April.

Temperature was near average for 30.3% of the crop land, mainly in southern India and Myanmar. The temperatures in most Indochina countries were higher than the 15YA. Meanwhile, the temperatures in 31.3% of cultivated areas were below average and fluctuated significantly, including northeastern India and Bangladesh.

CALF reached 87% in this MPZ, 21% above the average of this stage. Uncultivated areas are scattered in various countries. The VCIx map shows that favorable crop conditions with the values greater than 0.8 could be observed in India, Bangladesh and Vietnam. Poor crop growth (<0.5) was located in Thailand, Laos and Cambodia, which was mainly due to drier than normal conditions. The BIOMASS map shows that the areas with above average biomass were mainly distributed in the Indian Peninsula, and below-average BIOMASS occurred in Southeast Asian countries, including southern Myanmar, western Thailand, Cambodia and northern Vietnam.

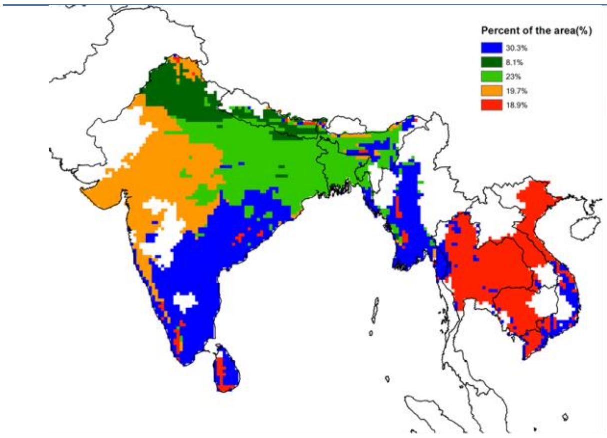
In summary, crop conditions in South Asia were favorable, whereas South-East Asian countries suffered from drought.

Figure 2.4 South and Southeast Asia MPZ: Agroclimatic and agronomic indicators, January to April 2020.

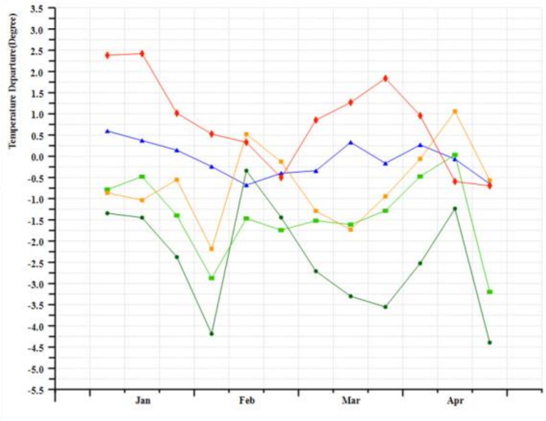


a. Spatial distribution of rainfall profiles

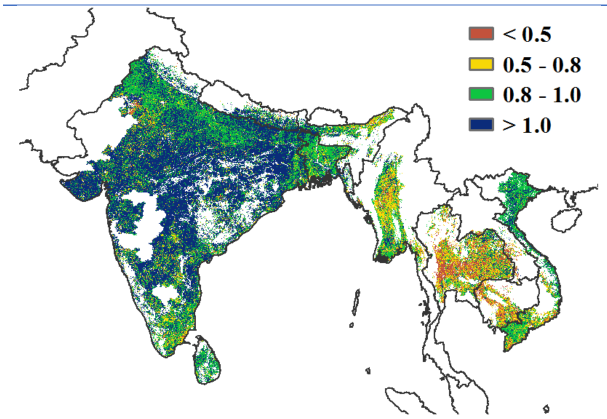
b. Profiles of rainfall departure from average (mm)



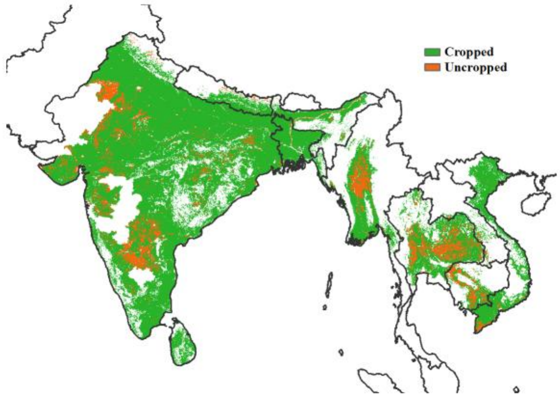
c. Spatial distribution of temperature profiles



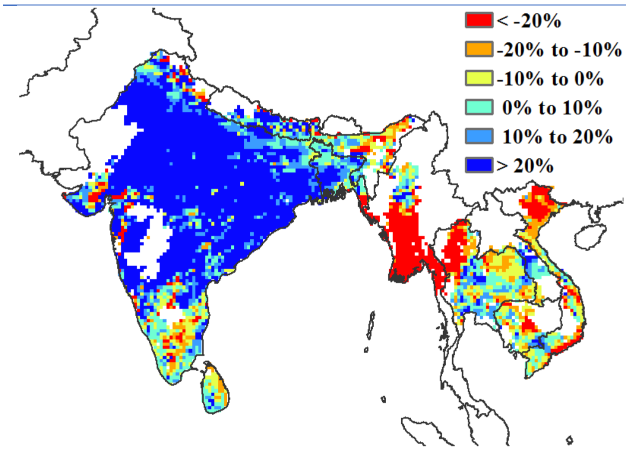
d. Profiles of temperature departure from average (mm)



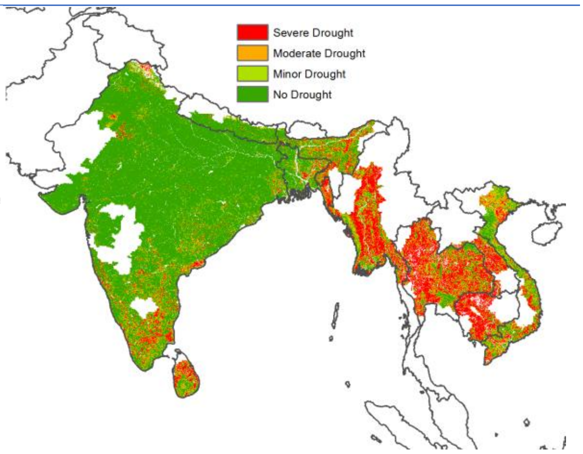
e. Maximum VCI



f. Cropped arable land



g. Biomass accumulation potential departure



h. VHI minimum

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

2.6 Western Europe

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

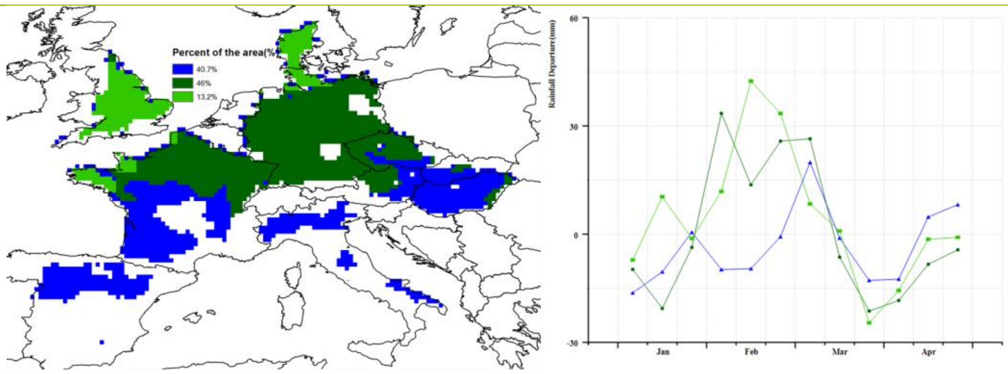
The whole MPZ showed a slight drop in RAIN (-2% below average) and small disparities among the major agricultural production areas. However, there were spatio-temporal differences. They can be characterized as follows (1) Precipitation was below average in most areas in January, with the exception of the United Kingdom, the western part of Bretagne and Normandie in France, and the northwestern part of Schleswig-Holstein in Germany in mid-January; (2) 59.3 percent of MPZ areas experienced above-average precipitation from February to early-March in addition to Spain, Italy, Hungary, south-central France, southern Czech Republic, eastern Austria and south-western Slovakia; (3) Precipitation was below average in most parts of MPZ areas (mainly in the United Kingdom, Denmark, most parts of France, most parts of Germany, most parts of the Czech Republic, western Austria), while areas with above-average precipitation accounted for only about 40.7% of the main producing areas in late April. Countries with the most severe precipitation deficit included Italy (RAIN -43%), Hungary (RAIN -34%), Slovakia (RAIN -24%), Czech Republic (RAIN -13%), while two countries had above normal precipitation: Denmark (RAIN +31%) and UK (RAIN +13%). More rain is needed in the coming months to raise soil moisture levels, and create favorable conditions for the growth of winter and summer crops.

Temperature (TEMP) for the MPZ as a whole was significantly above average (TEMP +1.5°C), and radiation also was above average with RADPAR at +5%. During the entire monitoring period, most areas experienced warmer-than-usual conditions, and related reports suggest that the monitoring period was the warmest since 1979 in parts of this MPZ, while below-average temperature mostly occurred in (1) United Kingdom, Italy, Hungary, Slovakia, most parts of Spain in early and mid-January; (2) The entire MPZ in late March. Due to suitable temperature and high sunshine conditions for the MPZ, the biomass accumulation potential BIOMSS was 2% above average. The lowest BIOMSS values (-20% and below) occurred in Austria, Italy, and Spain. In contrast, BIOMSS was above average (sometimes exceeding a 10% departure) for France, UK, Germany, Denmark and Hungary. The average maximum VCI for the MPZ reached 0.91.

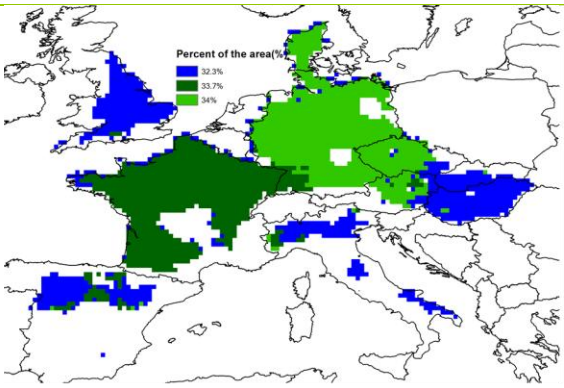
A total of 97% of arable land was cropped (i.e. 2% above average) in the whole MPZ. The area of uncultivated arable land was mainly located in Spain, south-eastern France, northern Italy and central Austria, where it might be affected by the COVID-19.

Generally, the conditions of winter crops in the MPZ were above average. However, more rain will be needed in several important crop production areas to ensure an adequate soil moisture supply for the crops..

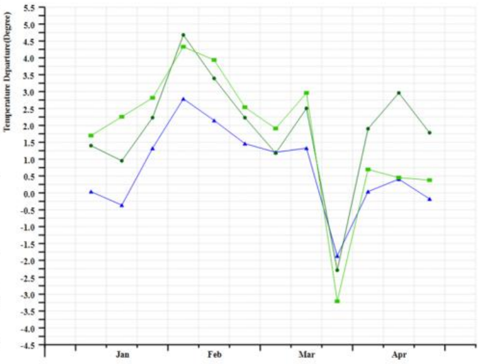
Figure 2.5 Western Europe MPZ: Agroclimatic and agronomic indicators, January to April 2020.



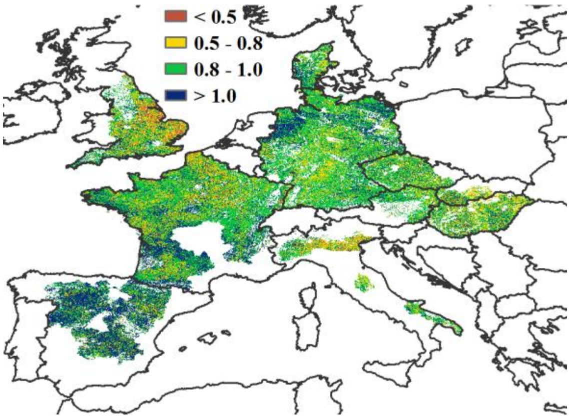
a. Spatial distribution of rainfall profiles | b. Profiles of rainfall departure from average (mm)



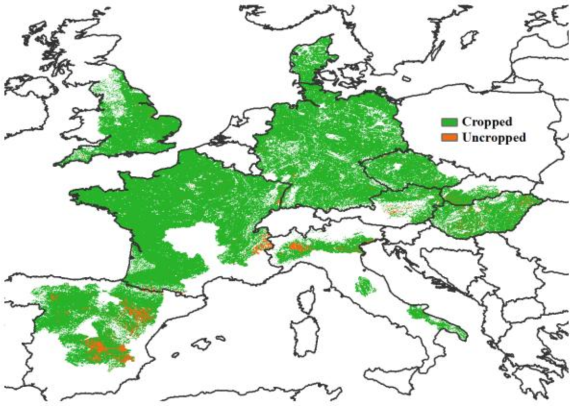
c. Spatial distribution of temperature profiles



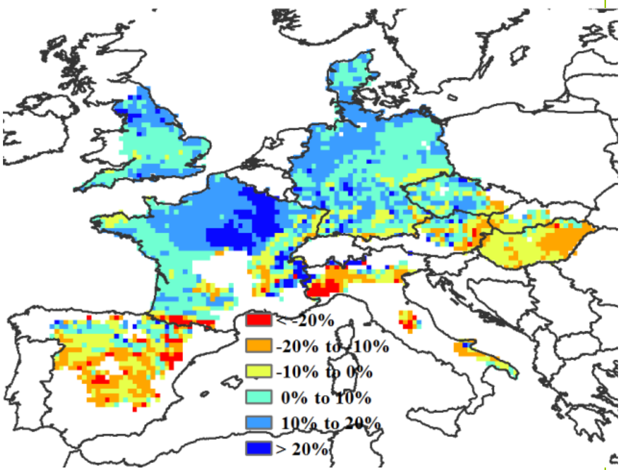
d. Profiles of temperature departure from average (mm)



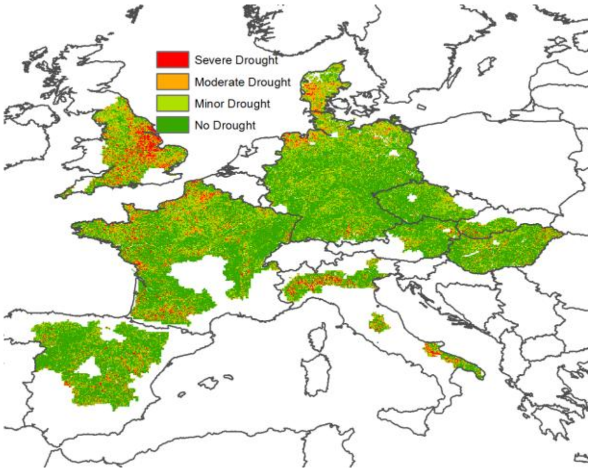
e. Maximum VCI



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 dormant winter season and spring green-up of winter cereals in Central Europe and the western Russia MPZ. Sowing of the summer crops started in April. Generally, agroclimatic variables demonstrated average conditions for rainfall (-1%), temperature (+2.9ºC), and RADPAR (-0.7%). Crop conditions were generally normal, but good rainfalls are needed during the remainder of the wheat growing season to ensure yields.

Based on the spatial distribution map of rainfall departure, the precipitation in most areas of the MPZ fluctuated around the mean, however, the period from mid March to mid April was below average in all regions. From February to early April 2020, the precipitation in southern Poland, southern Ukraine, Moldova, and Romania (37.5% of the MPZ) continued to decline. In the northwest of the MPZ (25.4% of the total area) precipitation was below average from mid-March to early April. This includes the northwest of Poland, the north of Ukraine, the south of Belarus and parts of the west of Russia. From mid-January to early March (25.5% of the MPZ), the regions with higher than average precipitation were located in western Russia.

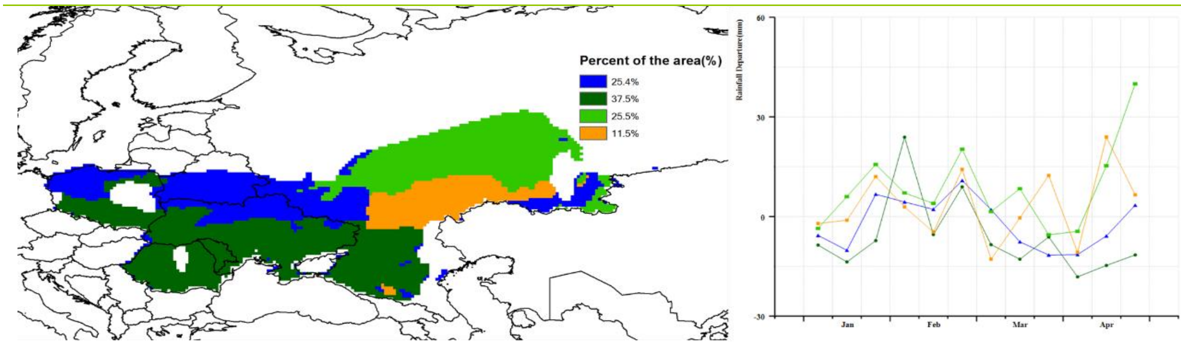
Temperatures were above average until mid March, when they started to drop to below average levels. This slowed growth in April. On average, temperatures in the main production area were higher (+ 2.9℃) than the 15YA. According to the temperature departure map, in early January, except for western Romania and western Russia (12.4% of the MPZ), temperatures were above average. From late January to the mid-April, the temperatures of the MPZ began to decline, and the lowest temperature departure value was nearly 3.8℃. The areas of lower temperature are located in the southeast of Belarus and parts of western Russia (20.1%).

CropWatch calculated that BIOMSS was 2% below the 15YA. The spatial distribution of BIOMSS showed that in the MPZ, the lowest BIOMSS (-20% and below) occurred in western Russia, Belarus and Northern Romania. In contrast, the highest BIOMSS (10% and above) was concentrated in Poland and Ukraine. From January 1 to April 30, the cropped arable lands proportion was 57% (-10% below average). The uncropped areas are mainly distributed in the southwest of Russia, some in the central and eastern Ukraine. They are consistent with the spatial distribution of BIOMSS.

The average value of maximum VCI was 0.83, and values higher than 0.8 were observed in western MPZ (Poland), and northeastern MPZ. Although the potential biomass was above average, the VCIx in Ukraine was lower. This is also proved by the distribution map of Minimum VHI, which demonstrated that some severe drought areas are located in the central and western MPZ (western Russia, central Ukraine and to some extent western Romania). Mostly drought-free conditions were observed for Poland and Belarus.

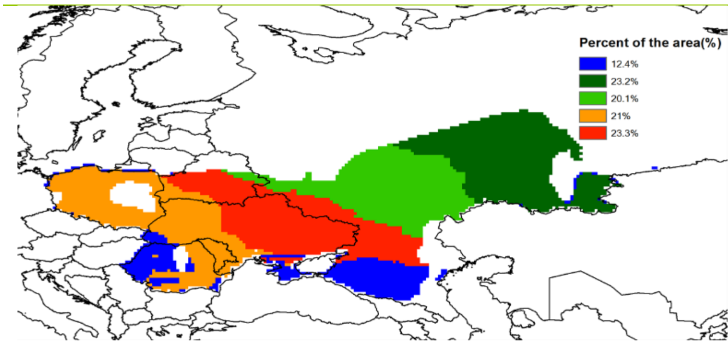
In brief, based on the results of CropWatch agroclimatic and agronomic indicators during the monitoring period, the condition of winter crops in the Central Europe and western Russia MPZ are normal, except for Ukraine, and the crop yields are expected to be normal.

Figure 2.6 Central Europe-Western Russia MPZ: Agroclimatic and agronomic indicators, January - April 2020.

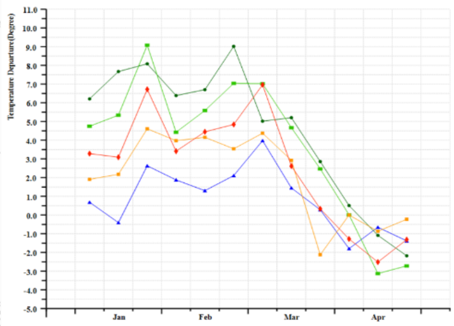


a. Spatial distribution of rainfall profiles

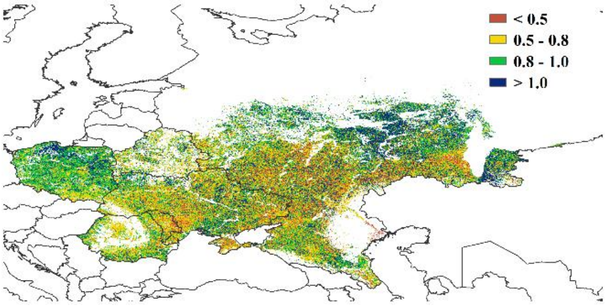
b. Profiles of rainfall departure from average (mm)



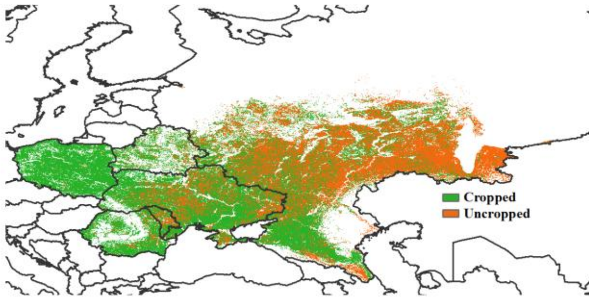
c. Spatial distribution of temperature profiles



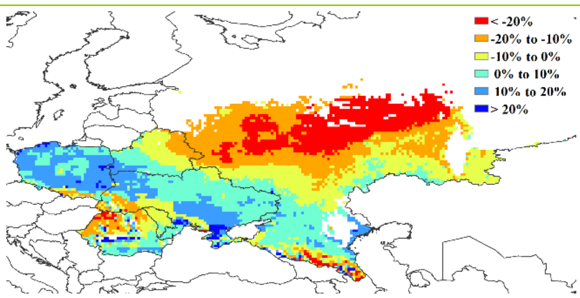
d. Profiles of temperature departure from average (mm)



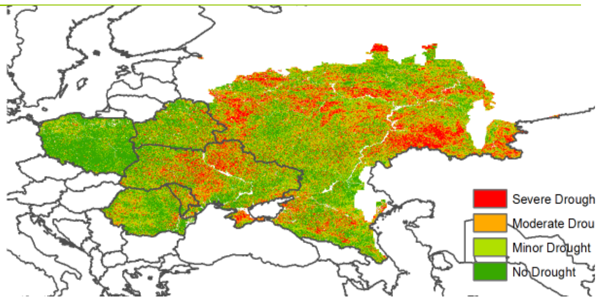
e. Maximum VCI



f. Cropped arable land



g. Biomass accumulation potential departure



h. VHI minimum

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

Chapter 3. Core countries

3.1 Overview

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

1. Introduction

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

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

2. Overview of weather conditions in major agricultural exporting countries

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

Maize: Maize exports are dominated by just 4 countries: USA, Brazil, Argentina and the Ukraine. Together, they supply three quarters of maize being traded internationally. Apart from Argentina and Brazil, the other relevant countries where the crops were in the field during this monitoring period were India, Paraguay and South Africa. Brazil and Argentina experienced near average conditions. In Argentina, RAIN was above average (+5.7%), whereas for Brazil, a slight deficit (-1.9%) was observed. Temperatures and radiation were close to the 15YA. Calculated Biomass was below the 15YA for Argentina (-2.6%) and Brazil (-5.3%). Both countries had a slightly higher CALF. Rainfall was below average in April in Mato Grosso and Goias. This may hamper the yields of second season maize crops. However, overall total maize production in these two countries can be expected to be close to average. India, the 10th largest exporter, experienced abundant rains in dry season (+26.6%) and slightly cooler (-0.8ºC) and cloudier conditions (RADPAR -4.7%). Estimated biomass was 28.9% above average. For Paraguay, the conditions were less favorable, due to less rainfall (381 mm), which was 26.4% below average. However, this was still deemed sufficient and biomass estimation was -1.5% only. South Africa is the largest maize exporter in Africa. All meteorological conditions were close to normal and biomass departure from the 15YA was +1%. In addition, an +8.5% increase in CALF for that country was observed. All in all, conditions for maize production in the major exporting countries were favorable.

Maize planting started in April in North America and Europe. So far, weather conditions have been favorable. In the USA, they are much better than they were a year ago. In the Ukraine and most of Europe, conditions were drier than usual in April. Moisture conditions in May will be key to good plant establishment.

Rice: India is the largest rice exporter. The region of irrigated dry season (Boro) rice production is limited to West Bengal, Telangana, Andhra Pradesh and Assam. Boro rice yields are much higher than those obtained in the Kharif (rainy) season, because farmers have control over the flooding depth. This enables them to grow modern, high yielding varieties. Above average rainfall during last year's monsoon and this monitoring period (+26.6% between January and April 2020) filled the water reservoirs. Farmers could not only expand the cultivated area, but also had more water available for irrigation during the growing season. According to CropWatch, both BIOMSS (+28.9%) and CALF (+37.7%) were above the average for India. Boro rice reached maturity in late April and early May. The country-wide lock-down may have caused a shortage of farm-hands for timely harvest (See Chapter 5.2 on Disasters for more details).

The other large rice exporter in South Asia, Pakistan, which ranks in the 4th position of exporting countries, grows rice during the rainy season only. For South-East Asia, dry season rice production is important. Thailand and Vietnam rank in the 2nd and the 3rd position of exporting countries. After a good rice harvest from the last Kharif season, the situation was rather dire for most rice producing regions in South-East Asia. Rainfall reached only 164 mm (-39.8%) in Thailand and 274 mm (-7.1%) in Viet Nam. However, in Vietnam the rainfall deficit occurred mostly in the South, whereas in the North, rains were close to normal. For Thailand, BIOMSS was -3.6% and CALF -5.3%, while for Vietnam, BIOMSS was -8.1% and CALF unchanged. CALF in Cambodia was -17.7%. A more detailed discussion on the conditions for rice production in South Asia can be found in Chapter 5.2. Conditions for the other important rice producing countries and regions, such as the Philippines, Indonesia, Southern Africa, Argentina and Brazil were generally favorable.

Wheat: In Australia, Canada, Russia and Kazakhstan, spring wheat sowing started in April and usually lasts until late May or early June. So far, conditions for sowing were favorable. Russia (+17.1%), the largest wheat exporter, Canada (+4.5%) and Kazakhstan (+27.1%) experienced above-average rainfall. Australia seems to be recovering from its drought conditions (RAIN +17.2%). So far, conditions have been favorable for these countries.

China and India are the top wheat producers, but most of their production is used for domestic consumption. India had a close-to-record harvest, due to high rainfall (+26.6%) and expanded area (CALF +37.1%). Similar to India, wheat production in China is also mostly irrigated, but above average rainfall (+19.7%) helped sustain good conditions for production. Unlike these two countries, most wheat production in the USA is rainfed. Rainfall was above average (+17.4%) in most regions, except for Colorado and north-west Oklahoma. These regions already experienced drier conditions last fall, which hindered good crop establishment. A cold snap in the southern plains in April may have caused some yield reductions as well. CALF for the USA was -2.6%, with wheat being the major crop in the field during this monitoring period. This indicates that the wheat area might be slightly reduced. For these reasons, an average production can be expected for the USA. Most of Europe experienced favorable winter rains until early March, followed by a sunny dry spell of 2 months. Some rains were recorded again in late April. Total rainfall (RAIN) from January to April deviated only slightly: France (– 2.1%) and (+4%) for Germany. Nevertheless, lower wheat yields are to be expected for western Europe. Similarly, the Ukraine also experienced drier-than-normal conditions (RAIN -25.4%). A severe drought will force Morocco (RAIN -20.9%) and Algeria (RAIN -15.2%) to import more wheat than usual. Apart from the Ukraine and North Africa, conditions were normal to favorable and an above-average wheat production can be expected for 2020.

Soybean: In the USA, Canada and the Ukraine, soybean sowing started at the end of this monitoring period, in late April. Soil moisture conditions seem to be favorable for the USA and Canada, whereas they were drier than usual in parts of the Ukraine. Conditions in May will determine the area planted and crop establishment.

Argentina, Brazil, Paraguay and Uruguay produce more than half of the world's soybeans traded on the international market. Rio Grande do Sul, Brazil's third largest soybean producer, behind Mato Grosso and Parana suffered from drought conditions in February. Similarly, Santa Fe province in Argentina was also affected by a dry spell. Conditions in the other soybean regions were normal. CALF was high in Argentina (98.1, +0.3) and Brazil (99.9, +0.7). This indicates a high acreage and thus a large production volume. So all in all, prospects for the 2020 soybean yields are favorable.

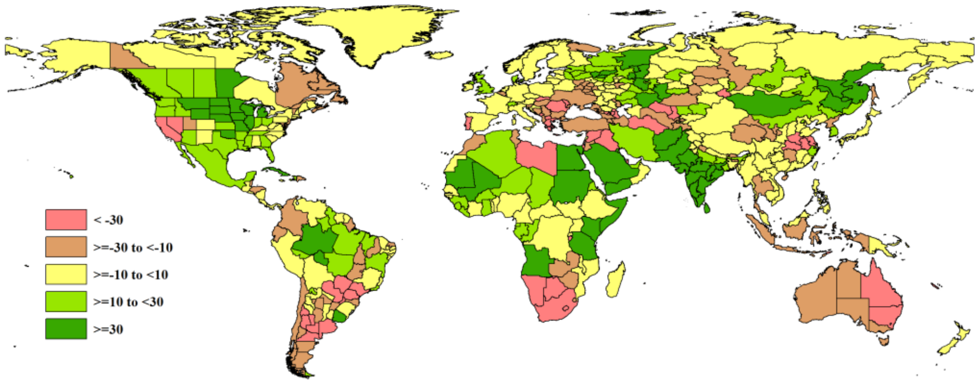


Figure 3.1 National and subnational rainfall anomaly (as indicated by the RAIN indicator) of January to April 2020 total relative to the 2005-2019 average (15YA), in percent.

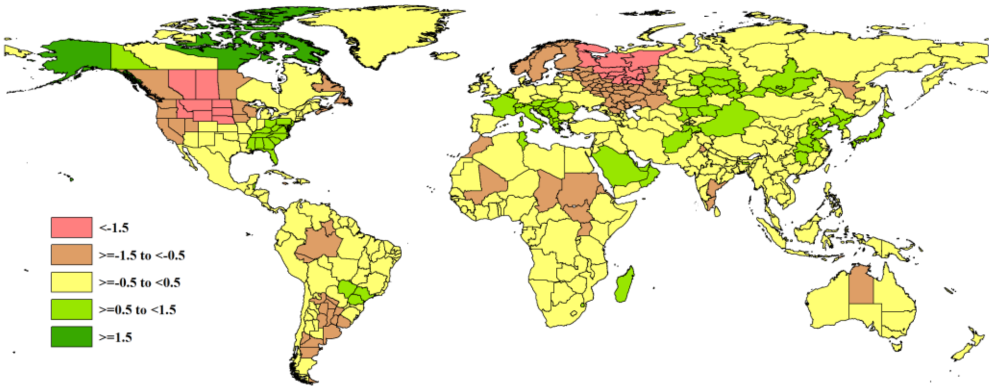


Figure 3.2 National and subnational temperatute rainfall anomaly (as indicated by the RAIN indicator) of January to April 2020 average relative to the 2005-2019 average (15YA), in °C

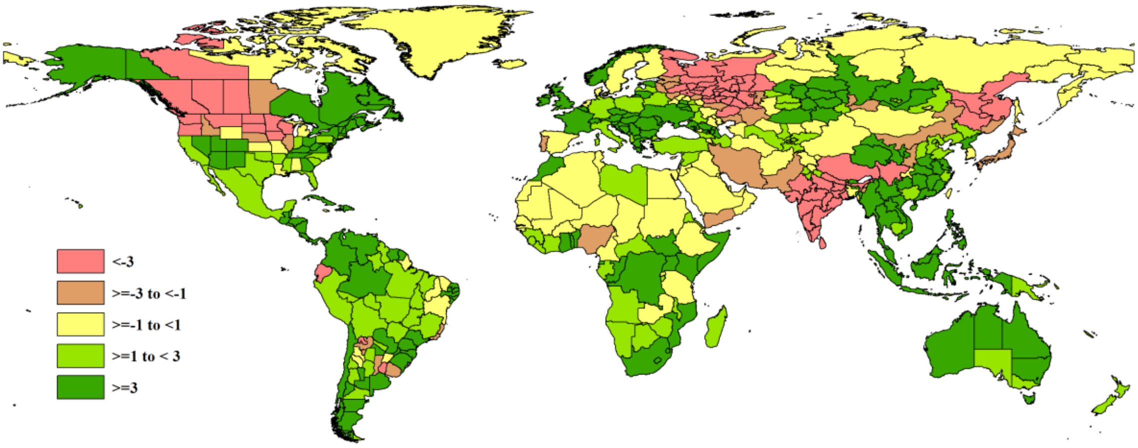


Figure 3.3 National and subnational sunshine anomaly (as indicated by the RADPAR indicator) of January to April 2020 total relative to the 2005-2019 average (15YA), in percent.

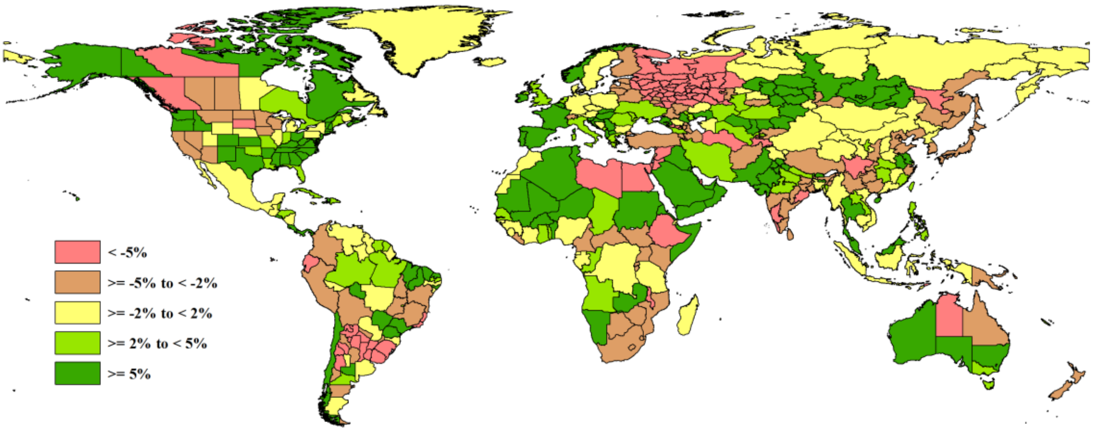


Figure 3.4 National and subnational bionass production potential anomaly (as indicated by the BIOMSS indicator) of January to April 2020 total relative to the 2005-2019 average (15YA), in percent.

3.2 Country analysis

This section presents CropWatch analyses for each of 42 key countries (China is addressed in Chapter 4). The maps 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 January - April 2019 period to the previous season and the five-year average (5YA) and maximum; (c) Maximum VCI (over arable land) for January - April 2019 by pixel; (d) Spatial NDVI patterns up to January - April 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 January - April 2020 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 January - April 2020.

[AFG] Afghanistan

Winter and spring wheat are the main cereals sown in Afghanistan. Most winter wheat is grown in the northern border provinces. Harvest is in May. Spring wheat was planted between March and April. The precipitation in Afghanistan was 25% higher than the 15YA. Both temperature and sunshine were below average (TEMP 4.8°C, -0.4°C; RADPAR 912MJ/m², -6%). The resulting estimate of biomass production was close to average. The cropped arable land fraction (CALF) increased by 32%, and the maximum vegetation condition index (VCIx) was 0.81. According to crop condition development graphs based on NDVI, the national crop growth was below the five-year average from January to early March and then recovered to the above-average level in April. Crop conditions were above average throughout the reporting period on 47.7% of crop lands, mainly in the northern part of Kandahar, the northern border areas of Badghis and west of Faryab. Crop conditions below average were scattered in 29% of crop land between January and April, mainly in Takhar, Kunduz, Ghor, Ghazni and Wardak provinces. According to the maximum vegetation condition index (VCIx), the vegetation in the South was better than in the North. Wheat grew well during the monitoring period and above average output is expected.

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.

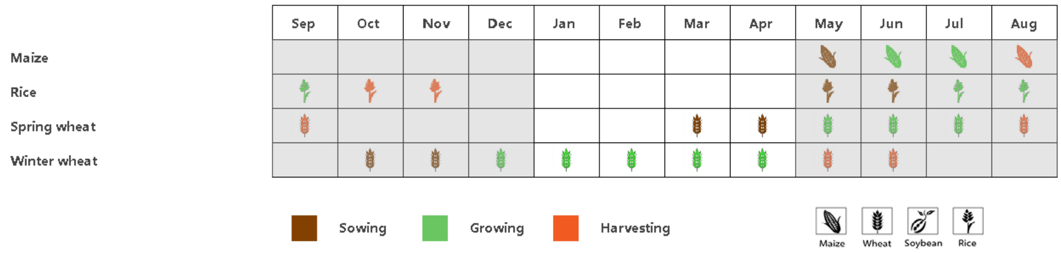
The RAIN in the Central region with sparse vegetation was 337 mm, +21%; TEMP was -0.3°C, and the RADPAR was 942 MJ/m2 (-5%). According to the crop condition development graph, NDVI was far below average in January. Since February, NDVI has increased rapidly and exceeded the average in April. The potential biomass decreased by 15%.

The Dry region recorded 303 mm of RAIN (+36%), TEMP was 7.5°C (-0.9°C), and RADPAR was 1001 MJ/m2 (-5%). VCIx was 0.87, and the potential biomass increased by 8%. In this region, the rainy season ends in April.

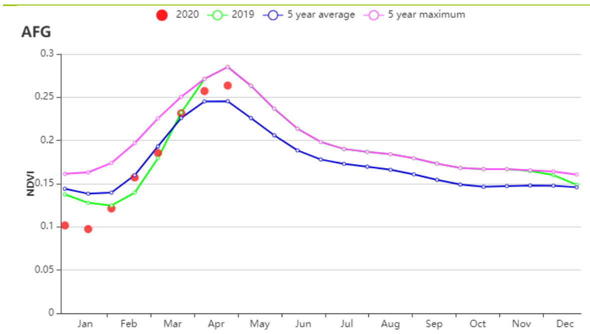
In the Mixed dry farming and irrigated cultivation region the following indicator values were observed: RAIN 504 mm (+22%); TEMP 3.2°C (-0.2°C) and RADPAR 830MJ/m2 (-7%). Potential biomass and CALF in this area were the highest among the four regions. CALF was 24% higher than average. Abundant rainfall and higher CALF improved production prospects in this AEZ, where VCIx reached 0.73. The agro-climatic conditions were favorable for crop growth.

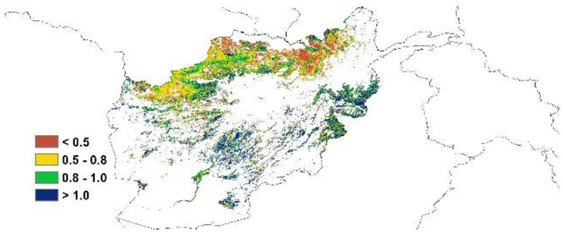
The Mixed dry farming and grazing region recorded 285 mm of RAIN, 30% above average, TEMP was 5.8°C (-0.4°C) and RADPAR was 938 MJ/m2 (-5%). According to the NDVI development graph, crop conditions were lower than the five-year average from January to March and reached the average after March. CALF in this region was at 16% and VCIx reached 0.84. The warmer and rainy weather will promote crop growth.

Figure 3.5 Afghanistan's crop condition, January - April 2020



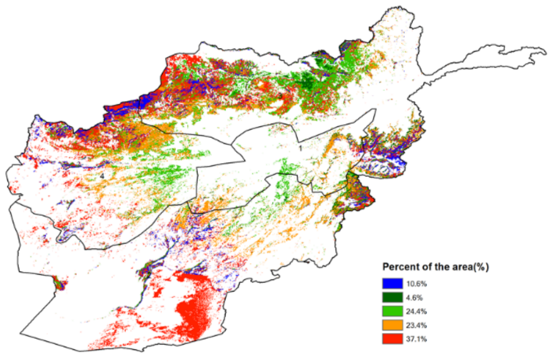
(a) Phenology of major crops

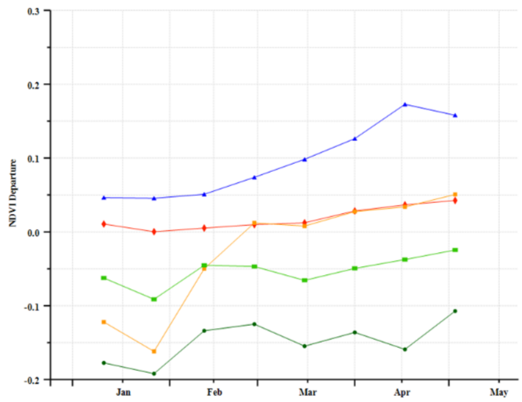




(b) Crop condition development graph based on NDVI

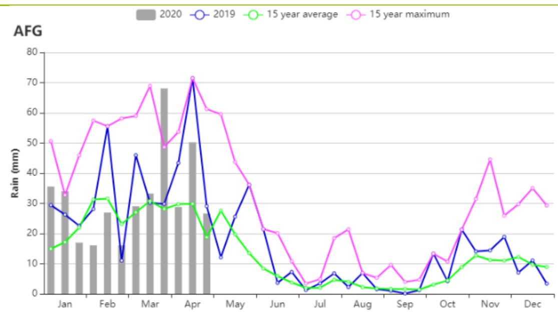
(c) Maximum VCI

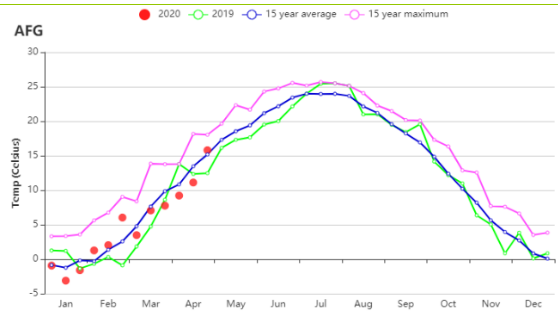




(d) Spatial NDVI patterns compared to 5YA

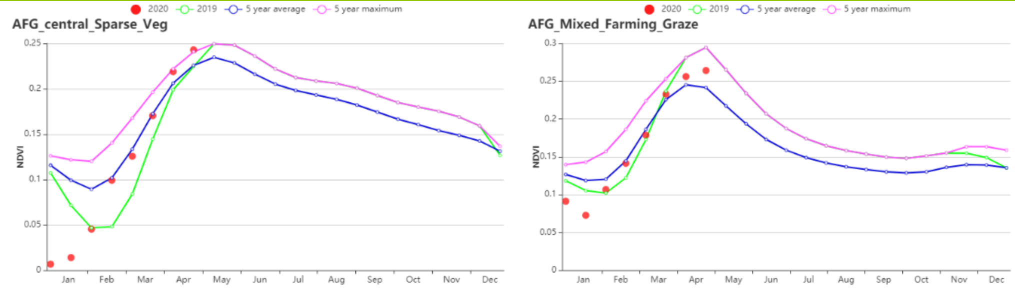
(e) NDVI profiles



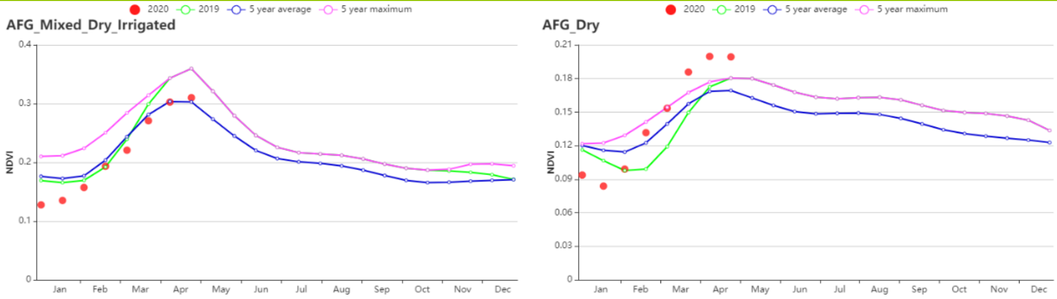


(f) Rainfall profiles

(g) Temperature profiles



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



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

Table 3.1 Afghanistan's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 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	337	21	-0.3	0	942	-5	168	-15
Dry region	303	36	7.5	-0.9	1001	-5	321	8
Dry and irrigated cultivation region	504	22	3.2	-0.2	830	-7	200	-12
Dry and grazing region	285	30	5.8	-0.4	938	-5	251	1

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Central region	9	60	0.98
Dry region	7	88	0.87
Dry and irrigated cultivation region	25	24	0.73
Dry and grazing region	16	33	0.84

[AGO] Angola

The January-April 2020 reporting period covers the late growth and harvest of Maize and Rice. During this period, the CropWatch agroclimatic indicators reveal that compared to the previous 15YA, rainfall was 10% above the average, while both temperature and radiation showed a slight decrease of 0.1ºC and 1%, respectively. Despite these variations, the resulting agronomic indicators showed a decrease in BIOMSS by about 8% while CALF increased by 1%. During this period, a maximum VCIx of 0.94 was observed. The national crop conditions development graph based on NDVI showed that except for early January, the crop conditions were favourable during the entire monitoring period. This is also confirmed by the maximum VCIx, which was equal to or higher than 0.8 for most of the cropped areas. The NDVI profiles show that better crop conditions were observed in the provinces of Cunene, Namibe, Huila, Benguela, Cuando Cubango, Zaire and Uige, accounting for 31.1% of the cropped area. However, 11.6% of the area showed below-average crop conditions compared to the previous 5YA. Overall, during the January-April 2020 reporting period, in Angola the crop conditions were favourable

Regional Analysis

Considering the cropping systems, climatic zones and topographic conditions, Angola is divided into six agro −ecological zones (AEZs): The Central Plateau, Humid, Sub-humid, Semi-arid, Arid and Desert.

In the Arid zone, the crop conditions were favourable from January till March. In April, crop conditions were below the average of the previous 5 years, but yet, above the crop conditions of the same period in last year. The agroclimatic indicators in this region show that both rainfall and temperature increased by 8% and 0.1°C, respectively. Radiation was near average, both BIOMSS and CALF increased by about 3% and 9%, respectively. A maximum VCIx of 0.86 was observed.

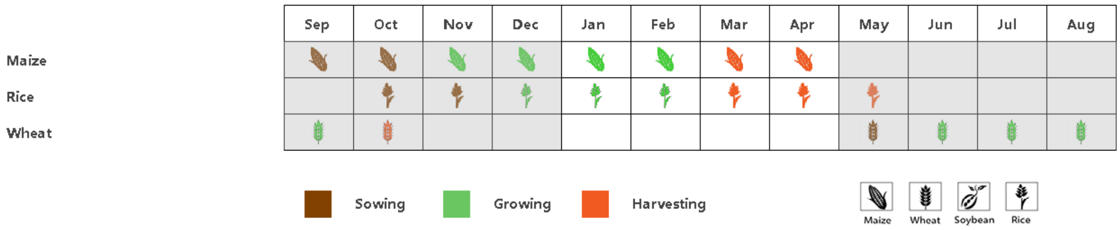
With crop conditions above the averages during almost the entire monitoring period, in the Central Plateau zone, the rainfall increased by about 22% while both temperature and radiation decreased by about 0.3°C and 3%, respectively. The resulting agronomic indicators reveal a decrease in BIOMSS by 15%. With CALF about the average, the maximum VCIx in this region was of about 0.92.

In the Humid zone, favourable crop conditions were observed from mid-March till the end of the monitoring period. This region was characterised by a decrease in rainfall by about 1%. The temperature recorded a slight increase of 0.1°C. With radiation decreasing in 1%, BIOMASS also decreased by 9%. CALF in this region was about average and a maximum VCIx of 0.96 was observed.

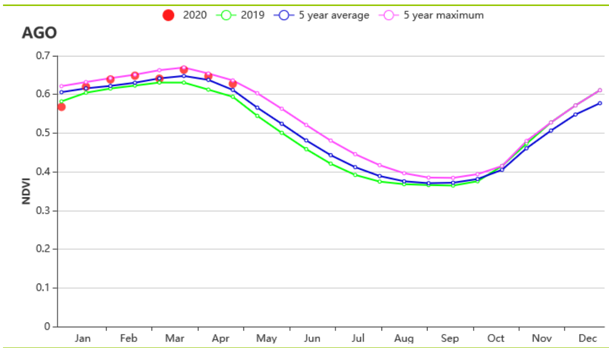
Except for early January, favourable crop conditions were also verified in the Semi-arid zone. in this zone, the rainfall increased by 22% while the temperature decreased by about 0.1°C. Radiation was stable. While the BIOMSS decreased by 6%, the CALF increased by 3%. A maximum VCIx of 0.95 was observed in the Semi-arid zone.

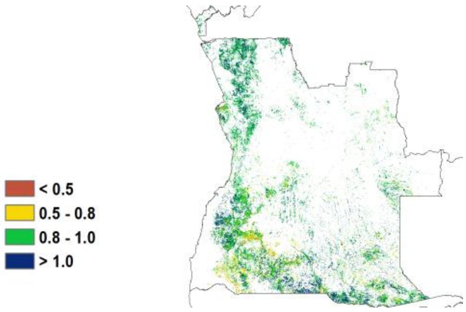
Average crop conditions were observed in the Subhumid zone. In this region, while rainfall was 6% above the average, both temperature and radiation decreased by 0.2°C and 1% respectively. The agronomic indicators show that BIOMSS decreased by about 8% while CALF was near the average of the previous 5 years. In this zone, the maximum VCIx observed was of about 0.93.

Figure 3.6 Angola's crop condition, January-April 2020



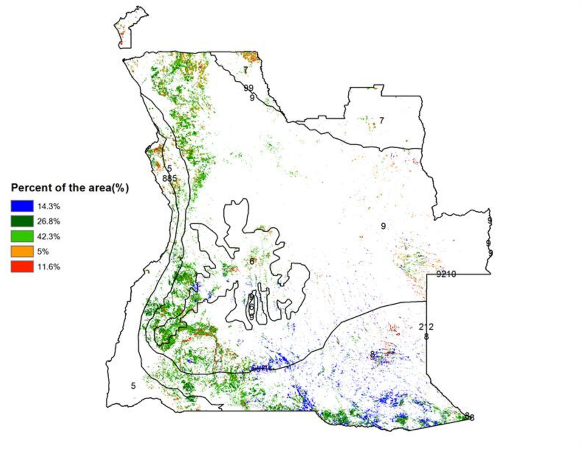
(a). Phenology of major crops

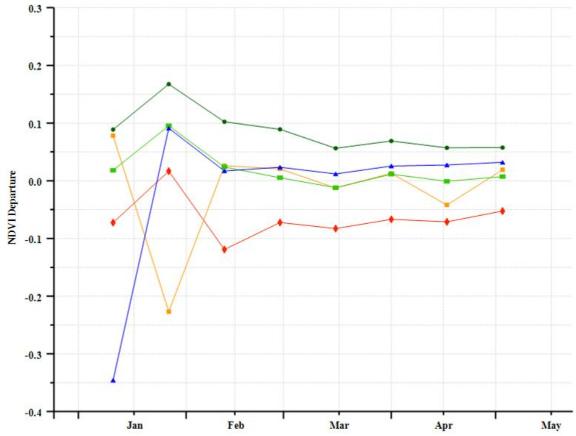




(b) Crop condition development graph based on NDVI

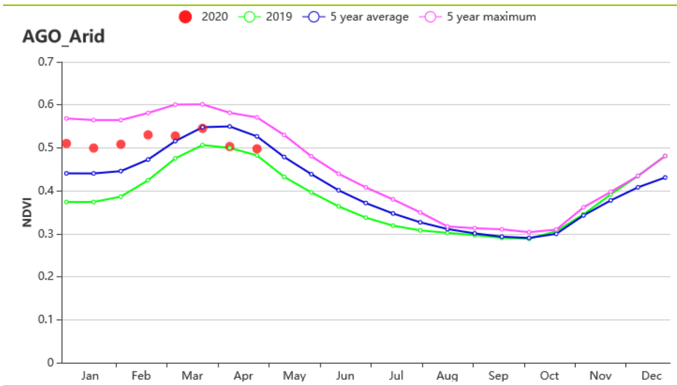
(c) Maximum VCI

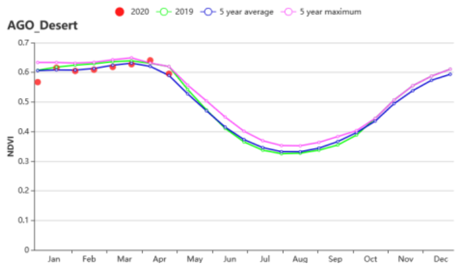




(d) Spatial NDVI patterns compared to 5YA

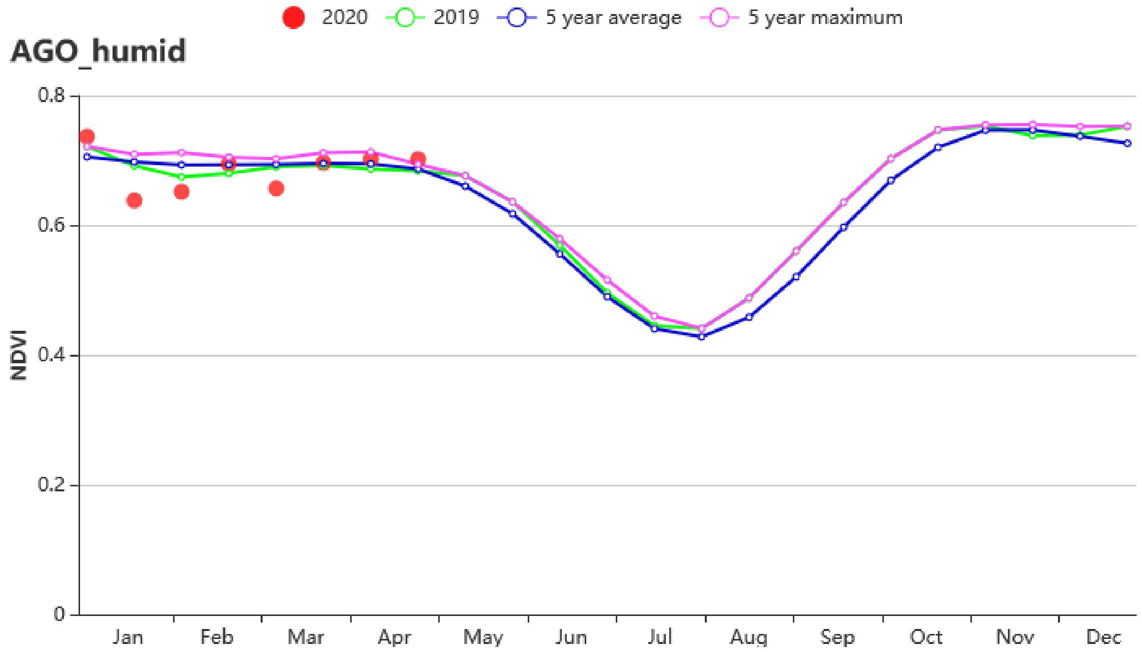
(e) NDVI profiles

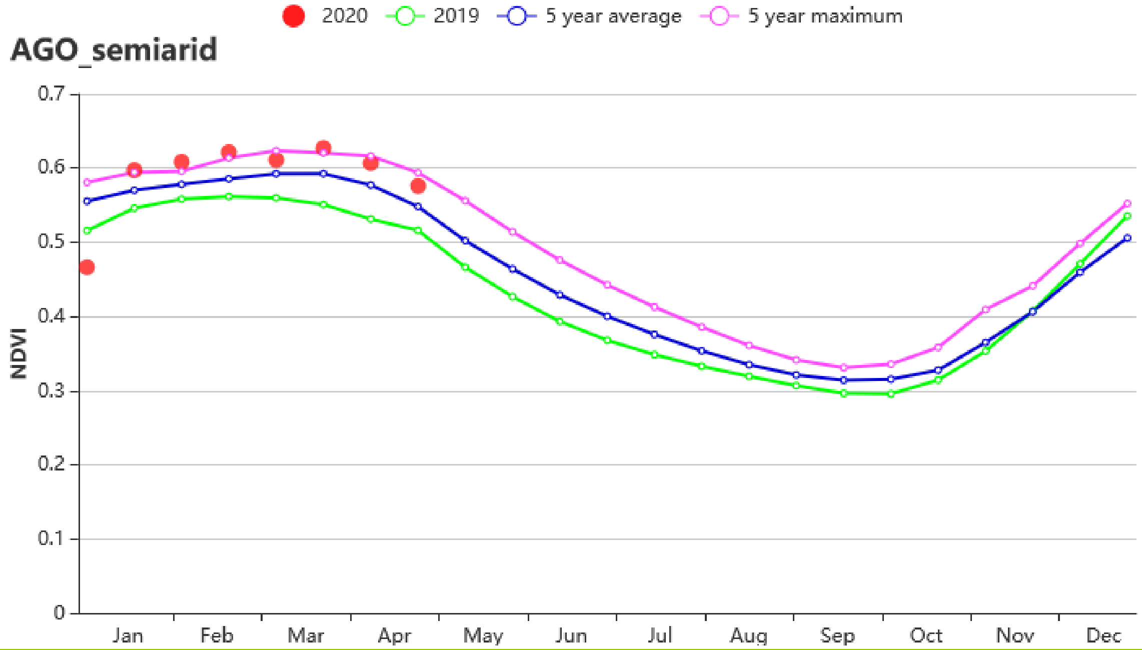




(f) Crop condition development graph based on NDVI- Arid zone

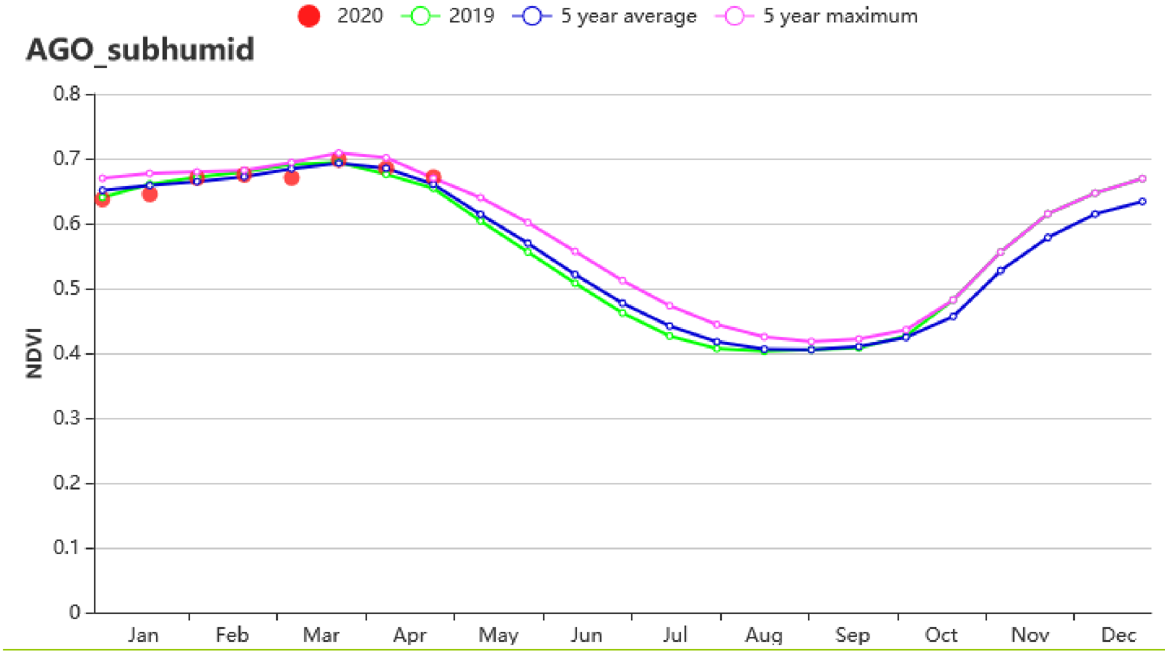
(g) Crop condition development graph based on NDVI - Central Plateau



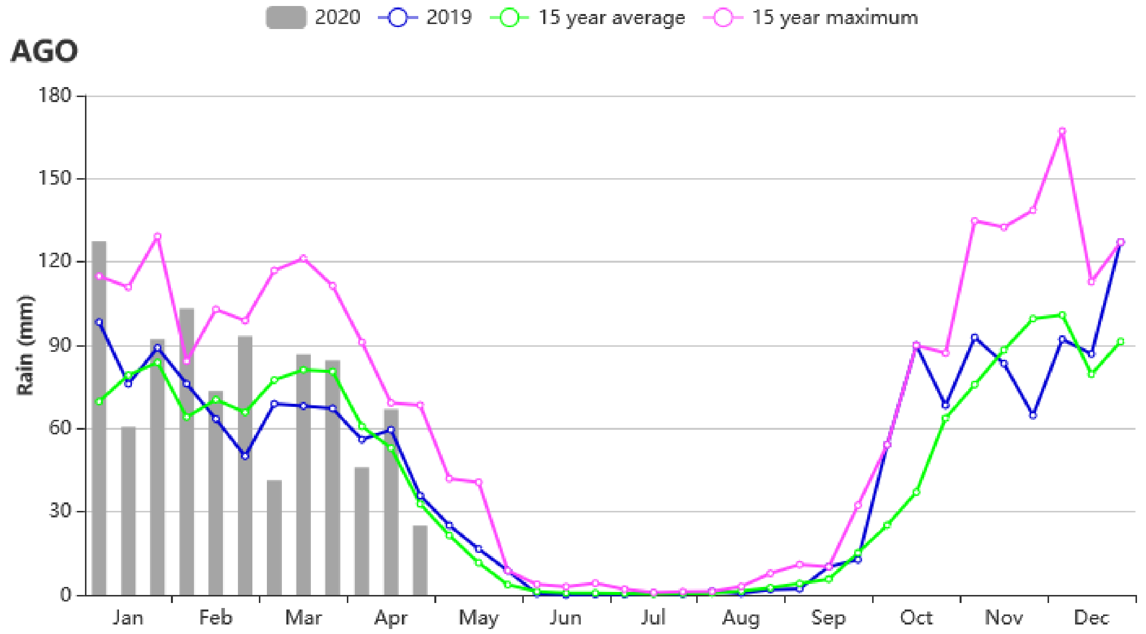


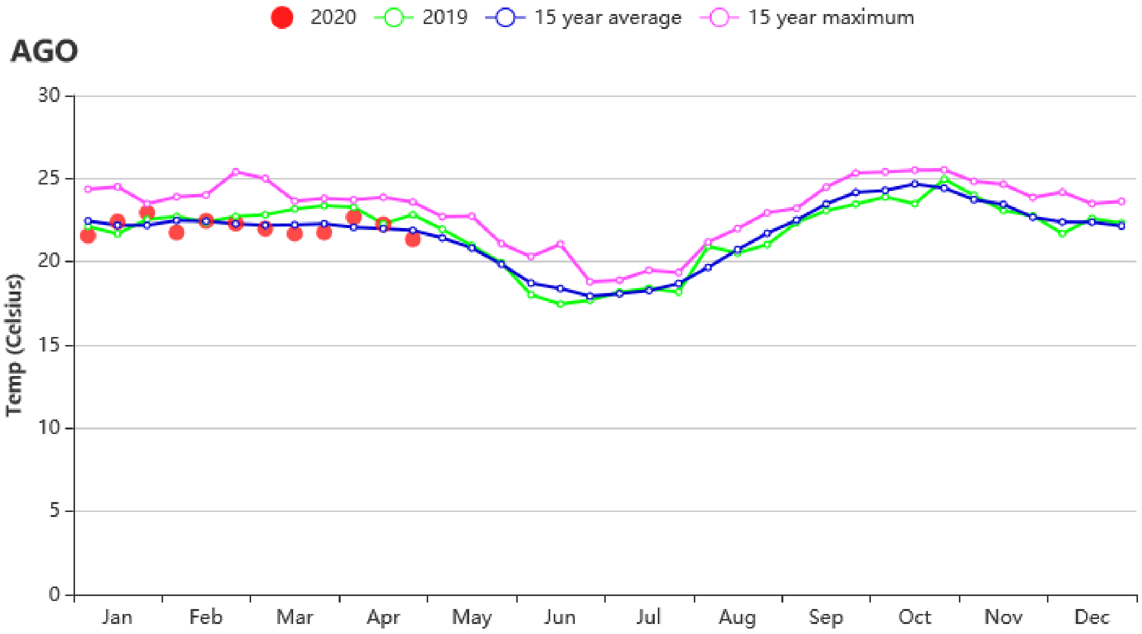
(h) Crop condition development graph based on NDVI- Humid zone

(i) Crop condition development graph based on NDVI - Semi-arid zone



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





(k) National time-series rainfall profiles (l) National time-series temperature profiles

Table 3.3 Angola agro-climatic indicators by sub-national regions, current season's values and departure from 15YA, January-April 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/m2)	Departure from 15YA (%)
Arid Zone	538	8	25.2	0.1	1239	0	774	3
Central Plateau	1153	22	18.1	-0.3	1076	-3	508	-15
Humid zone	1050	-1	22.5	0.1	1137	-1	693	-9
Semi-Arid Zone	757	22	22.7	-0.1	1191	0	674	-6
Sub-humid zone	989	6	21.6	-0.2	1139	-1	637	-8

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current
Arid Zone	94	9	0.86
Central Plateau	100	0	0.92
Humid zone	100	0	0.96
Semi-Arid Zone	100	3	0.95
Sub-humid zone	100	0	0.93

[ARG] Argentina

This reporting period covers the main growing season of summer crops: soybean, maize and rice and the harvesting period of early planted crops. For the whole country rainfall showed a 6 % positive anomaly. Temperature was 0.1°C below average and RADPAR increased 2%. BIOMSS showed a reduction of 3% compared to average. Overall, crop conditions were near average during the monitoring period.

Rainfall temporal profile showed quite homogeneous precipitation events with values near average, but lower than the previous year. Temperature profile showed some variability with higher positive and negative anomalies in February and April. From the graph of Argentina NDVI development, below-average values were observed during the whole reporting period. In relation to the last year, when values were near the maximum, the difference was quite high.

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.

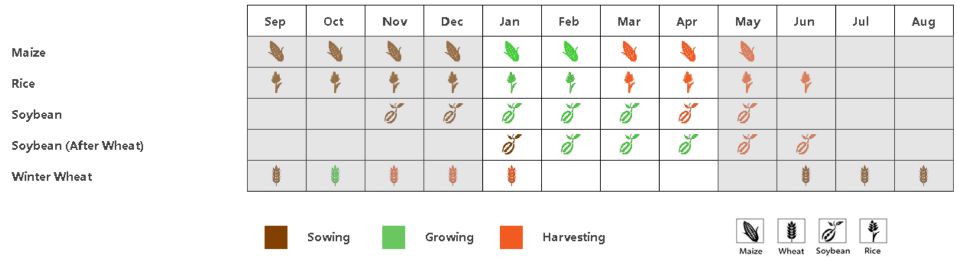
During the monitoring period, the rainfall of Humid Pampas and Subtropical highlands were above average by 26 and 36 % respectively, while Chaco showed a slight reduction of 1 % and Mesopotamia a 29 % reduction. Negative TEMP anomalies were observed in Chaco (-0.3°C), Humid Pampas (-0,2°C) and Subtropical highlands (-0.1°C). RADPAR showed average values in Humid Pampas, positive values in Mesopotamia (+ 6%) and Chaco (+4 %), and negative values in Subtropical highlands (-3%). BIOMSS showed a slight increase in Humid Pampas (+1 %) and reductions in Subtropical Highlands (-11 %), Mesopotamia (-8 %) and Chaco (-2 %). CALF was almost complete (99-100 %) in these four AEZs. Maximum VCI showed quite good conditions with higher values in Humid Pampas (0.89), followed by Subtropical highlands (0.87), Mesopotamia (0.86) and Chaco (0.83).

Crop condition development graphs based on NDVI for Pampas showed negative anomalies since the beginning of the reporting period (the most relevant growth period for summer crops) with near average values during end March and April. On the contrary, Chaco showed alomost average values at the beginning and negative anomalies during March and April. Mesopotamia displayed mostly an average NDVI profile and Tropical highlands showed almost always below-average values.

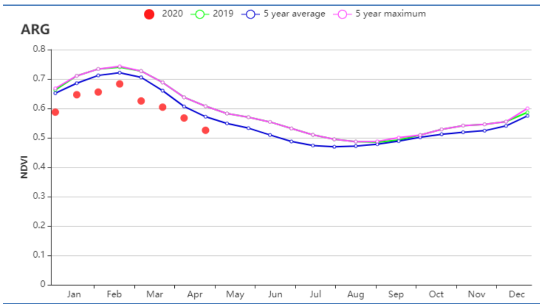
Spatial distribution of NDVI profiles shows a mixed pattern among the regions. Some homogeneous areas can be observed in South West Pampas (blue area) with a negative anomaly around 0.1 and in Flooding Pampas (light green area) with negative NDVI values at the beginning, and positive values at the end of the reporting period. A mixed pattern with positive anomalies at the beginning and negative anomalies at the end (red and dark green areas) was observed in the Pampas grain belt (Center North Pampas). Maximum VCI showed quite good conditions (higher than 0.8) in the four AEZ with the exception of marginal areas in South West Pampas and South Chaco.

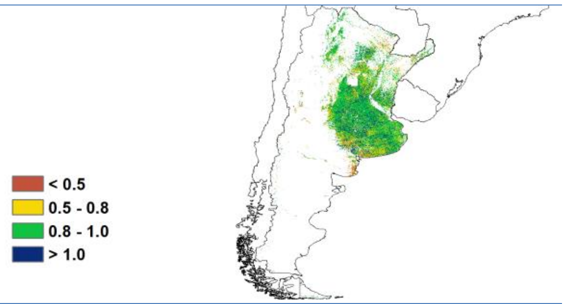
In general, Argentina showed regular to good conditions. No strong negative or positive anomalies were observed for RAIN and TEMP, but a slight reduction in NDVI profile was observed in particular for the Humid Pampas, the main agricultural region. Yield is expected to be lower than the previous growing season which showed near-maximum vegetation index values.

Figure 3.7 Argentina´s crop condition, January 2020 - April 2020



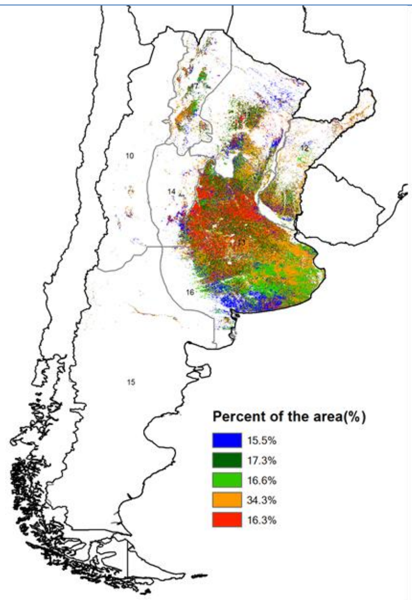
(a). Phenology of major crops

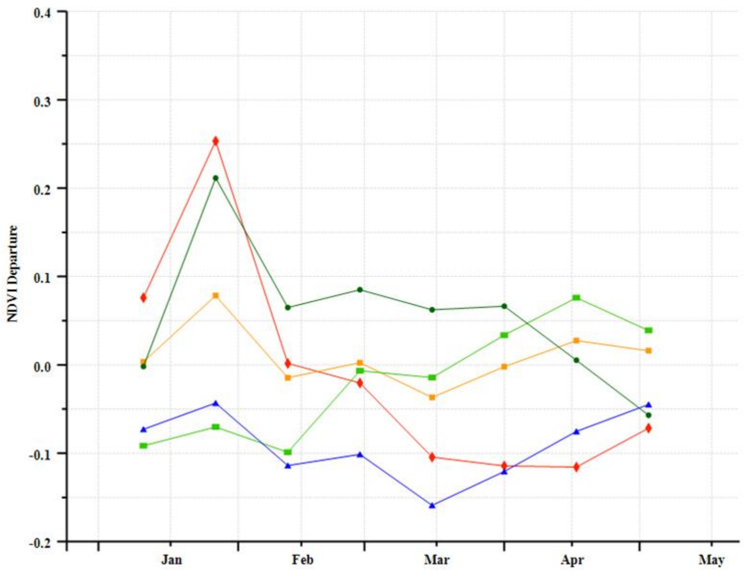




(b) Crop condition development graph based on NDVI

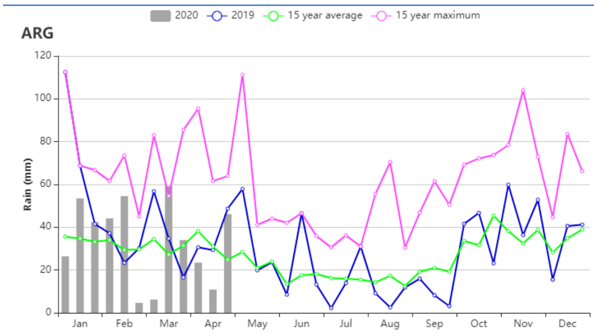
(c) Maximum VCI

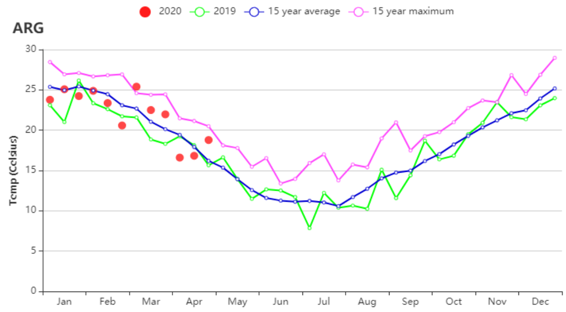




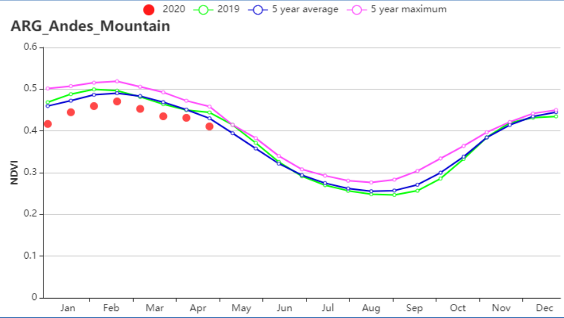
(d) Spatial NDVI patterns compared to 5YA

(e) NDVI profiles

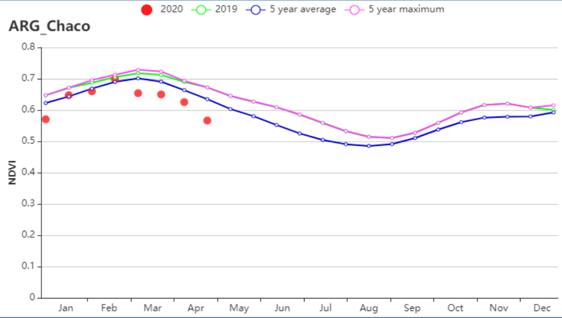




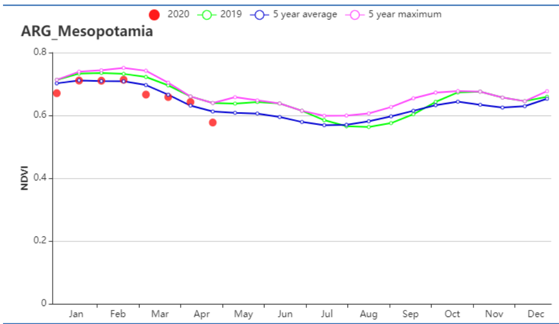
(f) Time series rainfall profile (left) and temperature profile (right))



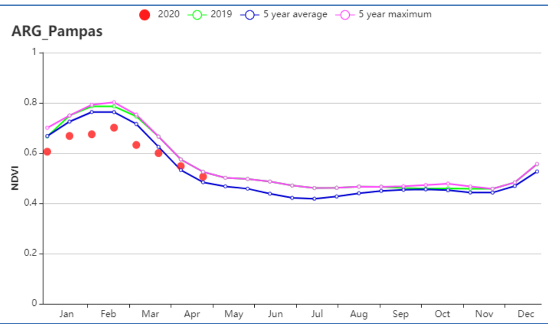
(g). Crop condition development graph based on NDVI (Andes)



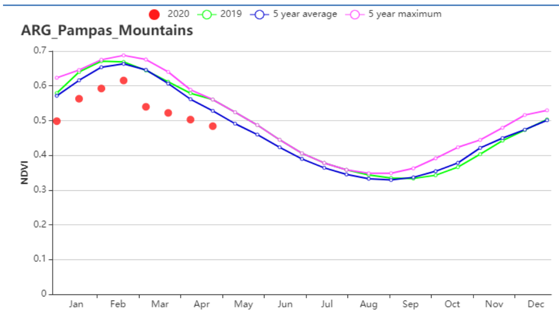
(h). Crop condition development graph based on NDVI (Chaco)



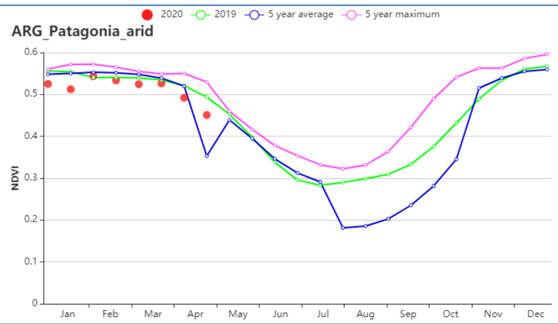
(i). Crop condition development graph based on NDVI (Mesopotamia)



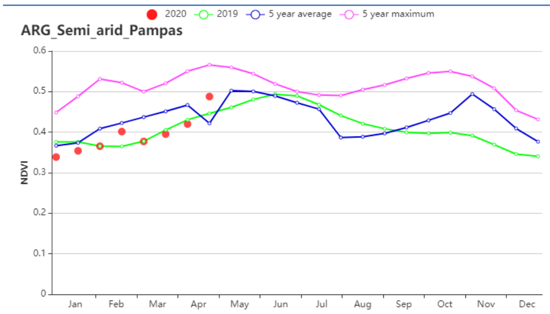
(j). Crop condition development graph based on NDVI (Humid Pampas)



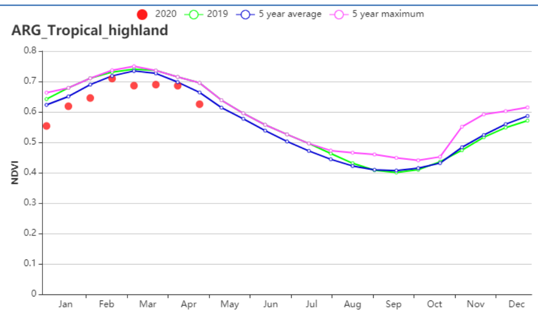
(k). Crop condition development graph based on NDVI (Pampas hills)



(l). Crop condition development graph based on NDVI (Arid part of Patagonia)



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



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

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

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Andes	541	41	15.8	0.4	1259	-4	528	-6
Chaco	430	-1	24.6	-0.3	1184	4	696	-2
Mesopotamia	348	-29	23.4	0	1245	6	666	-8
Humid Pampas	327	26	21.4	-0.2	1213	0	668	1
Pampas hills	312	25	21.5	0.2	1226	0	703	3
Arid part of	180	-20	11.8	0.4	1114	2	335	-6

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Patagonia								
Dry Pampas	191	28	21	-0.3	1245	-1	677	3
Subtropical highlands	993	36	20.7	-0.1	1083	-3	600	-11

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Andes	82	4	0.69
Chaco	100	0	0.83
Mesopotamia	100	0	0.86
Humid Pampas	99	0	0.89
Pampas hills	99	-1	0.78
Arid part of Patagonia	86	7	0.86
Dry Pampas	77	-1	0.78
Subtropical highlands	100	0	0.87

[AUS] Australia

Triticeae crops, including wheat and barley, are the main cereal crops of Australia. According to the phenology map, they are usually planted from May to July and harvested from October to January. The current reporting period covers the end of the last harvesting season only. Therefore, there were no crops in the field for most of the time during this reporting period, which limits the relevance of NDVI-based indicators.

The agro-climatic indicators, which were moderate overall, show above-average rainfall (RAIN, +17%), whereas temperature (TEMP, -0.3°C) and sunshine (RADPAR, -2%) were slightly below average. This led to an average biomass accumulation potential (-1%). Sufficient rainfall has created favorable soil moisture conditions for the planting of wheat and barley in the coming months. CALF also increased by 34% compared with the recent five-year average, but this does not necessarily indicate an increase of the planted area at this stage.

Spatially, the conditions in the four main wheat production states can be divided into two groups. Group one includes southern states of New South Wales, South Australia and Victoria, which is characterized by abundant rainfall (NSW, +59%; SOU, +29%; VCT, +57%), cool temperature (NSW, -0.6°C; SOU, -1.2°C; VCT, -1.0°C), low sunshine (NSW, -5%; SOU, -5%; VCT, -9%), and consequently negative biomass (NSW, -3%; SOU, -3%; VCT, -7%). Group two includes Western Australia. It experienced opposite conditions (RAIN, -28%; TEMP, +0.2°C; RADPAR, 0%; BIOMSS, +5%). The maximum VCI was 0.89 all over the country, except for group two (below 0.5).

Though the NDVI in the reporting period was gradually recovering from the below-average values caused by the prolonged drought, the NDVI clusters show that there was still 60.7% of the cropland with below-average NDVI in JFMA months. These areas were mostly located in group two (Western Australia) again, while the others were largely above average starting in March.

Regional analysis

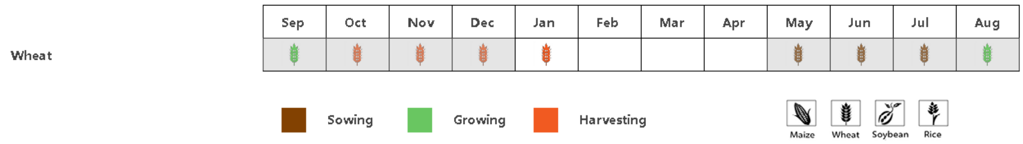
This analysis adopts five agro-ecological regions for Australia, namely the Arid and Semi-arid Zone (marked as 18 in NDVI clustering map), Southeastern Wheat Zone (19), Subhumid Subtropical Zone (20), Southwestern Wheat Zone (21), Wet Temperate and Subtropical Zone (22).

Similar to the main production states analysis, the agro-climatic and agronomic indicators of these five regions can be also assigned into two groups. Group 1 includes region Arid and Semi-arid Zone and Southwestern Wheat Zone. This group had a below average rainfall (-20%, -33%), slightly warmer temperatures (+0.8°C, +0.1°C) as well as slightly higher or average sunshine (+4%, -0%). The agro-climatic indicators result in a tiny increase of or average potential biomass (+0%, +6%). Both the CALF (-2%, -51%) and VCIx (0.73, 0.42) in this group are lower than the other regions.

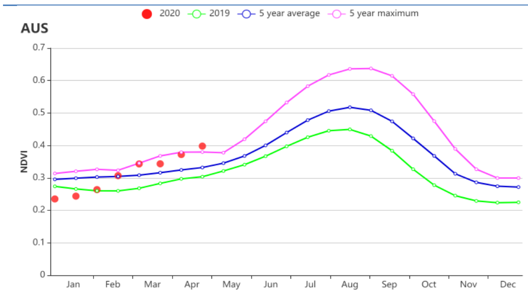
The other 3 regions (Southeastern Wheat Zone, Subhumid Subtropical Zone, Wet Temperate and Subtropical Zone) experienced similar conditions. Both the agro-climatic and agronomic indicators in this group 2 are opposite to group 1, including above-average rainfall (+62%, +43%, +15%), slightly below-average temperature (-1.0°C, -0.1°C, -0.0%) as well as sunshine (-7%, -3%, -1%). The potential biomass in these 3 regions was also below average (-4%, -1%, -4%). The CALF and VCIx were both better than group 1, which were higher (+89%, +54%, +7%), and larger than 1 (1.06, 1.08, 1.05) respectively.

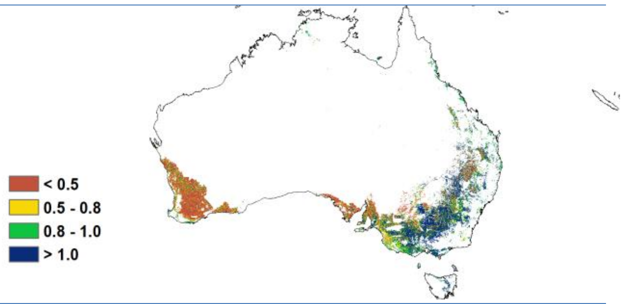
Overall, the agro-climatic indicators in the reporting period, especially the favorable rainfall are beneficial for the following wheat planting, except for Western Australia. CropWatch will keep on monitoring the crop conditions in the next bulletin.

Figure 3.8 Australia crop condition, January 2020 - April 2020



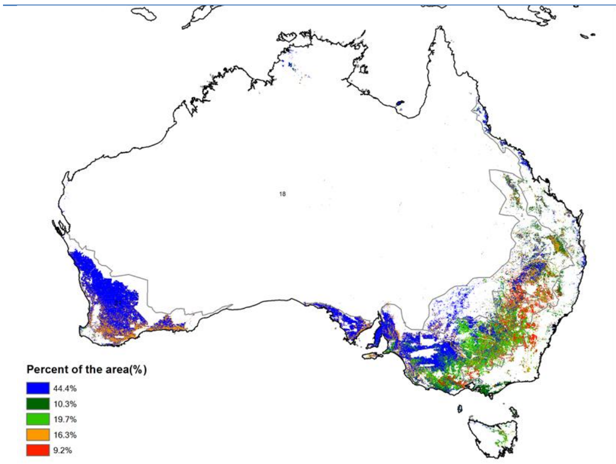
(a). Phenology of major crops

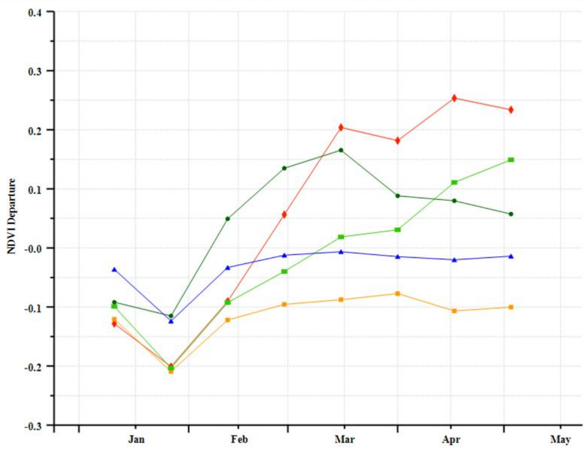




(b) Crop condition development graph based on NDVI

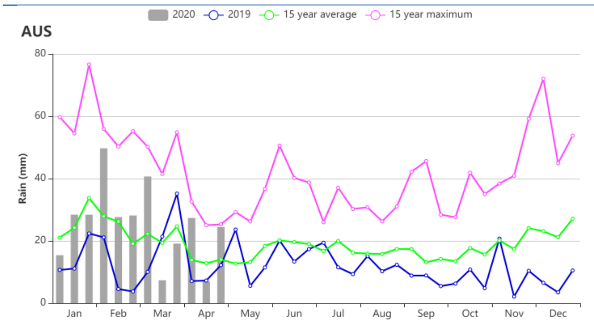
(c) Maximum VCI

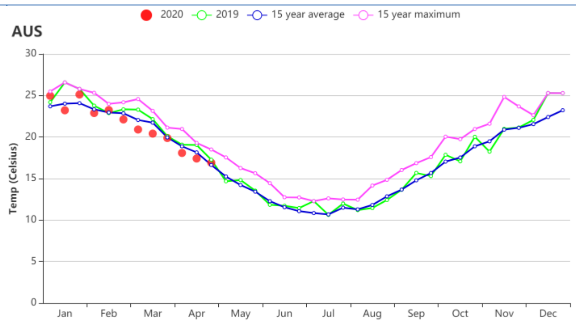




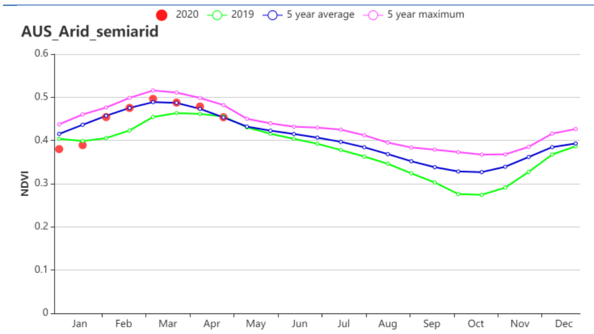
(d) Spatial NDVI patterns compared to 5YA

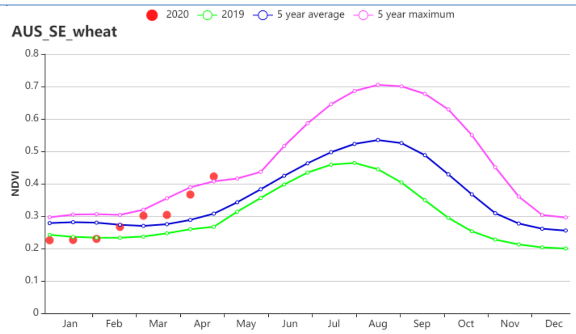
(e) NDVI profiles



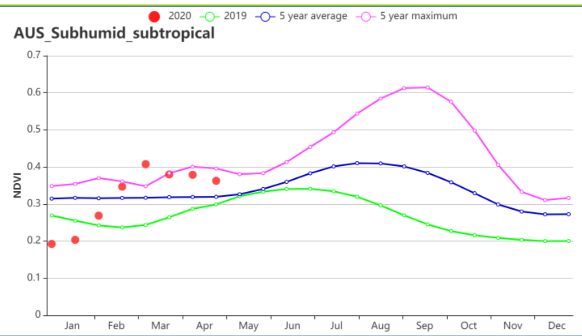


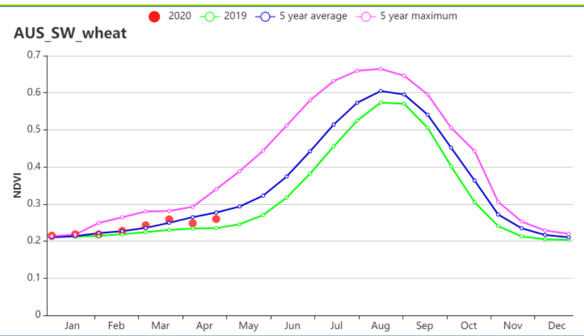
(f) Time series rainfall profile (left) and temperature profile (right))



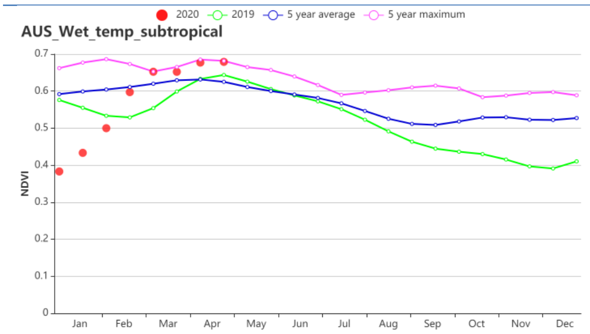


(g) Crop condition development graph based on NDVI (Arid and semiarid zone (left) and Southeastern wheat area (right))





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



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

Table 3.7 Australia agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 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	593	-20	26.8	0.8	1280	4	738	0
Southeastern wheat area	233	62	19.9	-1.0	1134	-7	594	-4
Subhumid subtropical zone	306	43	23.7	-0.1	1226	-3	689	-1
Southwestern wheat area	73	-33	21.1	0.1	1238	0	690	6
Wet temperate and subtropical zone	433	15	19.6	0.0	1133	-1	595	-4

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Arid and semiarid zone	65	-2	0.73
Southeastern wheat area	43	89	1.06
Subhumid subtropical zone	52	54	1.08
Southwestern wheat area	10	-51	0.42
Wet temperate and subtropical zone	99	7	1.05

[BGD] Bangladesh

The Reporting period covers the full cycle of dry winter season rice (Boro) and wheat crops; both are irrigated. Although the period between January and April does not correspond to the monsoon the country nevertheless received 164 mm rainfall which was about 22% above average. The temperature at 22.3°C was 1.1°C below average. The recorded RADPAR of 1167 MJ/m2 was lower than average by about 2%. Due to good growing environmental conditions CALF reached 97%; The nationwide NDVI spatial pattern shows that 12.4% of the cultivated area was above the 5YA, 7.6% was below, 35.2% was first above the 5YA till March, and 44.7% up and down on average. The maximum Vegetation Condition Index (VCIx) map shows that the condition of the current crops was favorable, with the national VCIx value of 0.94, most areas were higher than 0.8 and the low value areas is mainly distributed in the coastal area of Chittagong. CALF exceeded the 5YA by 1%. According to spatial clusters of NDVI profiles, crops are poor in 7.6% of arable land, dispersed over the country but concentrated in parts of Bogra and Tangail districts. Overall crop condition in the country was satisfactory.

Regional analysis

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

The Coastal region received 153 mm of rainfall over four months (RAIN +22% over average) and Temperate was 23.5°C (TEMP -1.1°C). RADPAR reached 1195 MJ/m2 (-2%). The crop condition development graph based on NDVI showed that crop condition was closed to the 5 years average. CALF at 88% and VCIx at 0.96 indicated good performance.

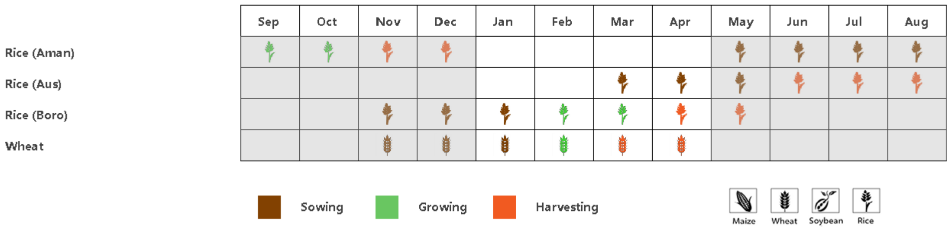
The Gangetic plains recorded 164 mm (RAIN +73% over average) . Temperate was 22.4℃ below average (-1.4°C) and RADPAR was 3% below. The NDVI was similar to the previous zone, starting closed to average and exceeding the average in April. High CALF (97%) and VCIx at 0.96 with BIOMSS up 15% (against 5YA) indicate good prospects.

The Hills recorded 145mm of rainfall (+4%), below average TEMP (21.8°C, -0.9°C) and favourable sunshine (RADPAR of 1246MJ/m2, -1%). The crop condition development graph based on NDVI showed that crop condition was high in January and early March, decreased to below average from late March to early April. BIOMSS was below average (-11%), CALF was 95% and VCIx was 0.95 showed crop condition unsatisfactory.

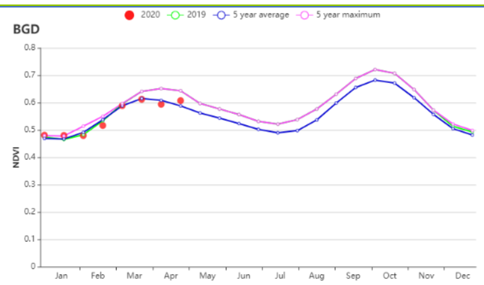
Sylhet Basin received the largest precipitation amount (191mm +4%). TEMP was 0.9°C below the average and RADPAR was 1% below. The BIOMSS potential of 568 gDM/m2 (the highest for any region) is also 14% above the 5YA. With CALF at 98% and VCIx of 0.92, crop prospects are probably the most favorable in the country.

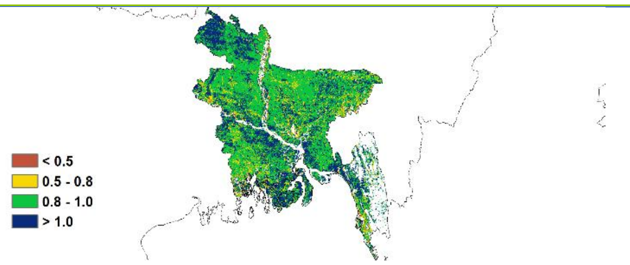
Overall, The Hills were obvious different from three other subregions, lower precipitation caused BIOMSS declined sharply although sunshine was adequate, and crop grain growth restricted by precipitation. Crop condition showed better prospects in other region.

Figure 3.9 Bangladesh's crop condition, January – April 2020.

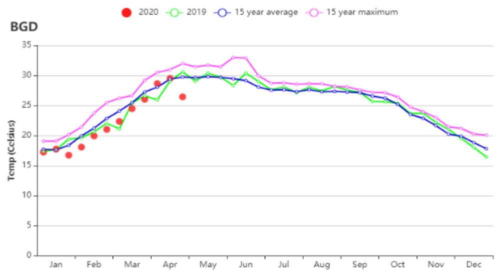


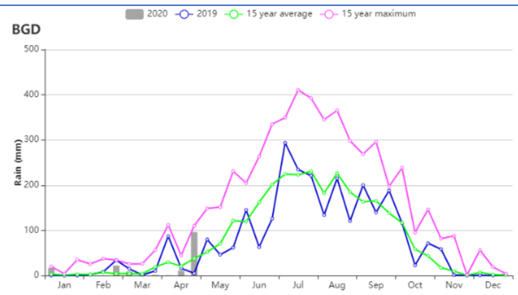
(a). Phenology of major crops



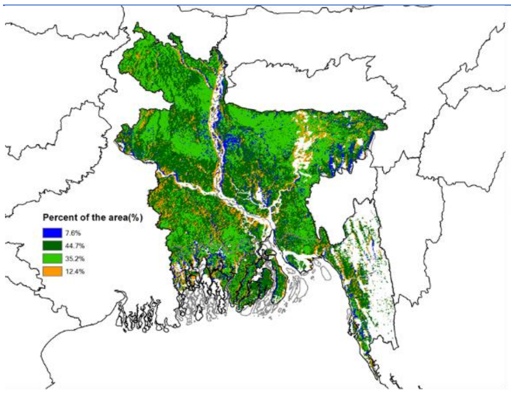


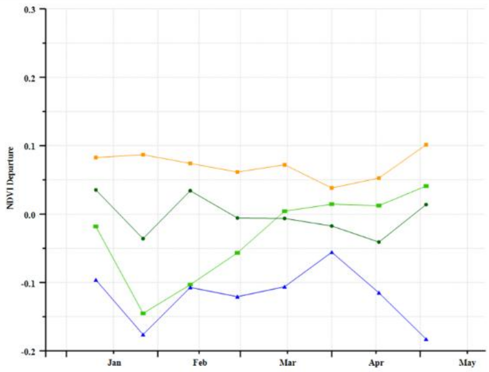
(b) Crop condition development graph based on NDVI (c) Maximum VCI



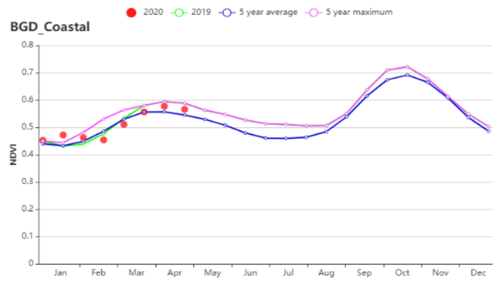


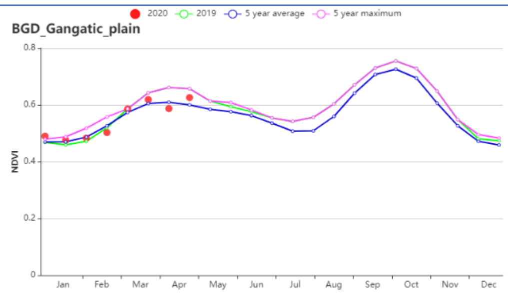
(d) Rainfall Index (e) Temperature Index



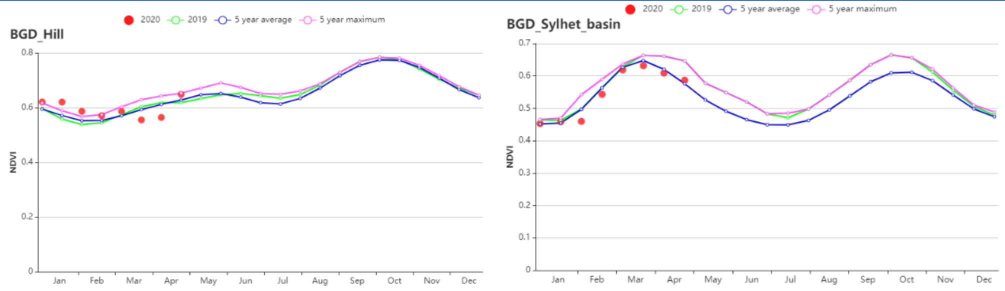


(f) Spatial NDVI patterns compared to 5YA (g) NDVI profiles





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



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

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

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Coastal region	153	31	23.5	-1.1	1195	-2	543	11
Gangetic plain	164	73	22.4	-1.4	1133	-3	552	15
Hills	145	0	21.8	-0.9	1246	-1	430	-11
Sylhet basin	191	4	22.2	-0.9	1150	-1	568	14

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

Region	CALF		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current
Coastal region	88	5	0.96
Gangetic plain	97	1	0.96
Hills	95	-1	0.95
Sylhet basin	98	0	0.92

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

Winter wheat was the major crop in the field during this monitoring period. Spring wheat sowing started in March. Rainfall (-15%) was below the 15YA, whereas solar radiation (RADPAR +2%) and temperature (+2.8°C) were above average. This resulted in a slightly lower than average potential biomass (-1.2%). Agronomic indicators showed a satisfactory maximum vegetation condition index (VCIx 0.8) while the cropped arable land fraction (CALF) decreased by 8% to 80%. The NDVI profile shows that the crop growth status was above average until March, when it started to fall to below average levels, presumably due to low rainfall. The spatial patterns of NDVI profiles show that around 59.5% of cropped areas eventually reached the 5-year average, except for some places in southeast and middle west (Gomel and Minsk Oblasts). In south-eastern and central areas (Mogilev and Minsk Oblasts) VCIx was between 0.5-0.8, while the value was above 0.8 in the west (Oblats of Grodno and Brest). At the end of this monitoring period, winter wheat was at a normal condition, however, more rains will be needed to ensure good yields.

Regional analysis

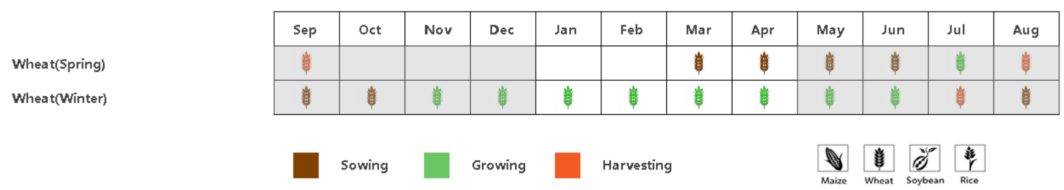
Based on cropping system, climatic zones and topographic conditions, regional analyses are provided for three agro-ecological zones (AEZ), including Northern Belarus (028, Vitebsk, northern area of Grodno, Minsk and Mogilev), Central Belarus (027, Grodno, Minsk and Mogilev and Southern Belarus (029)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

Northern Belarus suffered deficits in both rainfall (-8%) and radiation (-4%), while temperature was well above average (+3.2°C). The dry condition resulted in a potential biomass decrease by 8%. Agronomic indicators showed that CALF fell 5%, while VCIx reached a moderate value (0.82). Starting from March, the regional NDVI development curve stayed slightly below the long-term average, but the overall crop growth of the area was close to normal.

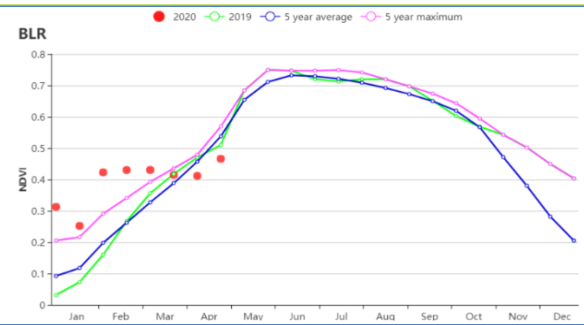
Central Belarus was also affected by low precipitation (18% lower), while temperature (2.6°C higher) and photosynthetically active radiation (+5%) were above the 15YA. The VCIx had reached 0.79, and CALF had reached 82%. Therefore, the potential biomass was expected to increase slightly (2%). Similar to northern Belarus, the NDVI growth curve remained close to the average trend starting from March.

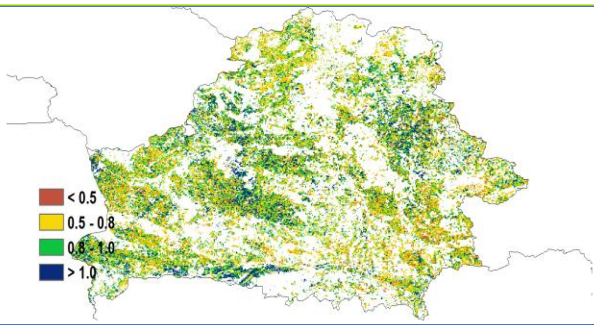
Precipitation in **southern Belarus** was significantly lower by 26%, while temperature and radiation were higher by 2.5°C and 8%, respectively. Potential biomass was expected to increase by 5%. The CALF and the VCIx were79% and 0.79 respectively. Although agronomic indicators showed that crop growth was generally favorable during the monitoring period, the impact of water shortage on the crops in subsequent months requires close attention.

Figure 3.10 Belarus's crop condition, January – April 2020.



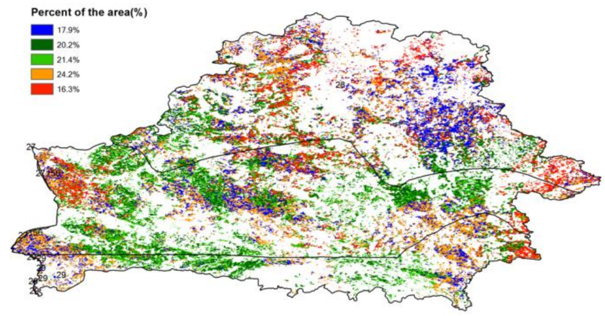
(a). Phenology of major crops

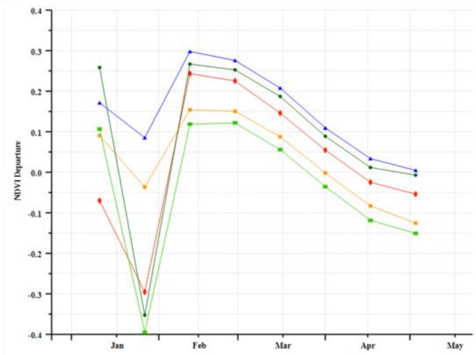




(b) Crop condition development graph based on NDVI

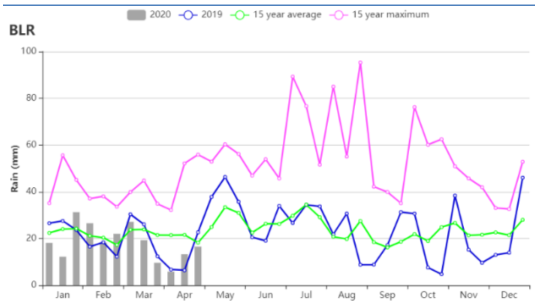
(c) Maximum VCI

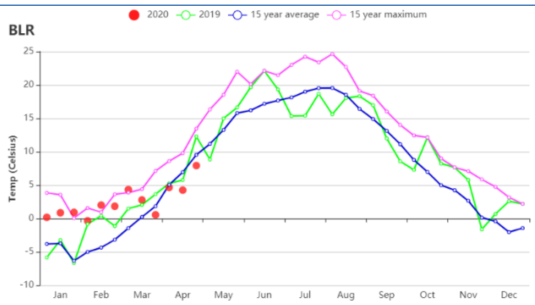




(d) Spatial NDVI patterns compared to 5YA

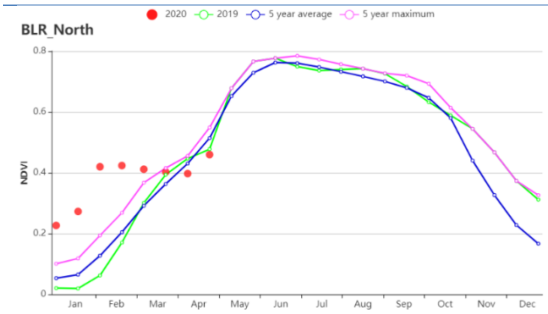
(e) NDVI profiles

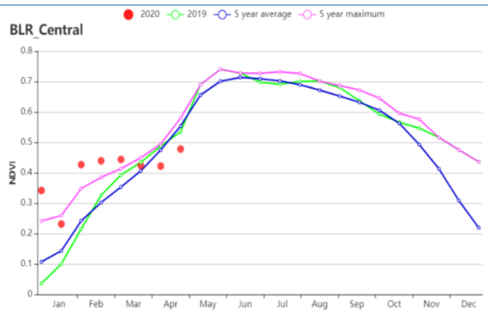




(f)Rainfall time series

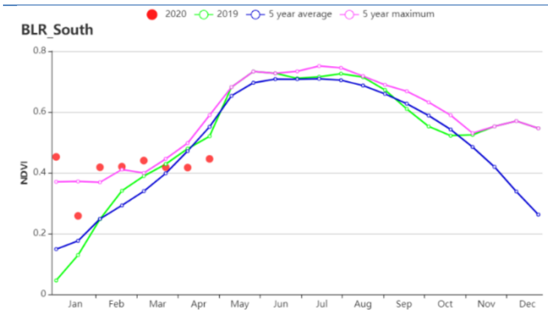
(g) Temperature time series





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

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



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

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

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Center	214	-18	2.8	2.6	446	5	90	2
North	238	-8	1.9	3.2	391	-4	72	-8
South-west	190	-26	3.2	2.5	474	8	100	5

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Center	82	-9	0.79
North	78	-5	0.82
South-west	79	-13	0.79

[BRA] Brazil

During this reporting period, the rice and main season maize in Central and Southern Brazil as well as soybean reached maturity stage and the harvests almost concluded by the end of April. Rice in north and northeast and second maize in Central and Southern Brazil were still at the peak growing stage. The sowing of maize in the northeast and wheat in the south started in April. Generally, crop conditions in Brazil were close to average compared to the previous five years.

Agro-climatic indicators present generally close to average conditions with 2% lower rainfall, 0.1℃ higher temperature and 1% above average RADPAR. Slightly below average rainfall resulted in 4% reduction of potential biomass compared with the 15YA. According to the national rainfall profiles, the 10-days accumulations of rainfall also show overall average conditions from January to April 2020. However, significant differences were identified among the provinces or agro-ecological zones (AEZs). Rainfall among the provinces ranged from 215 mm in Rio Grande Do Sul to 1451 mm in Para. Largest rainfall departure from the 15YA was also observed in Rio Grande Do Sul. Santa Catarina, Parana, Mato Grosso Do Sul, and Sao Paulo also suffered from water shortage with 42%, 41%, 20% and 17% less rainfall, respectively. Temperature was overall close to average except for Rio De Janeiro with 1.0 degree lower than the 15YA. Among the major agricultural producing provinces, large departures were observed in Parana and Santa Catarina (+9%) and Minas Gerais (-7%). Radiation was the most limiting factor for biomass accumulation during the reporting period, reflected by negative radiation departures resulting in below average biomass. Large negative departures of rainfall also hampered the biomass accumulation and resulted in low biomass compared with the 15YA in Sao Paulo, Rio Grande Do Sul, Parana and Santa Catarina.

The crop condition development graph based on NDVI for Brazil presents slightly below-average values throughout the reporting period mainly because of drought situations in southern Brazil. According to the NDVI departure clustering maps and profiles, below-average conditions were mostly located in Southern Brazil including Sao Paulo, Rio Grande Do Sul, Parana and Santa Catarina since February. Those areas mentioned above coincided with the areas with relatively low VCIx values (below 0.8). Scattered areas in East Coast and Eastern of Amazon presented below-average crop conditions in January and February. Two new graphs (figure o and p) were added to reflect the proportion of different categories of crop condition and drought, respectively. According to the two graphs, late January 2020 is a hot spot period with almost 50% of cropland at below-average situation. National VCIx is 0.96 and CALF is 1% above average. As for the provinces, Rio Grande Do Sul is the only one with VCIx below 0.85 (value at 0.81). It is noteworthy that CALF was below average only in two provinces (Amapa and Acre) while all other provinces presented an above-average CALF. All in all, crop conditions in Brazil were close to average and CropWatch estimates favorable outputs for soybean and average outputs for maize.

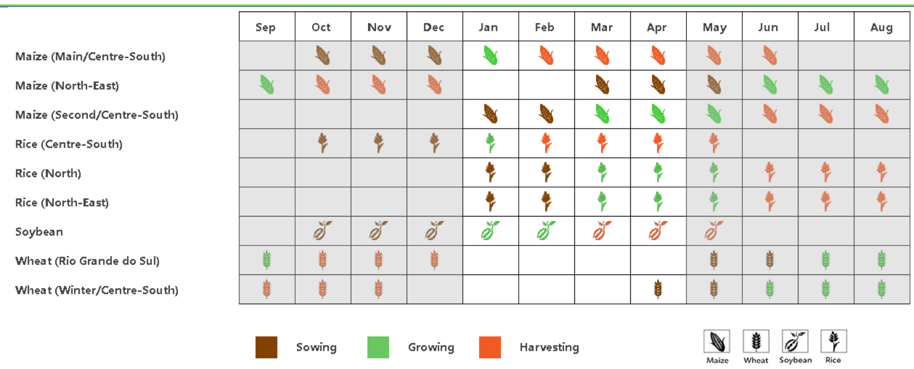
Regional analysis

Based on cropping systems, climatic zones and topographic conditions, eight agro-ecological zones (AEZ) are identified for Brazil. These include the Central Savanna, the east coast, Parana river, Amazon zone, Mato Grosso zone, Southern subtropical rangelands, mixed forest and farmland, and the Nordeste. Four zones received below-average rainfall, including Amazon, Mato Grosso, Parana Basin and Southern subtropical rangelands. The last three zones suffered persistent dry conditions since the last reporting period. The dry situation negatively impacted the crop development and resulted in below-average crop conditions. Above-average rainfall was observed in Central Savanna, Coast, Northeastern mixed forest and farmland, and Nordeste. Nordeste and Parana basin are the only two zones with below-average temperatures. The largest temperature anomaly was identified in Southern subtropical rangelands with 0.5 degree above average. Radiation anomalies were negatively correlated with rainfall departures. The largest departures of radiation were found in Central Savanna and Coast with 6% and 7% below teh 15YA. By integration of rainfall, temperature and radiation, achievable biomass is simulated and compared to the last 15YA. Large BIOMSS departures were also found in Central Savanna and Coast with 12% below 15YA mainly due to the lack of radiation. Mato Grosso is the only province in Brazil presenting above-average level of biomass (+1%). All zones in Brazil presented average or above average CALF. VCIx of southern subtropical rangelands was only 0.74 while VCIx of all other zones presented values higher than 0.95.

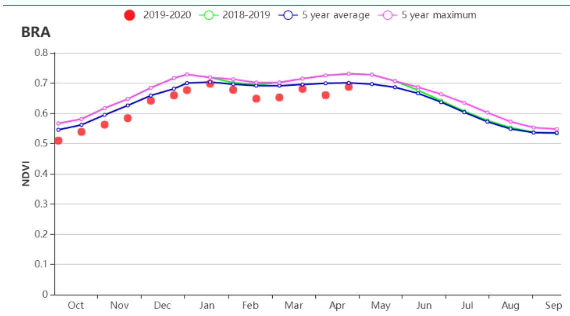
Normal or favorable agro-climatic conditions in Mato Grosso, Nordeste, Central Savanna, and Coast resulted in average to above-average crop condition as indicated by the NDVI based crop development profiles in the four zones. Crop conditions in the Nordeste were above the 5YA and the 5-year maximum values. CropWatch has produced average to favorable production forecasts for these four zones.

NDVI was significantly below average according to the NDVI-based development profiles in Amazonas, Northeastern mixed forest and farmland, Parana basin, and Southern subtropical rangelands. The below-average crop conditions mostly resulted from water shortages, but the impacts were different. Drought in Amazonas and Northeastern mixed forest and farmland affected the second maize outputs while low rainfall in the Parana basin mostly affected main maize and soybean at later growth stages. The crops in Southern subtropical rangelands are out of the growing season, but the continuous dry and hot weather might potentially affect the sowing and early growing stages of the wheat in the coming season.

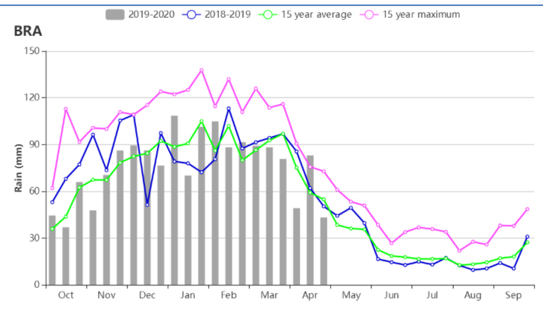
Figure 3.11 Brazil's crop condition, January - April 2020



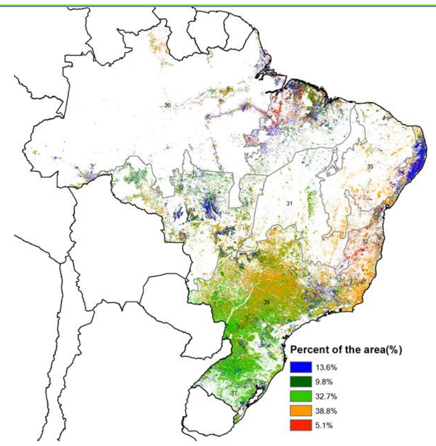
(a). Phenology of major crops

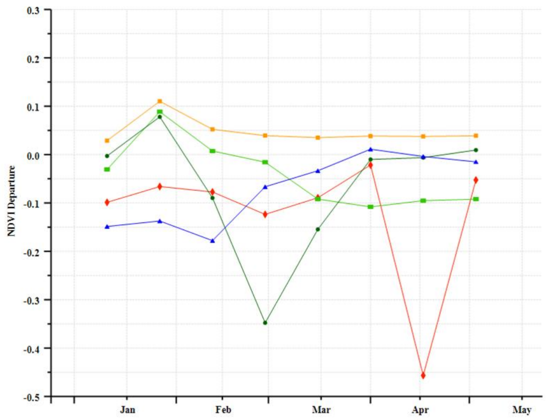


(b) Crop condition development graph based on NDVI

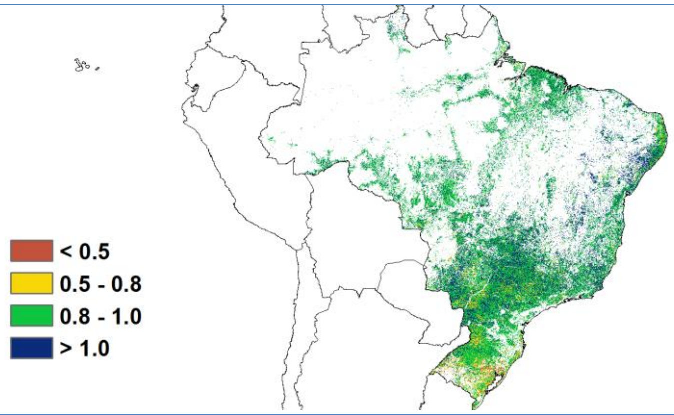


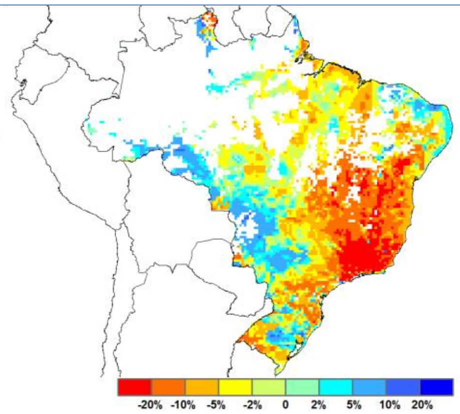
(c) Time series rainfall profile_Brazil



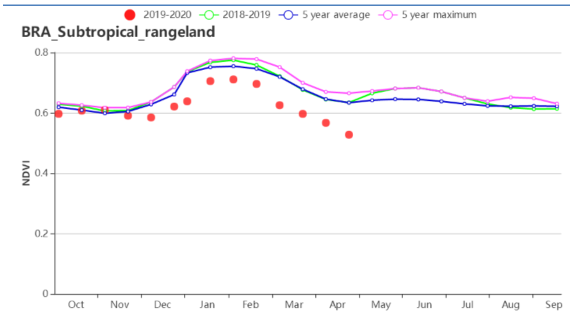


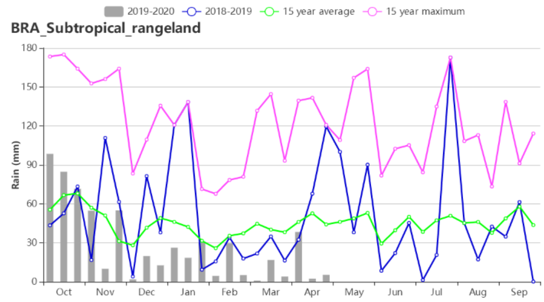
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



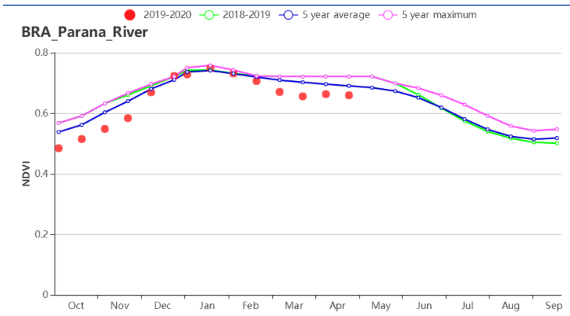


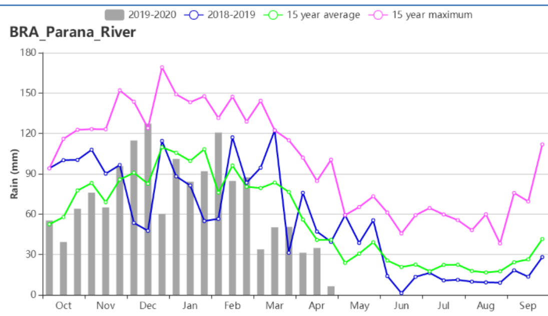
(f) Maximum VCI (g) Biomass departure



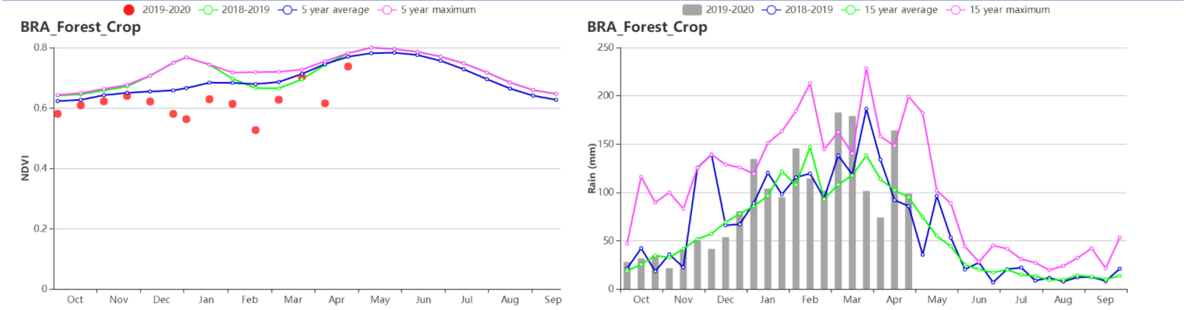


(h) Crop condition development graph based on NDVI (left) and rainfall profile (right) of Southern subtropical rangelands

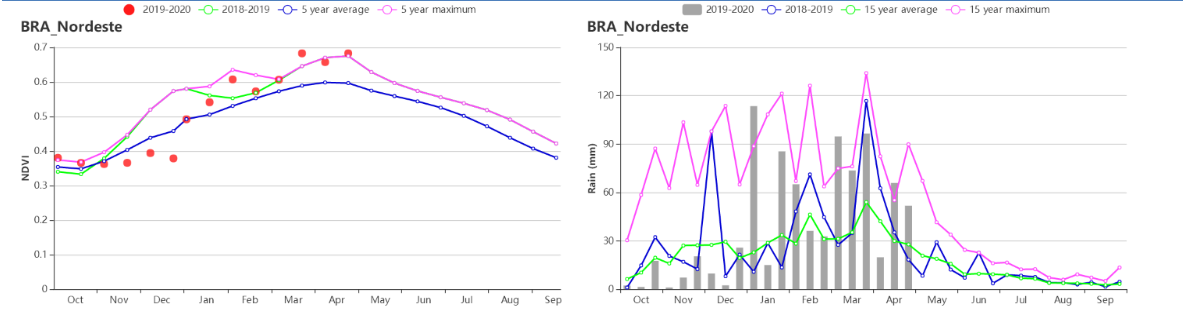




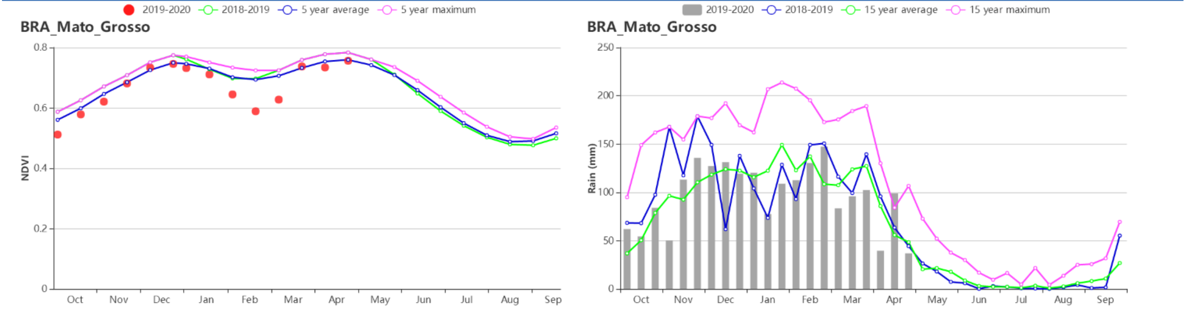
(i) Crop condition development graph based on NDVI (left) and rainfall profile (right) of Parana basin



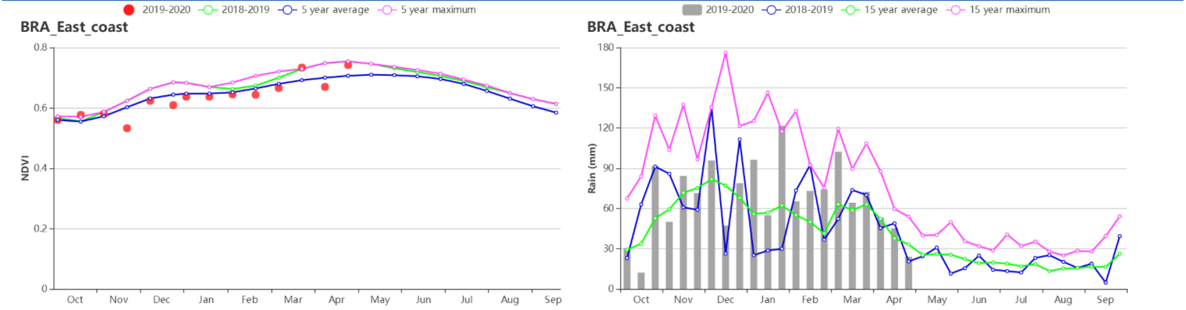
(j) Crop condition development graph based on NDVI (left) and rainfall profile (right) of Northeastern mixed forest and farmland



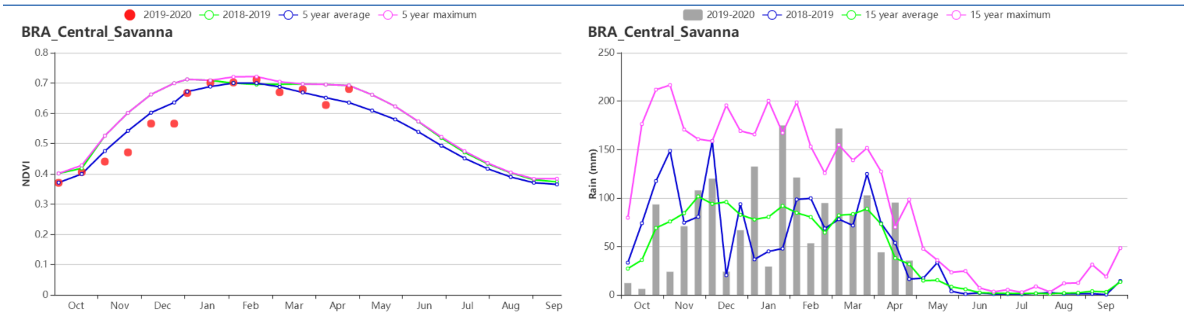
(k) Crop condition development graph based on NDVI (left) and rainfall profile (right) of Nordeste



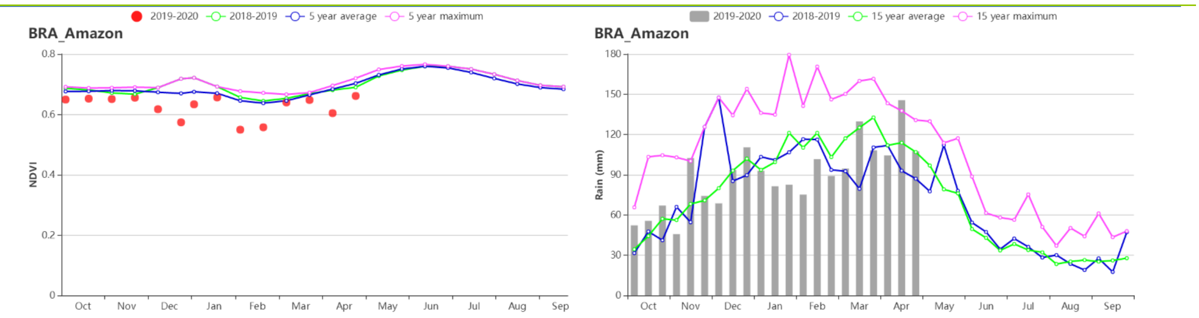
(L) Crop condition development graph based on NDVI (left) and rainfall profile (right) of Mato Grosso



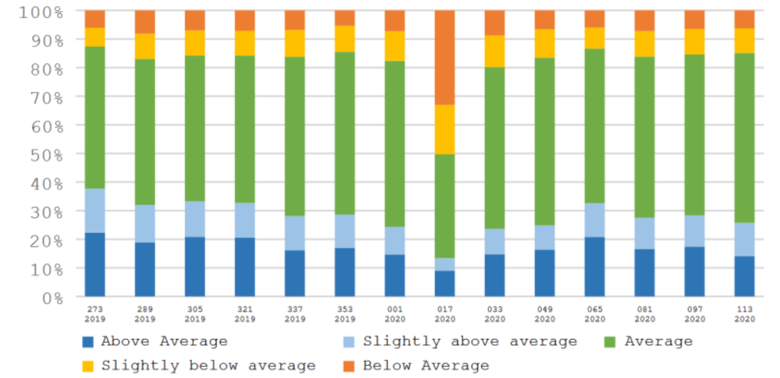
(m) Crop condition development graph based on NDVI (left) and rainfall profile (right) of Coast



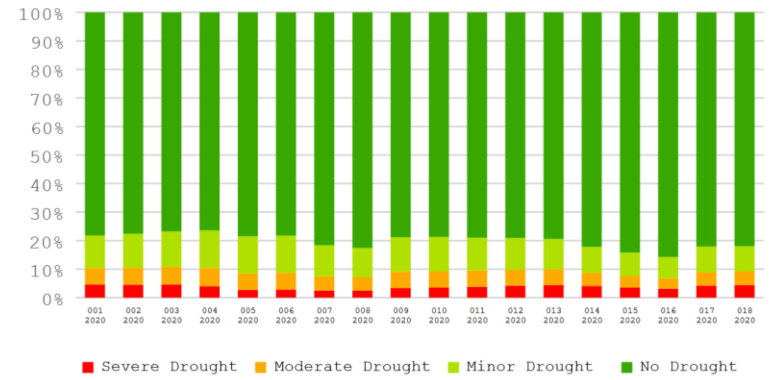
(n) Crop condition development graph based on NDVI (left) and rainfall profile (right) of Central Savanna



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



(p) Proportion of NDVI anomaly categories compared with 5YA from January - April 2020



(q) Proportion of drought categories from January - April 2020

Table 3.13 Brazil's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 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 (%)
Amazonas	1213	-11	25.3	0.3	1080	2	712	-1
Central Savanna	1139	30	23.4	0.0	1160	-6	722	-12
Coast	847	34	23.2	0.0	1146	-7	721	-12
Northeastern mixed forest and farmland	1495	13	25.0	0.1	1116	-2	745	-4
Mato Grosso	1154	-12	24.5	0.4	1146	5	754	1
Nordeste	750	83	25.3	-0.3	1205	-4	772	-7
Parana basin	777	-18	21.9	-0.2	1213	4	710	-6
Southern subtropical rangelands	181	-63	23.0	0.5	1224	5	709	-4

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current
Amazonas	100	1	0.96
Central Savanna	100	0	1.00
Coast	100	2	0.98
Northeastern mixed forest and farmland	100	0	0.96
Mato Grosso	100	0	0.96
Nordeste	99	9	1.04
Parana basin	100	0	0.95
Southern subtropical rangelands	100	0	0.74

[CAN] Canada

The current reporting period covers the overwintering and stems elongation stage of winter wheat in Canada. Sowing of maize, soybean, and spring wheat will predominantly take place in May. According to the crop condition development graph based on NDVI, the crop condition of current winter crops is below last year's and the 5-year average, but reached almost average values by the end of April.

Winter wheat accounts for less than 15% of agricultural land. It is mainly grown in Ontario and Quebec, followed by Saskatchewan, Alberta and Manitoba provinces. In general, above-average precipitation and temperatures occurred in Ontario, Quebec, Manitoba and Saskatchewan. Precipitation was above the recent 15-year average by 7%, 11%, 17%, and 3% respectively. Temperatures were above average by 1.6℃, 1.4℃, 0.8℃, and 0.1℃. But photosynthetically active radiation was below average by 11%, 4%, 9% and 1%.

Below-average PAR resulted in a reduction of potential biomass. Compared to the 15YA, biomass in Ontario, Quebec, Manitoba and Saskatchewan was below average by 15%, 6%, 15% and 3% respectively. Only a small portion of agricultural land was cropped. As compared to the 5YA, CALF dropped by 31%.

Overall, the current wheat production prospects show that the crop seems to be behind in its development due to cooler than normal temperatures during the spring green-up phase in April. At the end of this monitoring period, wheat had almost caught up with the 5YA. Conditions could become favorable in the coming months depending on the weather.

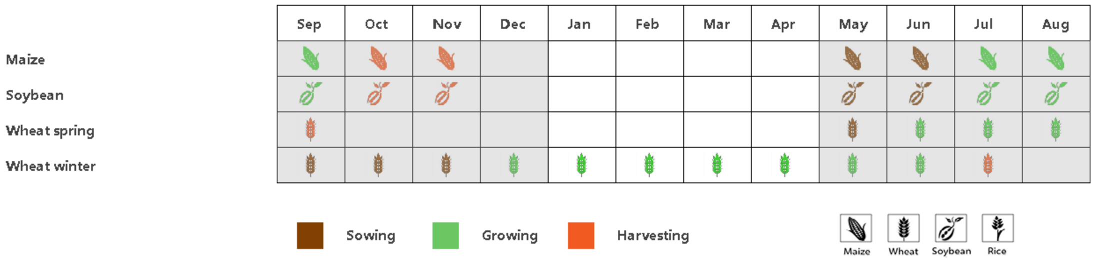
Regional analysis

Although Canada is divided into five agro-ecological zones, winter crops in this monitoring period are mainly distributed in the **Prairies** (area identified as 53 in the maximum VCI map) and **Saint Lawrence** basin (49, covering Ontario and Quebec).

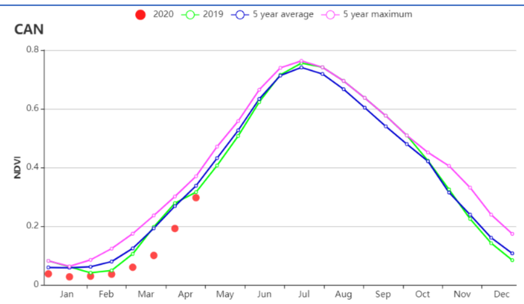
In the **Prairies**, precipitation was above average (RAIN 189mm, +3%), while the temperature and radiation were slightly lower than the 15-year average (TEMP -0.3℃; RADPAR -1%). As a result of the lower temperature and radiation, the potential biomass was slightly below the 15-year average as well (-5%). At the same time, the Cropped Arable Land Fraction fell significantly below the 5YA (CALF, -74%). The crop condition development graph based on NDVI shows that spring green up was delayed. Accordingly, VCIx (0.73) was also relatively low. However, prospects are still favorable.

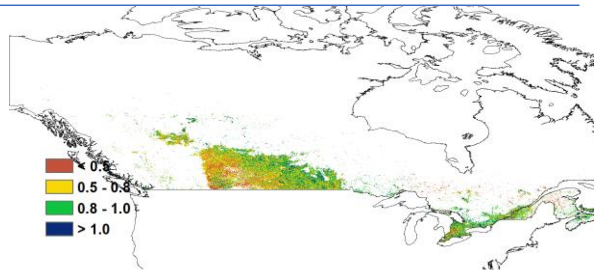
In the **Saint Lawrence basin**, the main winter wheat production area in Canada, precipitation and temperature were above the 15-year average (RAIN 439mm, +4%; TEMP +1.0°C), which was favorable for the growth of winter wheat. However, RADPAR was below the average (-4%), which caused BIOMSS estimation to be lower than the 15-year average (-7%). The Cropped Arable Land Fraction fell below the 5-year average (CALF, -8%), and the VCIx was 0.76. The NDVI values from late March to April were close to the last 5-year average. Therefore, prospects are still favorable for winter wheat in this region.

Figure 3.12 Canada's crop condition, January - April 2020



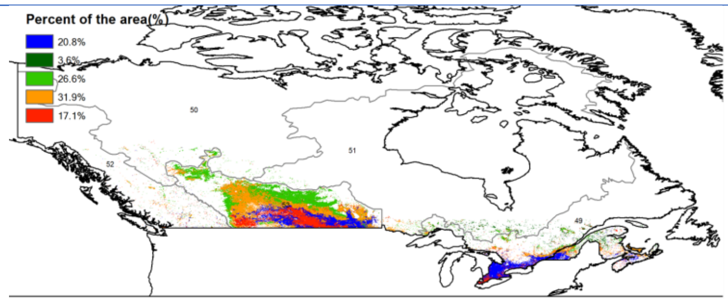
(a). Phenology of major crops

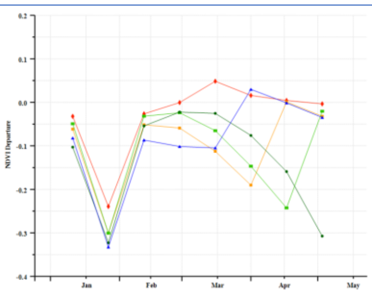




(b) Crop condition development graph based on NDVI

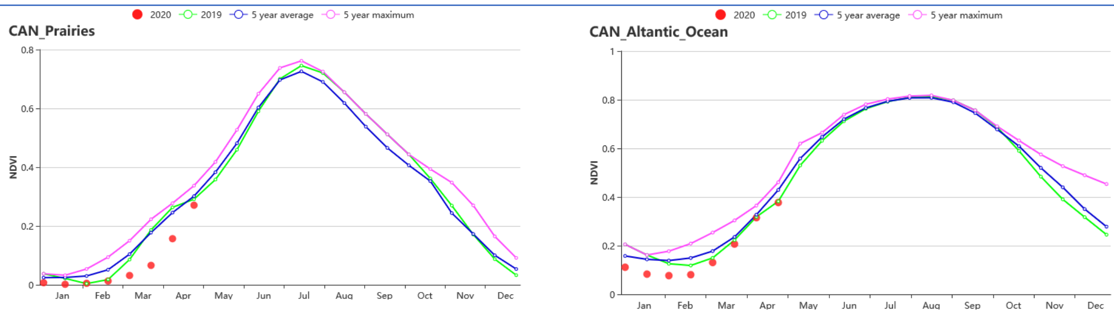
(c) Maximum VCI





(d) Spatial NDVI patterns compared to 5YA

(e) NDVI profiles



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

Table 3.15 Canada's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 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	439	4	-3.7	1.0	562	-4	74	-7
Prairies	189	3	-5.8	-0.3	571	-1	76	-5

Table 3.16 Canada agronomic indicators by sub-national regions, current season's values and departure from 5YA/15YA, January - April 2020

Region	CALF		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current
Saint Lawrence basin	47	-8	0.76
Prairies	2	-74	0.73

[DEU] Germany

This monitoring period covers the overwintering of fall-sown crops and the sowing of spring crops. In late April, winter wheat and barley were at the late vegetative stages, and spring wheat and maize were being planted. Generally, the crop conditions in Germany were above average in most regions based on the agroclimatic and agronomic indicators.

At the national level, total precipitation was 4% above average, temperature and radiation were significantly above average (TEMP, +1.8°C; RADPAR, +10%). High rainfall occurred between February and early March, whereas significantly negative rainfall departures were observed in January and from mid-March to April. Most of the country experienced warmer-than-usual conditions during this reporting period, except for late-March, when a cold spell swept through most European countries. Due to favorable temperatures and adequate water supply, the biomass production potential (BIOMSS) is estimated to increase by 8% nationwide as compared to the fifteen-year average.

As shown in the crop condition development graph and the NDVI profiles at the national level, NDVI values were above average until late March, when they fell to below average levels due to a dry spell from mid-March to mid-April. These observations are confirmed by the clustered NDVI profiles: 68.8% of regional NDVI values were above average before late March, when 77.9% of the area started to drop to below average. Overall VCIx for Germany was 0.91. CALF during the reporting period was the same as for the recent five-year average.

Generally, the agronomic indicators show favorable conditions for most winter and summer crops in Germany. However, more rain will be needed to ensure an adequate soil moisture supply for the reproductive phase 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 Sugarbeet Zone of the Northwest, Central Wheat Zone of Saxony and Thuringia, Sparse Crop Area of the East-German Lake and Heathland area, Western Sparse Crop Area of the Rhenish Massif and the Bavarian Plateau.

Schleswig-Holstein and the Baltic Coast are among the major winter wheat zones of Germany. The region experienced significantly warmer weather (TEMP, +1.9°C), above average radiation (RADPAR, +10%) and RAIN (+13%). As a result, BIOMSS is expected to increase by 12% as compared to the average. As shown in the crop condition development graph (NDVI), the values were above average in the first part of this monitoring period, and then fell to below average from late March to late April. The area has a high CALF (100%) as well as a favorable VCIx (0.91), indicating a high cropped area and favorable crop prospects.

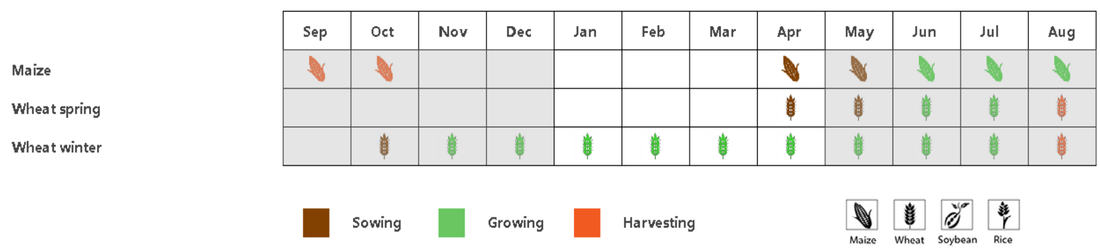
Wheat and sugarbeets are major crops in the **Mixed Wheat and Sugarbeet Zone of the Northwest.** According to the CropWatch agroclimatic indicators, RAIN (+7%), temperature (TEMP +1.8°C) and radiation (RADPAR, +11%) were all above average, which led to an increase for BIOMSS by 12%. As shown in the crop condition development graph based on NDVI, the values were above average until late March when they fell to below average. The area has a high CALF (100%) and crop condition for the region is good according to the high VCIx (0.95).

Central Wheat Zone of Saxony and Thuringia is another major winter wheat zone. RAIN (+1%), TEMP (+1.8°C) and RADPAR (+10%) were all above average. Mostly due to favorable temperatures and high sunshine, the biomass potential (BIOMSS) increased by 6% above average. As shown in the crop condition development graph based on NDVI, the values were above average until late March. Subsequently, they were near or below average from late March to late April due to low rainfall in that period. The area has a high CALF (100%) and the VCIx of 0.88 for this region also shows favorable crop prospects.

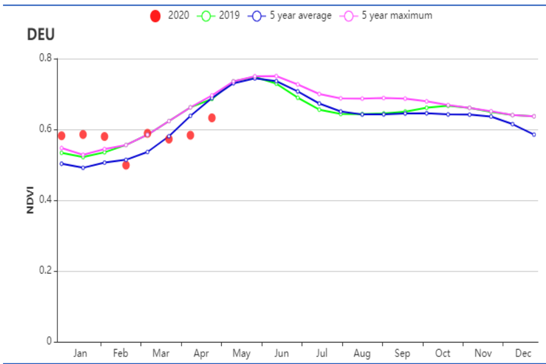
Crop conditions were also favorable in the **East-German Lake and Heathland Sparse Crop Area** and **Western Sparse Crop Area of the Rhenish Massif**. Average to significantly above-average precipitation was recorded in these two regions (RAIN 0% and +15%, respectively). In both regions, temperatures (TEMP +1.8°C) and solar radiation (RADPAR +9%) were above average. Due to adequate rain, suitable temperatures and high sunshine conditions, BIOMSS was higher by 6% and 10%, respectively, compared to the average of the past 15 years, and CALF was at 100% for both regions. As shown in the crop condition development graph based on NDVI, both regions showed the same trends: above average until late March and then below average from late March to late April due to monthly fluctuations in precipitation. Overall, favorable crop conditions were recorded with high VCIx values of 0.94 for the eastern and 0.87 for the western areas. CALF was 100% for both regions, indicating favorable crop prospects.

On average, almost normal rainfall was recorded for the **Bavarian Plateau** (RAIN -1%), with above-average temperature (+1.7°C) and radiation (RADPAR +10%). Compared to the five-year average, BIOMSS increased by 6%. The area had a high CALF (100%) as well as a favorable VCIx (0.89). As shown in the crop condition development graph based on NDVI, the values had the same trend as other regions.

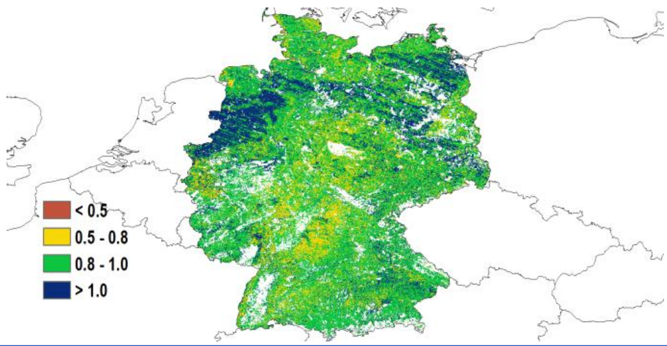
Figure 3.13 Germany's crop condition, January-April 2020



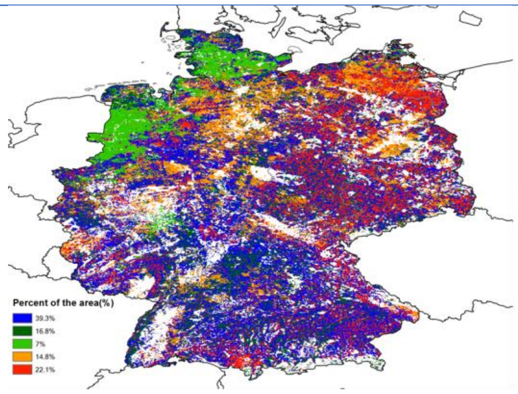
(a). Phenology of major crops



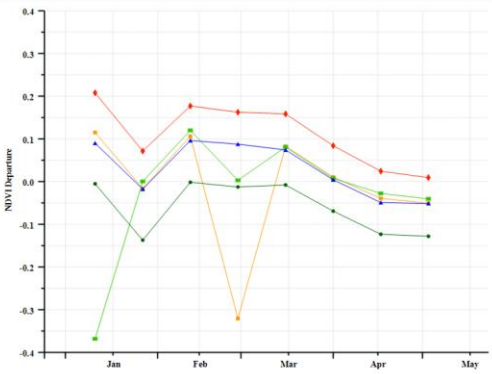
(b) Crop condition development graph based on NDVI



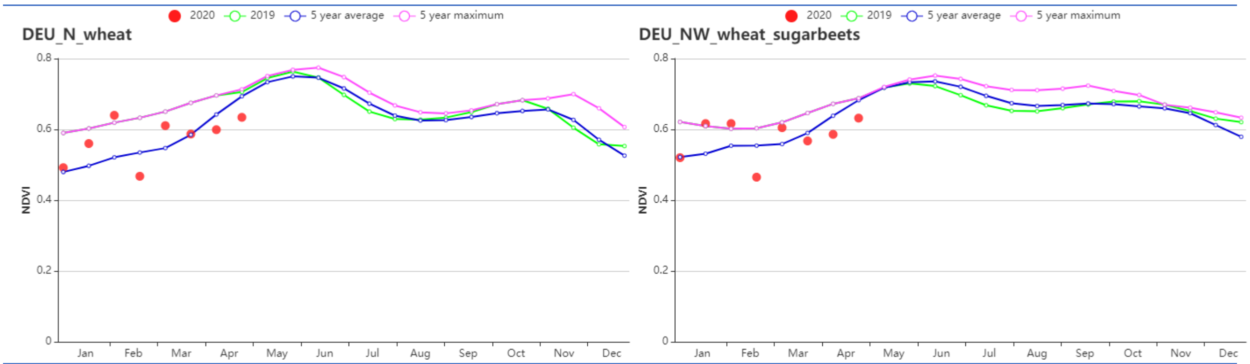
(c) Maximum VCI



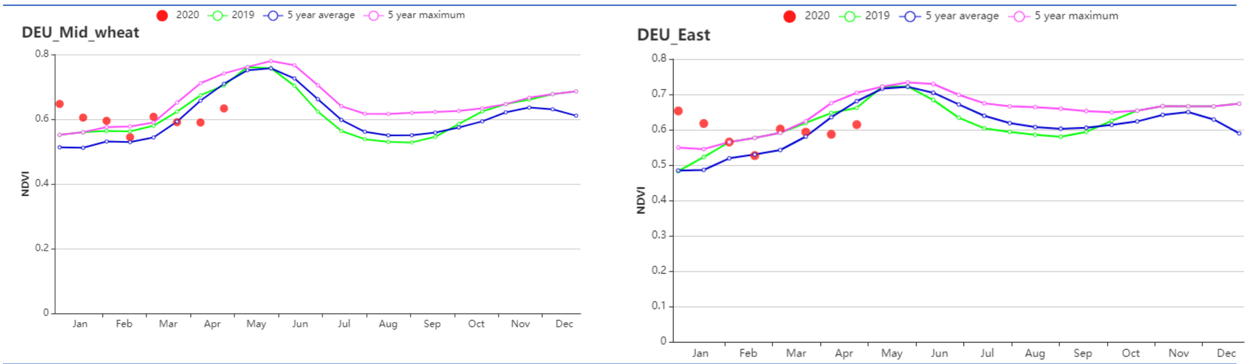
(d) Spatial NDVI patterns compared to 5YA



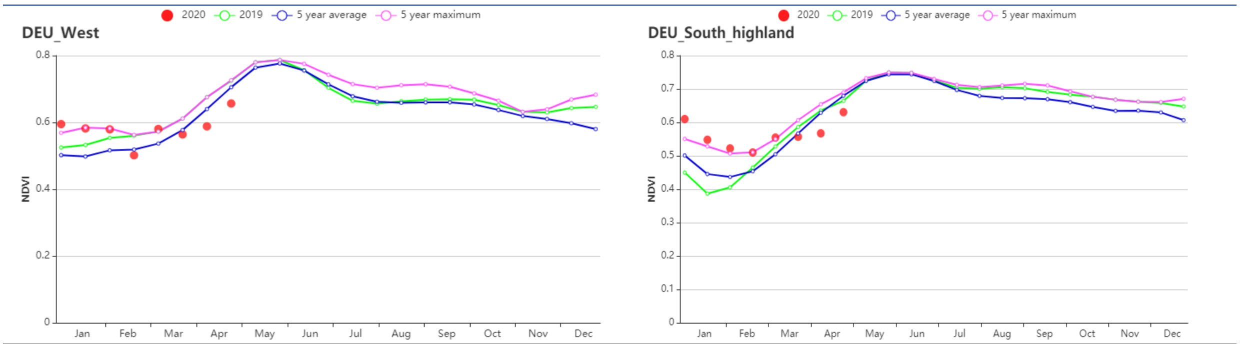
(e) NDVI profiles



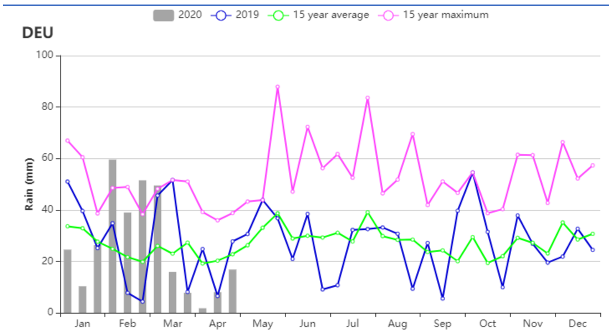
(f) Crop condition development graph based on NDVI (Wheat zone of Schleswig-Holstein and the Baltic coast (left) and Mixed wheat and sugar beets zone of the north-west(right))



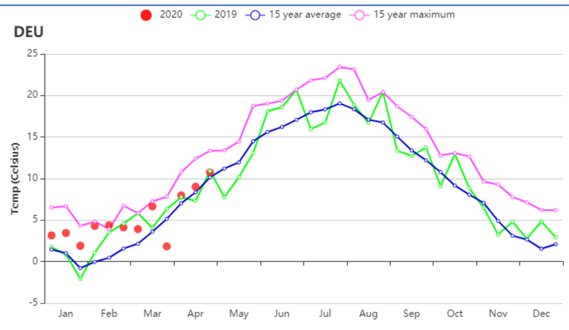
(g) Crop condition development graph based on NDVI (Central wheat zone of Saxony and Thuringia(left) and Sparse crop area of the east-German lake and Heathland (right))



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



(f)Time series profile of rainfall



(g)Time series profile of temperature

Table 3.17 Germany agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January-April 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	300	13	5.7	1.9	509	10	118	12
Mixed wheat and sugarbeets zone of the north-west	304	7	6.0	1.8	532	11	129	12
Central wheat zone of Saxony and Thuringia	247	1	5.0	1.9	556	10	129	6
East-German lake and Heathland sparse crop area	248	0	5.0	1.8	545	9	126	6
Western sparse crop area of the Rhenish massif	316	15	5.3	1.8	556	9	132	10
Bavarian Plateau	361	-1	4.2	1.7	624	10	133	6

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current
Wheat zone of Schleswig-Holstein and the Baltic coast	100	0	0.91
Mixed wheat and sugarbeets zone of the north-west	100	0	0.95
Central wheat zone of Saxony and Thuringia	100	0	0.88
East-German lake and Heathland sparse crop area	100	0	0.94
Western sparse crop area of the Rhenish massif	99	0	0.87
Bavarian Plateau	99	0	0.89

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

[EGY] Egypt

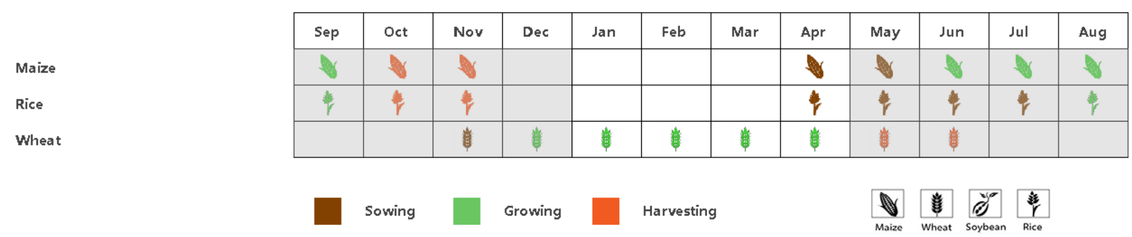
This reporting period covers the growing stage of winter wheat and the start of the sowing period for maize and rice. The CropWatch agro-climatic indicators show that the recorded rainfall was 112mm, 136% greater than the last 15-year average (15YA). The rainfall index graph shows that most of the rainfall fell during January (>15mm) and March (>40mm). The average temperature was 14.8°C (-0.7°C). RADPAR was 963 MJ/m2 (-5.7%) and BIOMSS was 302 gDM/m2 (+13%) as a result of good rainfall. The nation-wide NDVI development graph shows that the conditions of the crops were initially below average, then improved to show above-avrage levels and by the end of the season dropped to average levels. The NDVI profile map indicates that the conditions of about 33.4% of cultivated areas were above and 18.8% below average. The rest of the area (47.9%) fluctuated around the average throughout the whole reporting period. The VCIx map indicates that the condition of the current crops, mainly winter wheat, is good. This agrees with the whole country VCIx value (0.85) and the CALF exceeded the 5YA by 8%, indicating favorable crop conditions.

Regional Analysis

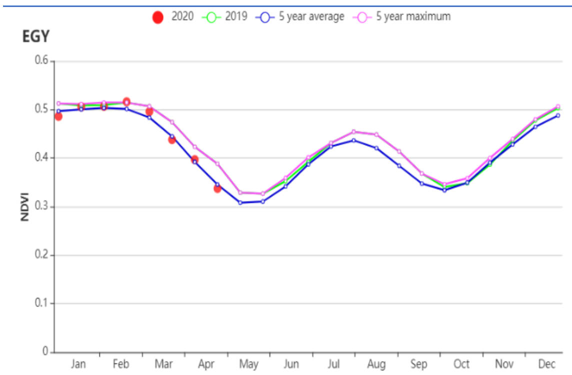
Egypt can be subdivided into three agro-ecological zones (AEZ), mostly based on cropping systems, climatic zones and topographic conditions. Only two of them are relevant for crops: **the Nile Delta and Mediterranean coastal strip**, and **the Nile Valley**. A detailed analysis is reported below.

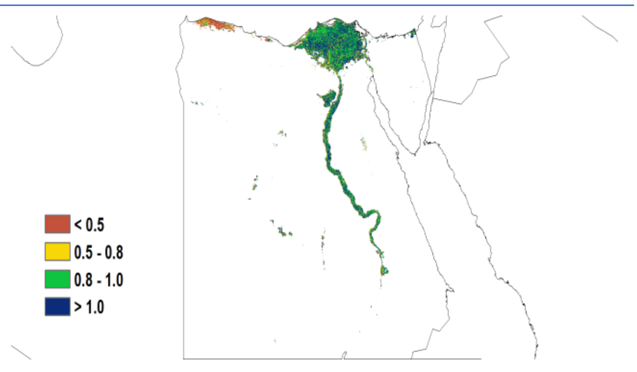
In **the Nile Delta and Mediterranean coastal strip**, the average rainfall was 113 mm (+131%), while in the **Nile Valley** zone it reached 65mm, an increase of 394% above average. Most of the Egyptian crop production is irrigated so rainfall has little impact on crop production. During this monitoring period there was a good amount of rainfall which positively affected the crop conditions and resulted in incrased estimation for BIOMASS. Temperature for both zones was 15°C (-1°C). RADPAR was about -6% and -4% below the average for the first and second zone respectively. The BIOMASS index shows an increase of 9% in the Nile Delta and Mediterranean coastal strip zone. For the **Nile Valley**, the increase over the 15YA was 27%. The NDVI-based crop condition development graphs show similar conditions for both zones and therefore also for the nation-wide crop development NDVI graph, in agreement with the favorable VCIx and CALF% values.

Figure 3.14 Egypt's crop condition, October 2019 - January 2020



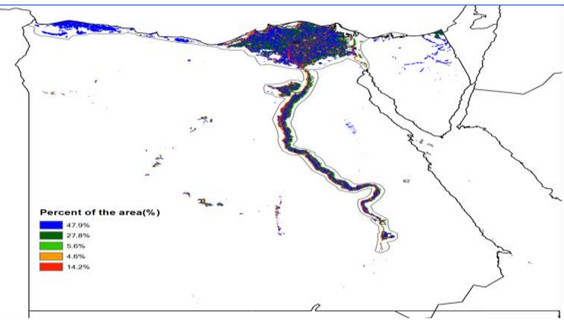
(a). Phenology of major crops

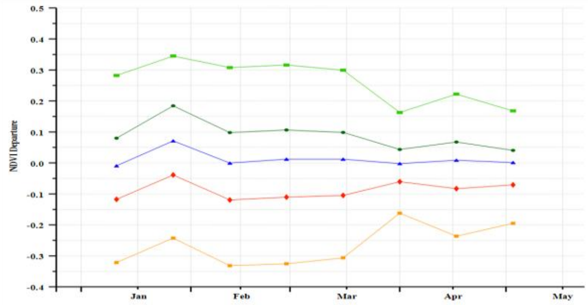




(b) Crop condition development graph based on NDVI

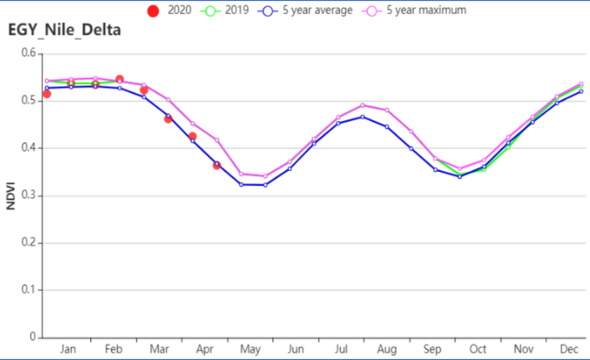
(c) Maximum VCI

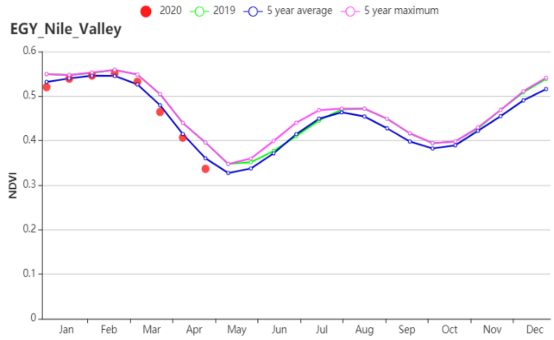




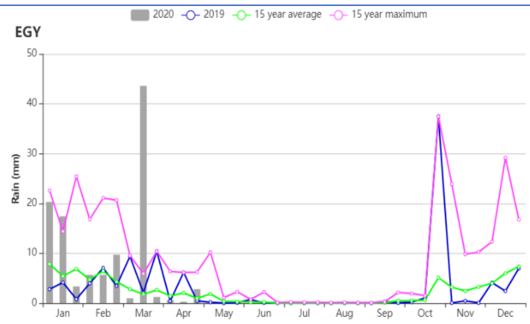
(d) Spatial NDVI patterns compared to 5YA

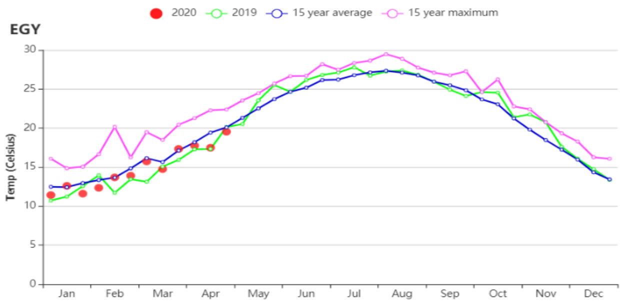
(e) NDVI profiles





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





(g) Time series profile of rainfall

(h) Time series profile of temperature

Table 3.19 Egypt's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 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	113	131	15	-1	945	-6	368	9
Nile Valley	29	58	23	0.9	1487	-0.7	212	27

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Nile Delta and Mediterranean coastal strip	73	7	0.87
Nile Valley	83	8	0.89

[ETH] Ethiopia

This reporting period covers January to April, which coincides with the short rainy season (Belg) in central and southeastern Ethiopia. The sowing of Meher (main season) maize started in the central and southeastern Oromia regions. At the national level, the agro-climatic and agronomic indicators were above the 15 year average: RAIN, +54%, BIOMASS +8%, and CALF +35%, whereas the temperatures (TEMP -0.2°C) and RADPAR (-4%) were slightly below average. As a result of the increase in rainfall starting in mid April, farmers were able to start land preparation for the main season crops. NDVI was also considerably above average, which together with a maximum VCI value of 0.98, indicated good conditions. Based on NDVI clusters only 16% of the cropland had slightly below-average conditions, whereas the remainder was above average. In general, prospects for the Meher season are favorable. Higher rainfall also has a positive effect on feed supply for the draft animals used for land preparation.

Regional analysis

The monitoring period covers main rain-fed cereal producing areas found in the **Southeastern mixed-maize zone**, **Western mixed maize zone**, and the **Central-northern maize-teff highlands zone**.

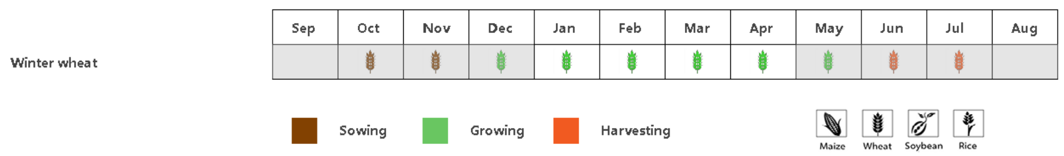
The South-eastern mixed maize zone

Based on CropWatch agroclimatic indicators, rainfall was recorded at 407 mm (+77%). Temperature and RADPAR were near average. As a result, the total biomass production increased by 5% compared to the 15 YA. CALF was 58% above average. The crop condition development graph based on NDV was also above the five-year average. Maximum VCI was 1.04. The conditions were favorable.

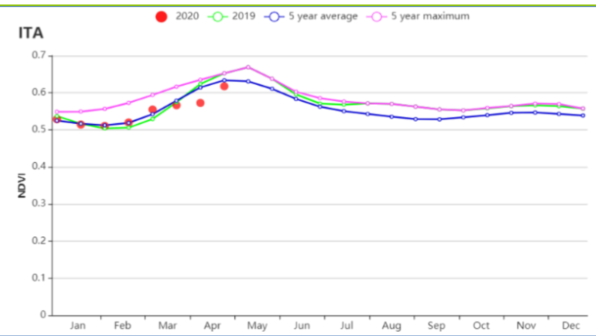
In **the Western mixed maize zone**, except for temperature, all CropWatch agronomic and agroclimatic indicators were above average. Total rainfall was 219 mm (+21%). Both the potential biomass (+15%) and CALF (+5%) were above average. However, the temperature was cooler (-0.6°C) and RADPAR unchanged. VCIx was at 0.90. The crop condition development graph based on NDVI was above average from January to Mid-March and then fell below average. Overall, based on all indicators, the conditions were favorable for land preparation and building up of favorable soil moisture levels for the coming Meher season.

In the in **Central-northern maize-teff highlands zone** conditions were favorable as well: Rain (183 mm +58%) was above average and temperatures remained near average. Resulting biomass was 8% above the 15YA. CALF also showed a significant increase of 64%. The NDVI profile and the maximum VCI of 0.98 were also favorable. Similar to the other zones, the condition were conducive for sowing and land preparation for the Meher season.

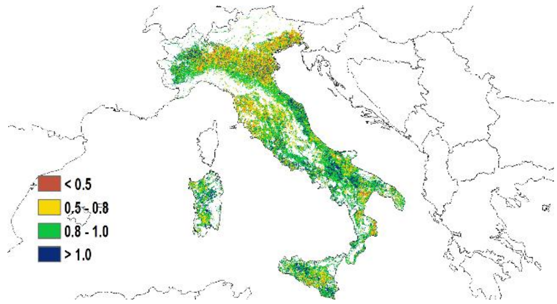
Figure 3.15 Ethiopia's crop condition, January - April 2020



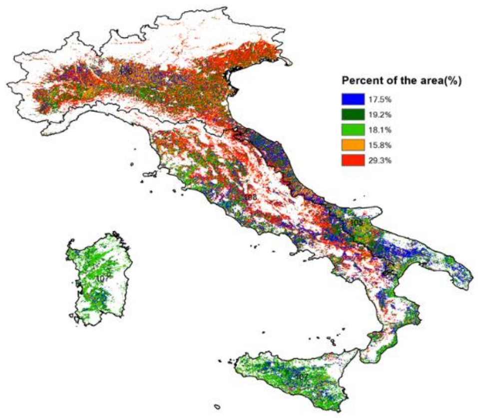
(a). Phenology of major crops



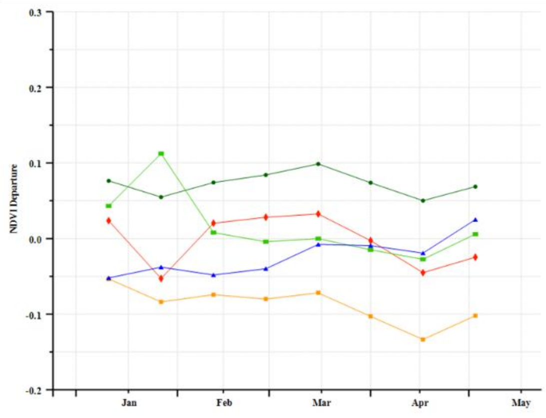
(b) Crop condition development graph based on NDVI



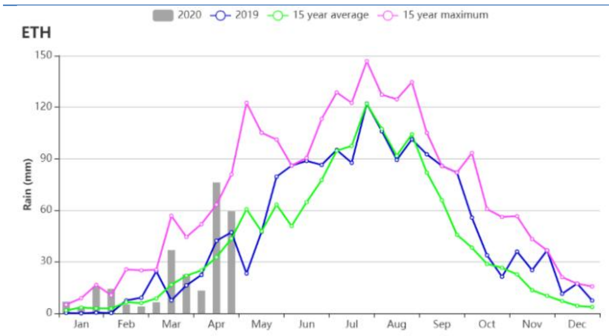
(c) Maximum VCI



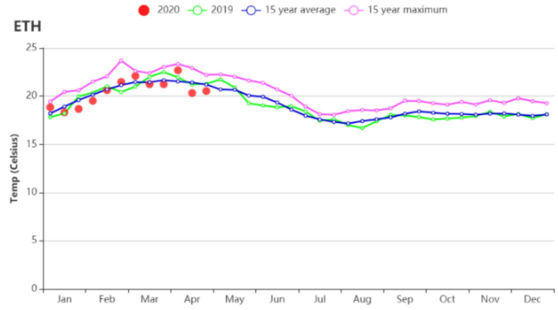
(d) Spatial NDVI patterns compared to 5YA



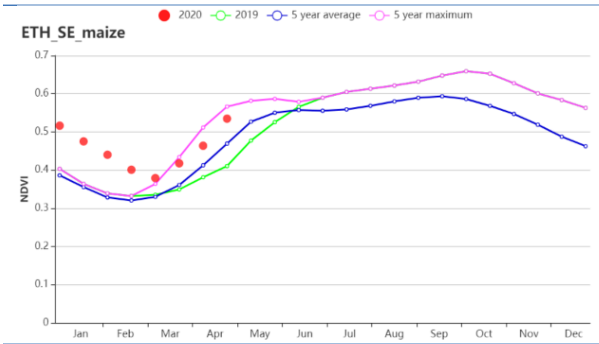
(e) NDVI profiles

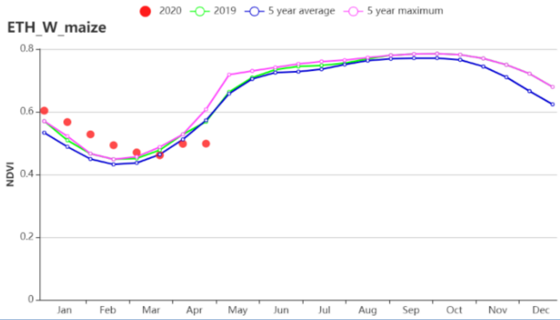


(f) Rainfall profiles

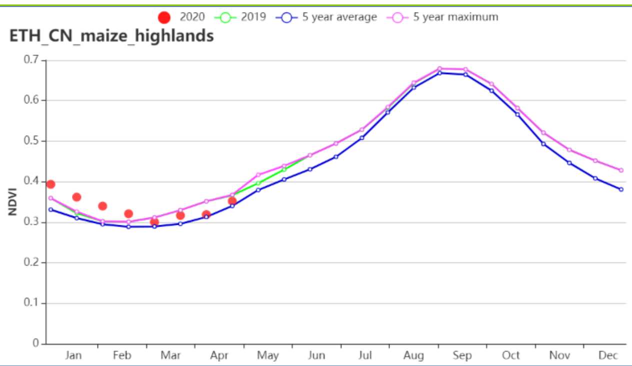


(g) Temperature profiles





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



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

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

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
South-eastern mixed maize zone	407	77	19.3	-0.1	1155	-13	510	5
Western mixed maize zone	219	21	24.2	-0.6	1300	0	586	15
Central-northern maize-teff highlands	183	58	19.7	0	1344	-5	446	8

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
South-eastern mixed maize zone	90	58	1.04
Western mixed maize zone	98	5	0.9
Central-northern maize-teff highlands	44	64	0.98

[FRA] France

This monitoring period covers winter wheat, as well as the sowing of spring wheat and maize in France. CropWatch agro-climatic indicators show that the temperature was above average (TEMP, +1.8°C). RAIN was close to the average and sunshine was above average (RADPAR, +3%). Due to suitable temperature, rainfall and high sunshine conditions, the biomass accumulation potential BIOMSS was 7% above average compared with the past fifteen-year average.

As shown in the national crop condition development graph and the NDVI profiles, NDVI values in France were close to or above average before mid-March, and then below average until late April. The spatial patterns of NDVI departures indicate above-average NDVI values in 30.1% of the arable land during the entire monitoring period. This is also partly reflected by the spatial distribution of maximum VCI (VCIx) across the country, which reached an average of 0.9. Overall, at this mid stage of winter wheat, the outlook is favorable.

Regional analyses

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

In the Northern barley region, RAIN (+14%), TEMP (+1.8°C) and RADPAR (+8%) were all above average. The BIOMSS also increased by 16% when compared to the past fifteen-year average. However, the NDVI profile for this region was below the past five-year average.

In the Mixed maize/barley and rapeseed zone from the Center to the Atlantic Ocean, a warmer (TEMP 2°C above average) and wetter (RAIN 10% above average) season was observed, with overall average-level RADPAR. For the crops, BIOMSS was 11% higher than average and CALF was at average levels. The regional NDVI profile presented an overall close-to-average trend, except for a drop in mid-April, which might have been due to an anomaly.

In the Maize-barley and livestock zone along the English Channel, NDVI fluctuated somewhat, but tended to stay slightly below average. RAIN, TEMP and RADPAR were increased by 21%, 1.7°C and 1% respectively, when compared to average levels. The BIOMSS increased by 10%. CALF was average and VCIx was recorded relatively low at 0.9, indicating slightly below-average crop conditions.

In the Rapeseed zone of eastern France, the NDVI profile also indicated below-average conditions. Overall, RAIN in this period dropped by 5% from average level, while TEMP increased by 2°C and RADPAR increased by 10%, indicating relatively drier and warmer conditions. BIOMSS was about 13% higher than average while CALF was at the average level, however, VCIx was relatively low (0.88).

In the Massif Central dry zone, the VCIx was recorded at a high level (1.01) and the NDVI profile was showing an average to above-average level, indicating overall better than normal crop conditions. The RAIN decreased by 14%, while the TEMP and RADPAR increased by 2°C and 3%, respectively. BIOMSS increased by 4% while CALF did not show significant changes when compared to the five-year averages.

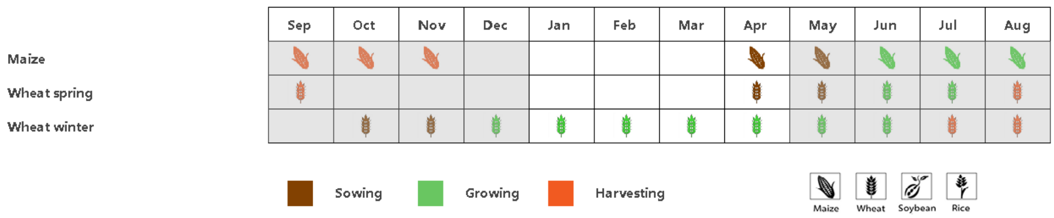
The Southwestern maize zone is one of the major irrigated regions in France. The regional NDVI profile presented an overall close-to-average trend and the VCIx was recorded at a relative high level (0.97), all indicating average to above-average crop conditions. RAIN in the period was 7% lower than average, while TEMP was 1.9°C higher. RADPAR only slightly dropped by 2%. Both BIOMSS (+1%) and CALF (+0.9%) did not show significant changes.

In the Eastern Alpes region, the NDVI profile presented an overall close-to-average trend, especially starting in March. VCIx for the region was recorded at 0.91 and CALF was slightly higher (+2%) than average, indicating overall average crop conditions. RAIN in the region was 12% lower than average, while

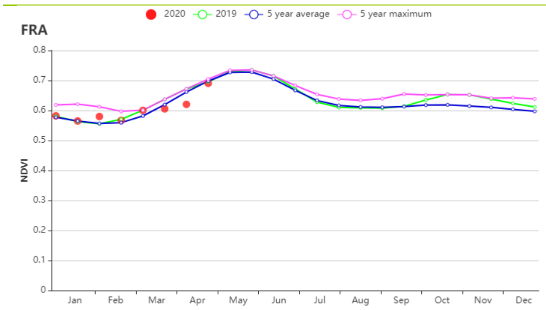
TEMP and RADPAR was 2°C and 5% higher than their averages. BIOMSS was 4% higher than the fifteen-year average.

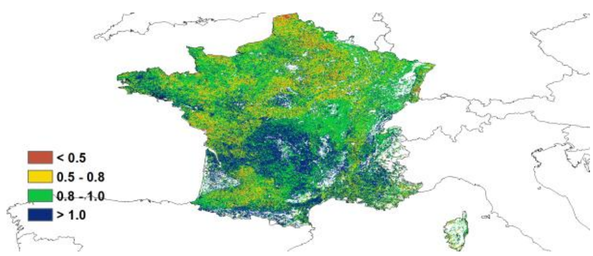
The Mediterranean zone also presented an overall close to average NDVI profile. The region also recorded a high VCIx level (0.96) and the highest CALF increase (4.8%) across France. Taking these factors into account, the region is showing average to above-average crop conditions. RAIN and RADPAR were 12% and 2% lower than average, while TEMP was slightly higher (+1.4°C). BIOMSS was slightly higher (2%) than the fifteen-year average.

Figure 3.16 France's crop condition, January - April 2020



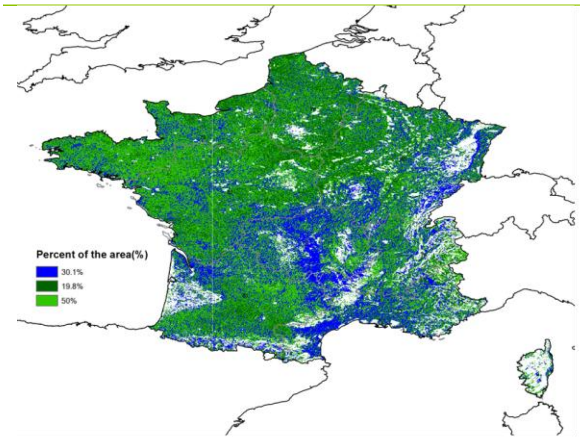
(a). Phenology of major crops

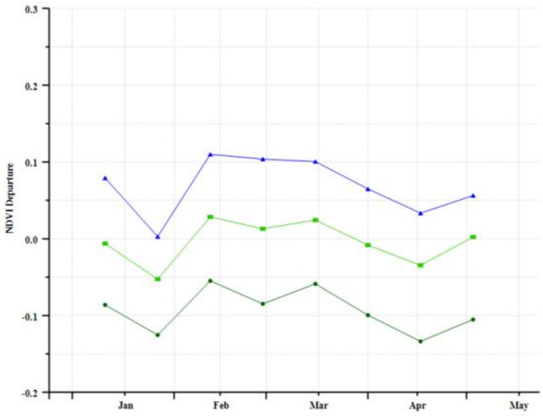




(b) Crop condition development graph based on NDVI

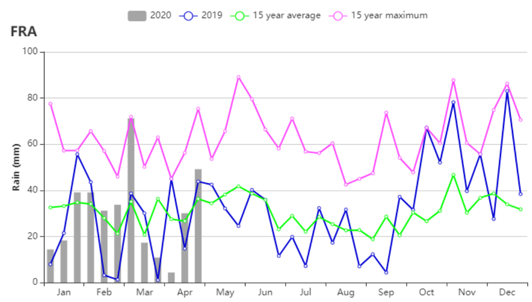
(c) Maximum VCI

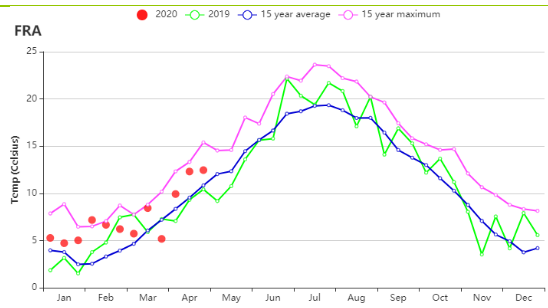




(d) Spatial NDVI patterns compared to 5YA

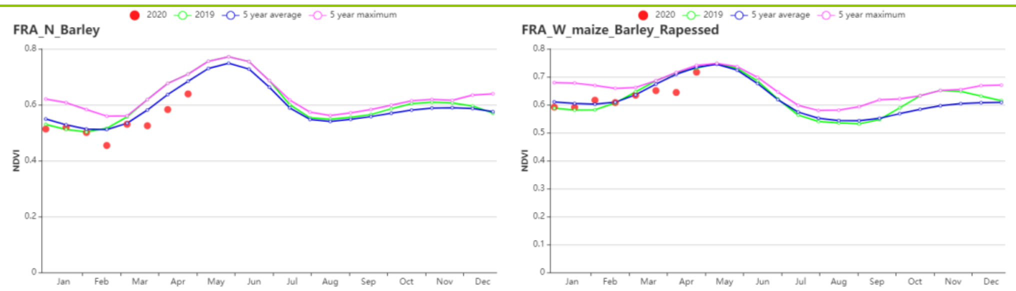
(e) NDVI profiles



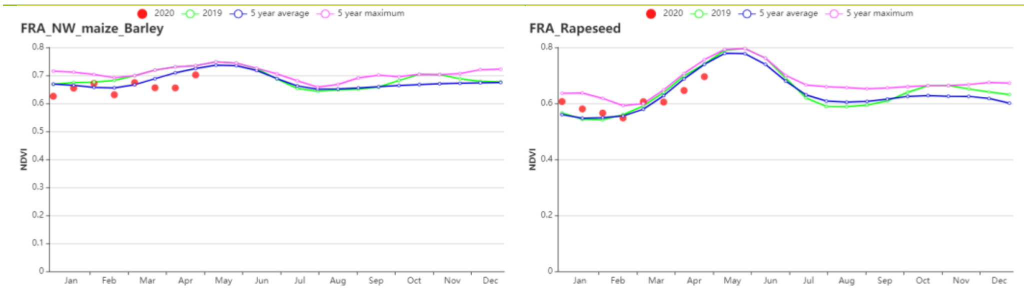


(f) Rainfall profiles

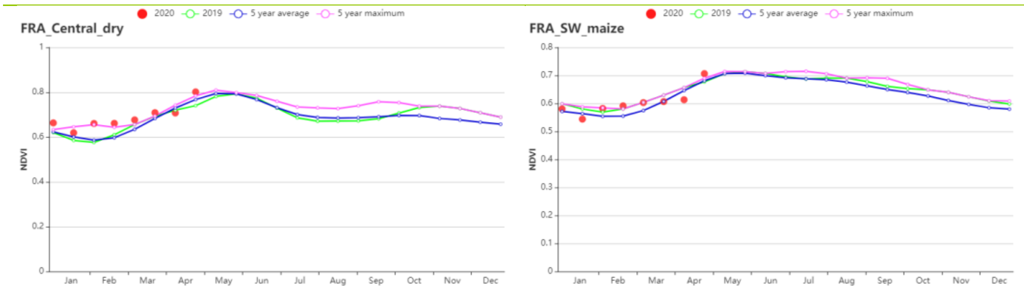
(g) Temperature profiles



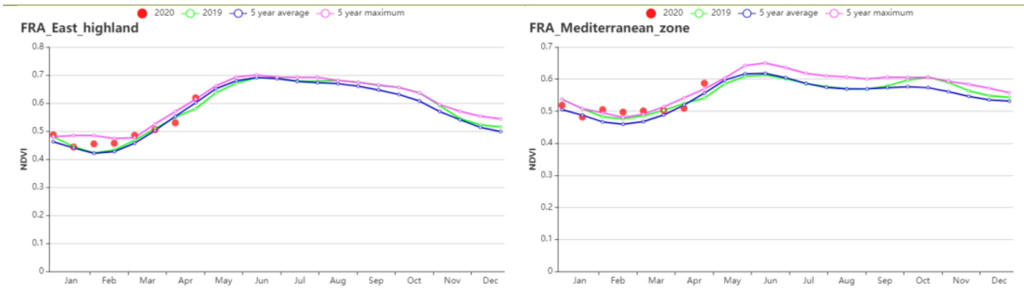
(h) Crop condition development graph based on NDVI (Northern barley region (left) and Mixed maize, Barley and Rapeseed zone (right))



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



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



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

Table 3.23 France's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 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	327	14	7.5	1.8	566	8	154	16
Mixed maize/barley and rapessed zone from the Centre to the Atlantic Ocean	352	10	8.8	2.0	590	1	171	11
Maize barley and livestock zone along the English Channel	393	21	8.5	1.7	549	1	155	10

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	347	-5	6.6	2.0	612	10	152	13
Massif Central Dry zone	323	-14	6.6	2.0	630	3	150	4
Southwest maize zone	414	-7	8.2	1.9	638	-2	173	1
Alpes region	389	-12	5.0	2.0	695	5	147	4
Mediterranean zone	308	-12	6.7	1.4	716	-2	179	2

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Northern Barley zone	99	-1	0.82
Mixed maize/barley and rapessed zone from the Centre to the Atlantic Ocean	100	0	0.89
Maize barley and livestock zone along the English Channel	100	0	0.90
Rapeseed zone of eastern France	99	0	0.88
Massif Central Dry zone	100	0	1.01
Southwest maize zone	98	1	0.97
Alpes region	88	2	0.91
Mediterranean zone	92	5	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

[GBR] United Kingdom

This report covers the vegetative growth period of winter wheat, winter barley and rapeseed. According to the crop condition development graph, NDVI values were below average from January to April. Although the temporal NDVI graphs showed below average conditions, the agroclimatic conditions were favorable. Rainfall (RAIN, +13%), temperatures (TEMP, +0.8°C) and radiation were above average (RADPAR, +9%). Favorable agroclimatic conditions resulted in above-average biomass (BIOMSS, +11%). The seasonal RAIN profile presents overall above-average rainfall except in April. Rainfall surpassed the 15YA in February and may have been excessive in some parts of the kingdom.

The national average VCIx was 0.82. CALF (99%) was unchanged compared to its five-year average. The NDVI departure cluster profiles indicate that: (1) 48.8% of arable land, scattered around East Midland (Leicestershire), Southeast England (West Sussex, Hampshire) and Southwest England (Devon), experienced slightly above-average or average crop conditions,. (2) 14.7% of arable land experienced significantly below-average crop conditions in January and subsequently recovered to average crop conditions. It covered mainly Southeast England (East Sussex). (3) 23.3% of arable land experienced below-average crop conditions except average crop conditions in January. This was the case for East Midlands (Lincoinshire), East of England (Cambridgeshire, Bedfordshire and Hertfordshire), and Southeast England (Oxfordshire, Buckinghamshire). (4)13.2% of arable land experienced below average crop conditions, mainly in the east and south of the United Kingdom, including Scotland (Aberdeenshire), Yorkshire and the Humber (East Riding of Yorkshire), East of England (Norfolk), Southwest England (Dorset) and Southeast England (Hampshire and Kent).

Altogether, the conditions for wheat in the UK are assessed to be slightly above average.

Regional analysis

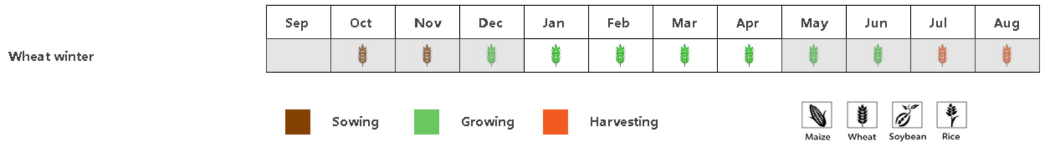
Based on cropping systems, climatic zones and topographic conditions, three sub-national regions can be distinguished: 1) Central sparse crop region, 2) Northern barley region, and 3) Southern mixed wheat and barley region. The fractions of arable land (CALF) in all subregions are average compared to the 5-year average.

The **Central sparse crop region** is one of the major agricultural regions in terms of crop production. Rainfall, temperature and radiation were above average (RAIN +17%; TEMP, +0.7° C; RADPAR, +11%), which resulted in biomass estimates that were above average (BIOMSS, +12%). NDVI values were slightly below or near average according to the region's crop condition development graph in this reporting period. The VCIx was at 0.90. Altogether, the conditions for wheat are expected to be above average.

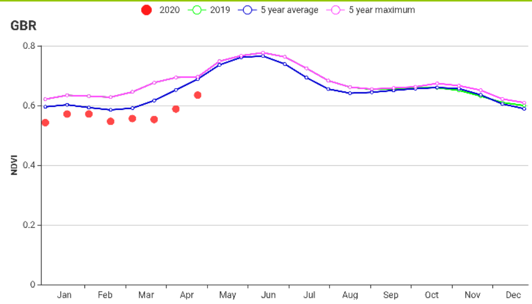
Northern barley region experienced above-average rain, temperature and radiation (RAIN +9%; TEMP, +0.5°C; RADPAR, +12%). Biomass was above average (BIOMSS, +13%). NDVI was slightly below or near average according to the crop condition graphs in this reporting period. The VCIx was 0.86. Altogether, the output of wheat is expected to be slightly above average.

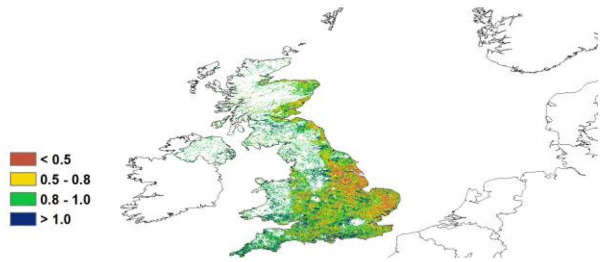
Southern mixed wheat and barley zone experienced similar agroclimatic conditions as the other regions. Rainfall, temperature and radiation were above average (RAIN +14%; TEMP, +1.0° C; RADPAR, +8%), which resulted in the biomass estimates that were above average (BIOMSS, +8%). NDVI was below average according to the crop condition graph in this reporting period. The VCIx was 0.79, slightly less than the other regions. Altogether, the output of wheat is expected to be around average.

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



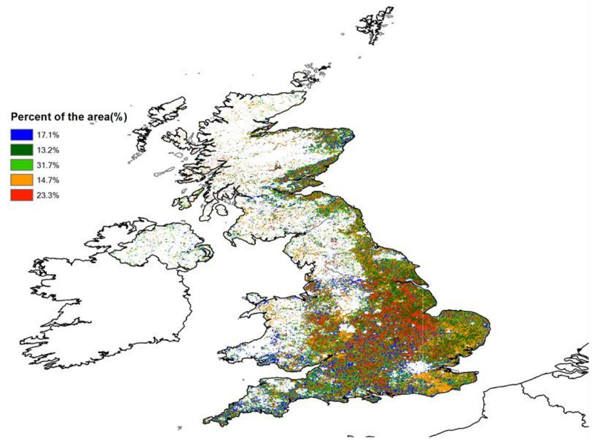
(a). Phenology of major crops

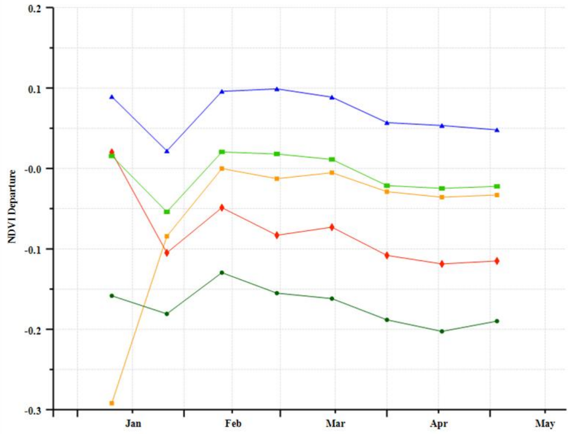




(b) Crop condition development graph based on NDVI

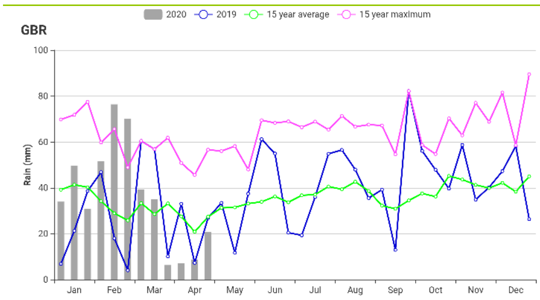
(c) Maximum VCI

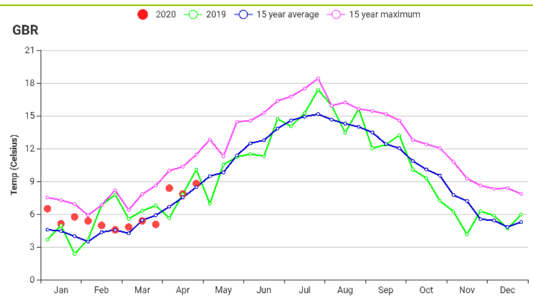




(d) Spatial NDVI patterns compared to 5YA

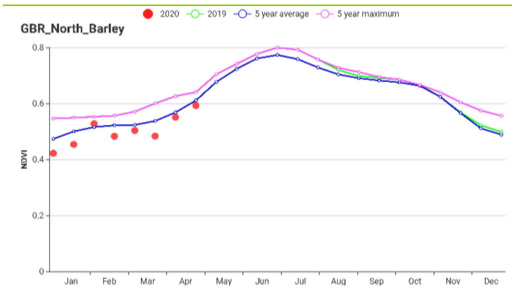
(e) NDVI profiles

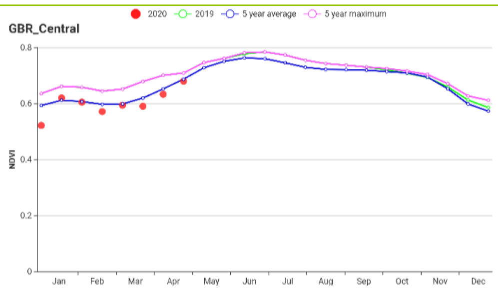




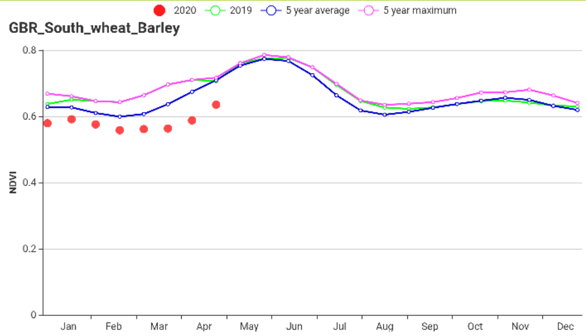
(f) Rainfall profiles

(g) Temperature profiles





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



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

Table 3.25 United Kingdom's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 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)	517	9	4.9	0.5	416	12	92	13
Dry region	461	17	5.9	0.7	457	11	108	12
Southern mixed wheat and Barley zone (UK)	338	14	6.8	1.0	494	8	123	8

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Northern Barley region(UK)	97	2	0.86
Dry region	99	1	0.90
Southern mixed wheat and Barley zone (UK)	99	0	0.79

[HUN] Hungary

For Hungary, the main crop being monitored for this report is winter wheat. Conditions were favorable until mid March, when they started to decline and fell below the longterm average in April, due to a scarcity of rainfall (RAIN -34%). Agro-climatic conditions were above average for temperature and radiation (TEMP +0.7°C; RADPAR +11%), but moisture limited crop growth and BIOMSS was down 9.0%. NDVI was above average throughout the monitoring period for 29.5% of the arable land, below average for 38.3% in the Northern Great Plain such as Helves, Jasz-Nagykun-Szolnok, Bekes, and Szabolcs-Szatmar-Bereg. For the remaining 32.2%, the NDVI was below average in late January and late April. At other times, the NDVI was above average in the Puszta region such as Jaz-Nagykum-Szolnok and Bekes.

The maximum VCI value at the national level reached 0.84 and the cropped arable land fraction (CALF) was at 94% (2% below the recent five-year average). Considering rainfall, biomass and NDVI profiles, crop conditions are estimated as below average and good rainfall will be needed in the coming months to secure average wheat yields.

Regional analysis

CropWatch has adopted four agro-ecological zones (AEZ) to provide a more detailed spatial analysis for the country. They include North Hungary, Central Hungary, the Puszta and Southern Transdanubia. Specific observations for the reporting period are included for each region.

Cultivated arable land (CALF) decreased in all sub-regions: 2% in North Hungary region, 2% in Southern Transdanubia, 4% and 1% in Central Hungary and Puszta sub-regions, respectively.

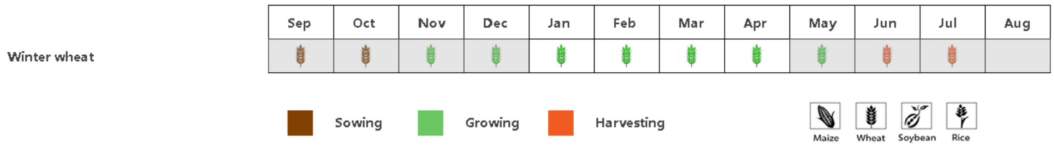
Central Hungary is one of the major agricultural regions in terms of crop production. A sizeable share of winter wheat, maize and sunflower is planted in this region. The NDVI was above average from January to late March and below average in April. Agro-climatic conditions were above average for temperature and radiation (TEMP +0.5%; RADPAR +14%), and rainfall was below average (RAIN, -34%). Compared to the 15YA, the biomass production potential was below average (BIOMSS, -7%) and VCIx reached 0.82. Crop production in this region is assessed as below average.

Northern Hungary is another important winter wheat region where 5 to 8% of the national winter wheat, and 1 to 4% of maize are grown. The NDVI was above average from January to late March and below average in April. The temperature (TEMP +0.6°C), and radiation (RADPAR +13%) were above average while the accumulated rainfall (RAIN -35%) was far below average, resulting in a biomass production potential decrease in this region (BIOMSS -7%). The VCIx was favorable at 0.81. Crop production in this region is expected to be below average.

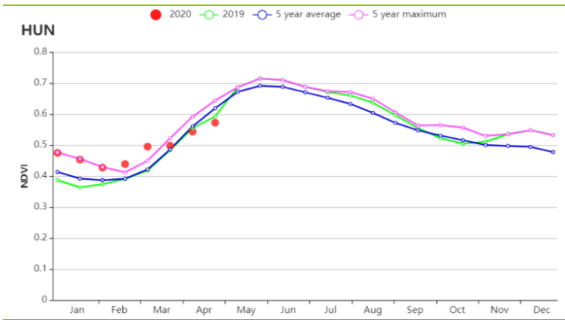
The Puszta region grows mostly winter wheat, maize and sunflower especially in the counties of Jaz-Nagykum-Szolnok and Bekes. According to the crop condition graph, NDVI was above average from January to late March and below average in April. The biomass potential decreased by 11% due to low rainfall (RAIN -28%). Radiation (RADPAR +11%) was significantly above average and temperature was close to average (TEMP +0.5°C). The maximum VCIx reached 0.86. Crop production in this region is expected to be below average.

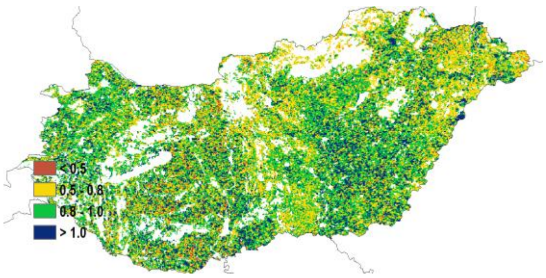
Southern Transdanubia cultivates winter wheat, maize and sunflower, mostly in Somogy and Tolna counties while smaller areas are planted in northern Transdanubia. According to the crop condition graph, NDVI was above average from January to late March and below average in April. The biomass potential decreased by 8% due to low rainfall (RAIN -39%), and radiation (RADPAR +11%) is above average, temperature was close to average (TEMP +1.0°C). The maximum VCIx value estimated was 0.85. Crop production in this region is expected to be below average.

Figure 3.18 Hungary's crop condition, January - April 2020

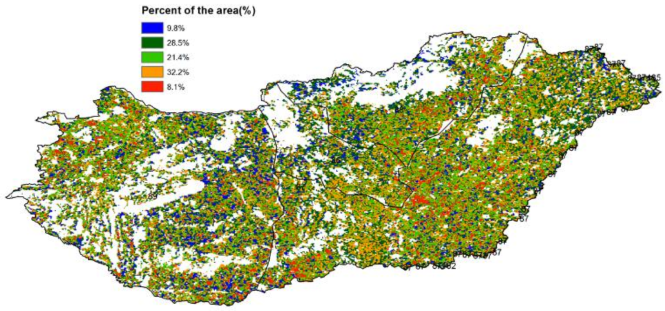


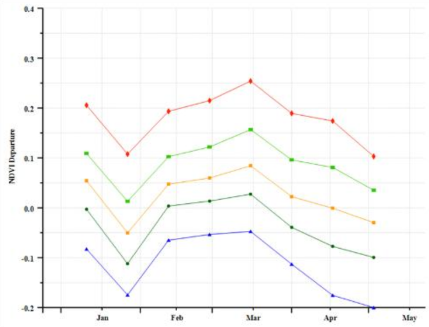
(a). Phenology of major crops



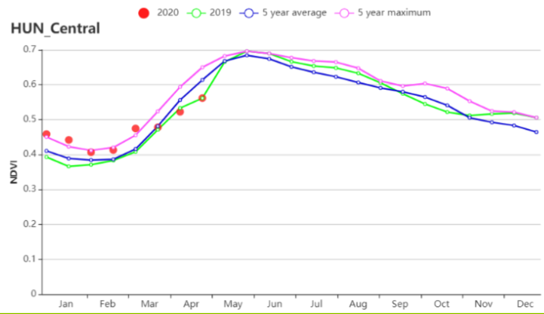


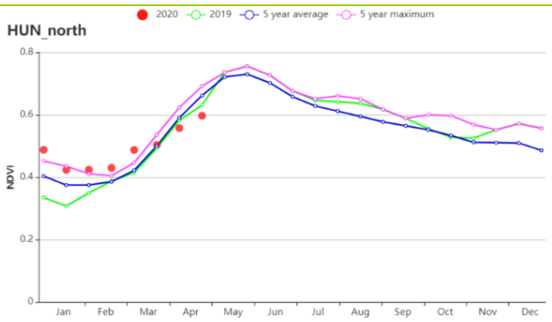
(b) Crop condition development graph based on NDVI (c)Maximum VCI



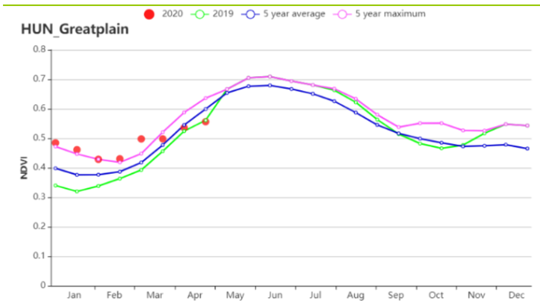


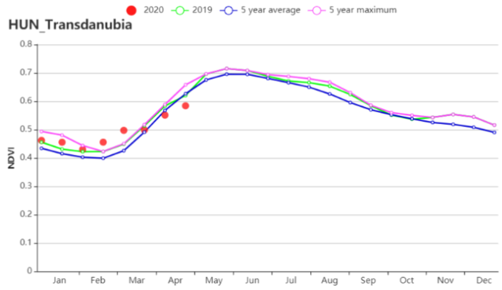
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles





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





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

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

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Central Hungary	147	-34	5.0	0.5	707	14	147	-7
North Hungary	148	-35	4.2	0.6	674	13	138	-7
The Puszta	180	-28	5.2	0.5	684	11	145	-11
Transdanubia	143	-39	5.5	1.0	717	11	151	-8

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Central Hungary	94	-4	0.82
North Hungary	97	-2	0.81
The Puszta	94	-1	0.86
Transdanubia	94	-2	0.85

[IDN] Indonesia

During January to April, the harvest of rainy season maize was completed in Java and Sumatra, while the main rice harvest started in March. According to the agroclimatic indicators, Indonesia experienced favorable weather conditions: radiation (RADPAR, +5%) and temperature (TEMP +0.4°C) were slightly above average, accompanied with average rainfall (RAIN, +1%), all of which led to a slightly increased biomass production potential (+ 4%). Nationwide, the crop conditions were below average according to the NDVI development graph as compared to the recent five-year average. Considering the favorable VCIx value of 0.96, the crop condition shown in the NDVI development graph may be somewhat underestimated. According to the NDVI profiles, crop condition in 48.7% of arable land distributed in the patches around Indonesia was slightly above average before March. However, it deteriorated to somewhat below average after that, which may result from the advance of harvest during this monitoring period. The crop condition for the rest of arable land was below average during the whole monitoring period, especially the area in 12.3% of total arable land (marked as blue) located in Sumatera Utara, Riau, Sumatera Selatan, and Bengkulu. However, BIOMSS production, CALF and VCIx were positive and we expect a slightly higher than average production.

Regional analysis

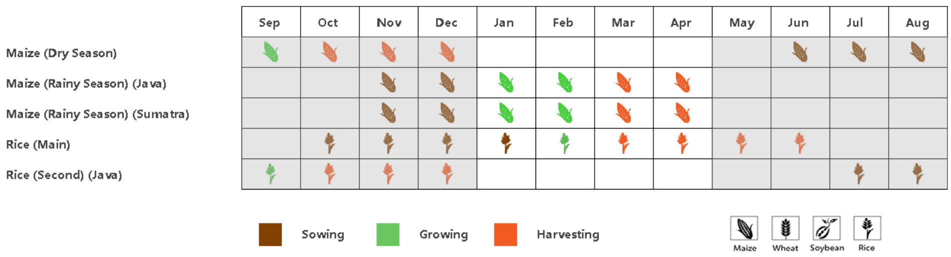
The analysis below focuses on four agro-ecological zones. The most relevant ones for crop cultivation are Sumatra (92), Java (90, the main agricultural region in the country), Kalimantan and Sulawesi (91). West Papua (93) is the least important one. The numbers correspond to the labels in the VCIx and NDVI profile maps.

According to the agroclimatic conditions of **Java**, rainfall (RAIN +2%), radiation (RADPAR +6%) and temperature (TEMP +0.5℃) were slightly above average, resulting in a rise of the biomass production potential (BIOMSS +6%). According to the NDVI development graph, crop condition was below the 5-year average before March and subsequently improved to average levels in April. However, considering the average CALF and favorable VCIx value of 0.94, crop production in Java is likely to be average or even slightly above average.

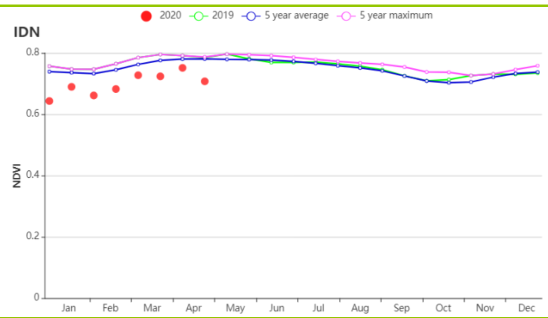
The agro-climatic conditions of **Kalimantan and Sulawesi** follow the same patterns as the country as a whole: accumulated rainfall (RAIN +3%), temperature (TEMP +0.4℃) and radiation (RADPAR +5%) were above average, leading to a 4% increase of the biomass production potential. According to the NDVI development graph, crop condition was slightly below the 5-year average. Considering the favorable VCIx value of 0.97, the crop condition shown in the NDVI development graph may be underestimated. The fraction of cropped arable land (CALF) was near average as compared to the 5YA. Altogether crop production is estimated as average.

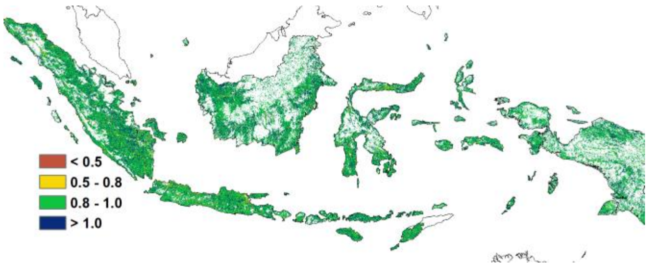
Temperature (TEMP +0.5°C) and radiation (RADPAR +5%) was slightly above average in **Sumatra**, while rainfall (RAIN, -3%) was just below average, leading to a small increase of the biomass production potential (BIOMSS +4%). As shown in the NDVI development graph, crop condition was below the 5-year average. Considering the favorable VCIx value of 0.96 and the average condition of CALF, crop condition and production may be close to or even slightly higher than average.

Figure 3.19 Indonesia's crop condition, January - April 2020

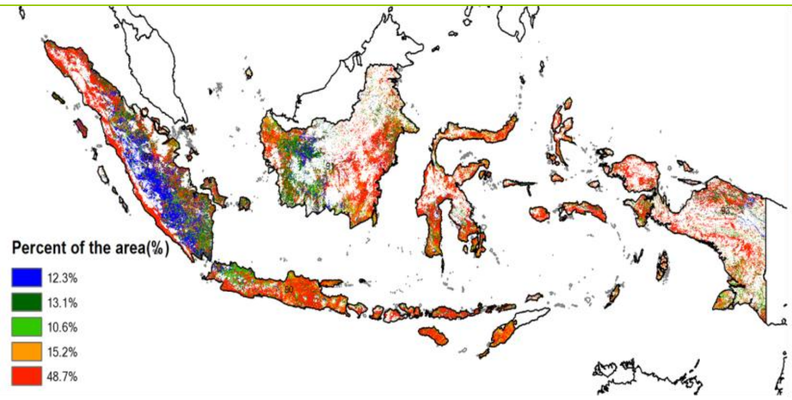


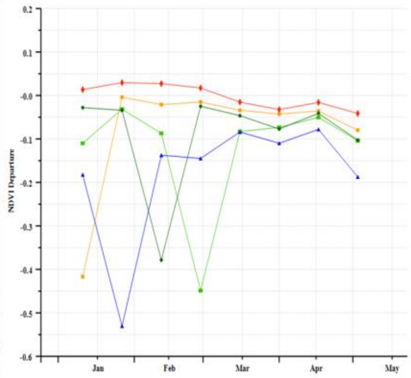
(a). Phenology of major crops



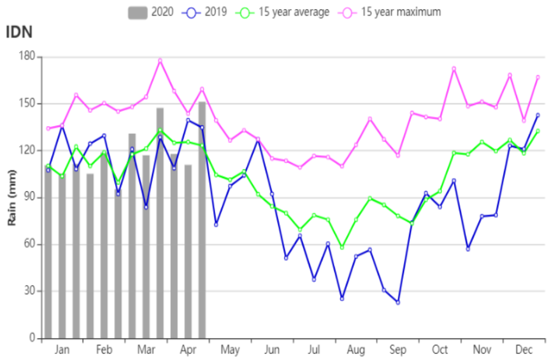


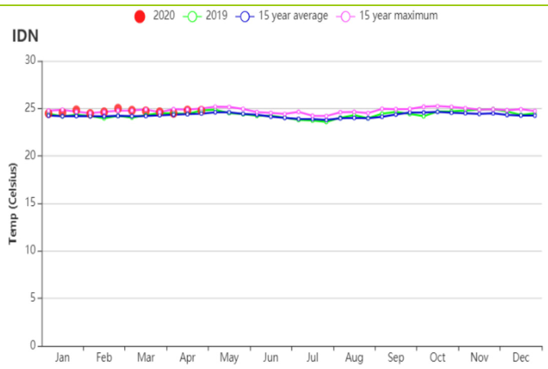
(b) Crop condition development graph based on NDVI (c) Maximum VCI



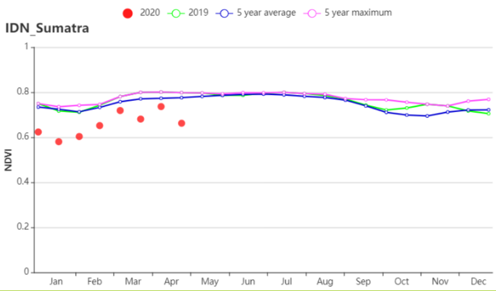


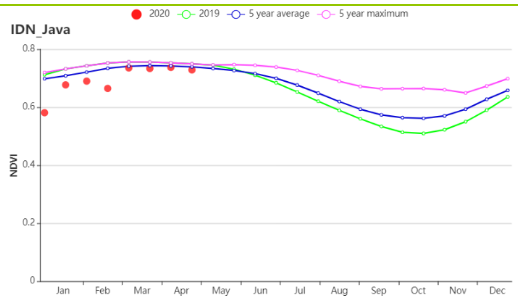
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



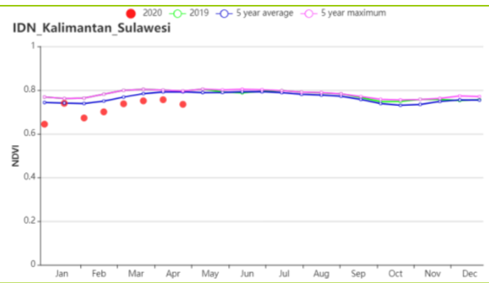


(f) Rainfall profiles (g) Temperature profiles





(h) Crop condition development graph based on NDVI (Sumatra (left) and Java (right))



(i) Crop condition development graph based on NDVI (Kalimantan and Sulawesi)

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

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Java	1353	2	25.5	0.5	1256	6	859	6
Kalimantan and Sulawesi	1360	3	24.9	0.4	1177	5	784	4
Sumatra	1289	-3	24.8	0.5	1162	5	774	4
West Papua	1704	0	23.9	0.5	1036	4	682	3

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Java	99	0	0.94
Kalimantan and Sulawesi	99	0	0.97
Sumatra	99	0	0.96
West Papua	100	0	0.97

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

[IND] India

This monitoring period covers most of the wheat and winter (Rabi) rice growing periods. Harvest for both crops was mostly completed by the end of April. Crop conditions were generally above average and even above the 5-year maximum during this reporting period, as indicated by the graph of NDVI development at the national level.

The CropWatch agroclimatic indicators show that nationwide TEMP and RADPAR were close to average (-0.8°C and -5%, respectively). India recorded abundant RAIN (+27%) after February, which exceeded the 15-year average for the same monitoring period, resulting in a BIOMSS increase by 29% compared with 15YA. Moreover, the overall VCIx was high, with a value of 1.11. As can be seen from the spatial distribution, only the southern, northeast and northwest recorded low values (less than 0.8). Most of India had high values in VCIx. These spatial patterns of VCIx were thus generally consistent with those of NDVI. Only 28.3% of the area recorded below-average crop conditions, in contrast, 71.7% of crop planted areas experienced continuously above-average crop conditions. CALF increased by 38% compared to 5YA. Crop production for this season is estimated to be above average.

Regional analysis

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

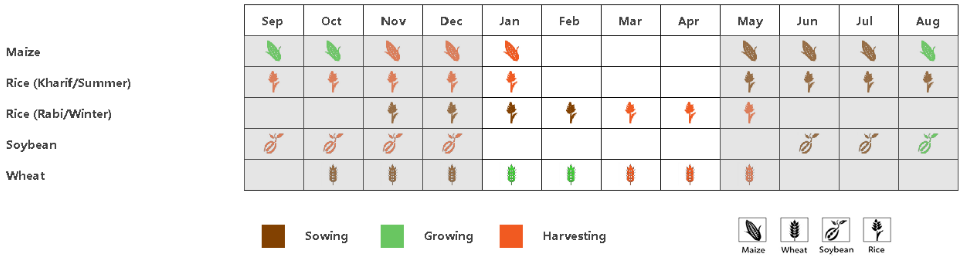
The four agro-ecological zones of the Deccan Plateau, the Gangetic plain, Agriculture areas in Rajasthan and Gujarat, and the North-western dry region have similar trends in agricultural indices. Compared to the same period of previous years, RAIN had increased significantly, especially in the Gangetic plain and the North-western dry region (more than +150%). Although TEMP and RADPAR were lower, abundant rainfall compensated for their effects and caused BIOMSS to be much higher than the 15-year average. At the same time, CALF also increased, and in the North-western dry region CALF increased by 82%. The highest increases had been observed for the Deccan Plateau and agricultural areas in Rajasthan and Gujarat (more than +50%) as well. The VCIx was high (1.07). The graph of NDVI development shows that the crop growth of these four agro-ecological regions during this monitoring period exceeded the 5-year maximum in most months. Generally, the crop production is expected to be above average.

The Eastern coastal region and the Western coastal region recorded similar trends of agricultural indices in this monitoring period. Compared to the same period of previous years, RAIN had decreased significantly, especially for the Western coastal region (-40%). Although TEMP was slightly different with -0.4°C in the Eastern coastal region and about average (+0.1°C) in the Western coastal region, and RADPAR were lower, the BIOMSS still increased. Both regions recorded high increases of CALF, especially in the Western coastal region (+65%). VCIx was higher than 1.05. The graph of NDVI development shows that the crop growth for the two regions exceeded the 5-year maximum. The crop production is expected to be above average.

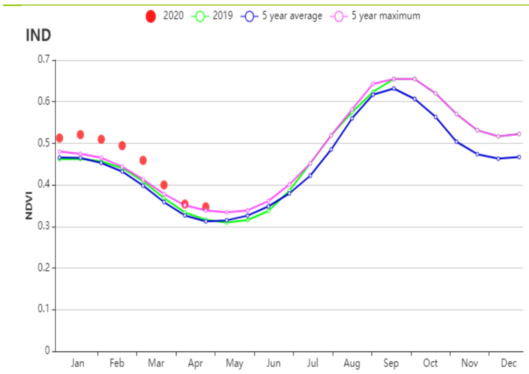
The Assam and Northeastern region recorded 358 mm of RAIN (+12%), with lower average TEMP at 17.4°C (-0.9°C) and RADPAR of 1052.5 MJ/m² (-4%). BIOMSS was lower than the average (-4%). Increased rainfall was not enough to compensate for reduced temperature and sunshine. CALF reached 93% which was above average (+2%), and VCIx was 0.89. The outlook of crop production in this region is average.

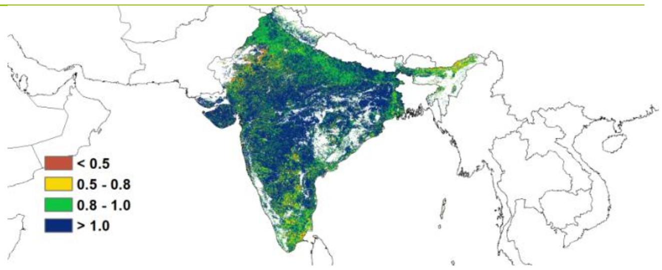
The Western Himalayan region recorded 467 mm of RAIN (+35% higher the average), with much lower average TEMP at 7.8°C (-2.0°C) and RADPAR of 995 MJ/m² (-5%). The BIOMSS was higher than the average (+12%) due to the sufficient rainfall. CALF reached 86% and VCIx was 0.93. Crop condition as assessed by NDVI was above the 5-year average after February and even exceeded the 5-year maximum in March. Therefore, the crop production is favorable.

Figure 3.20 India' crop condition, January - April 2020

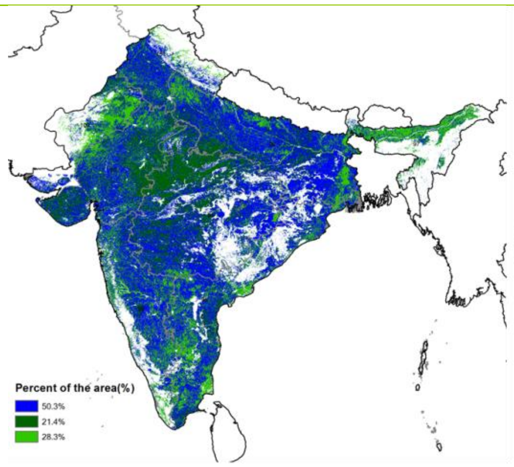


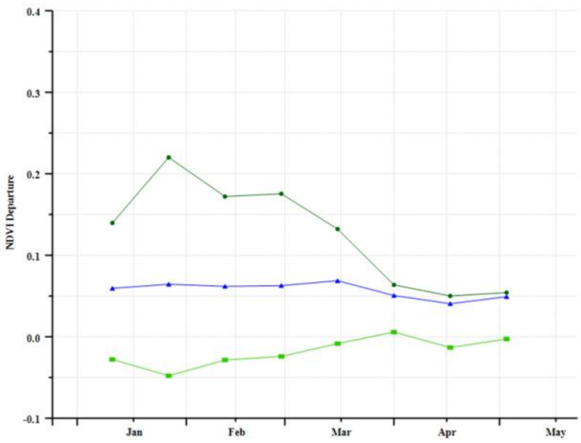
(a). Phenology of major crops



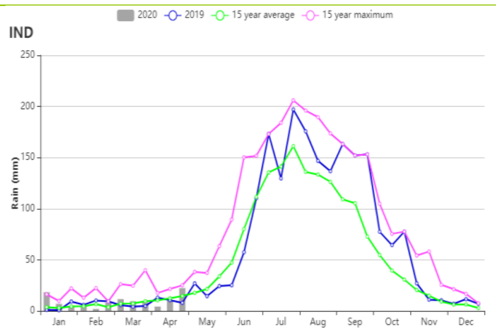


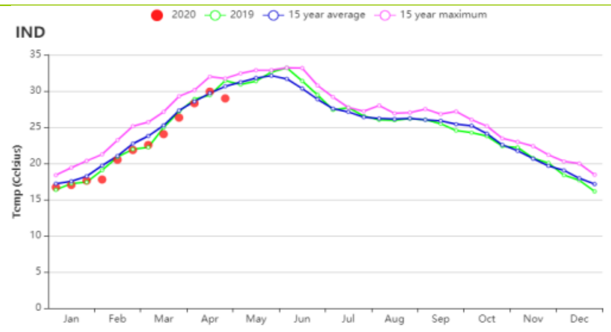
(b) Crop condition development graph based on NDVI (c) Maximum VCI



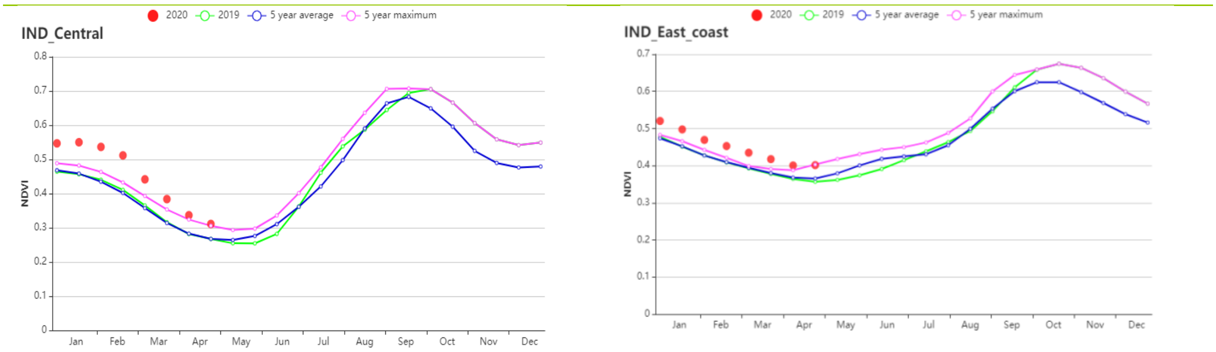


(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles

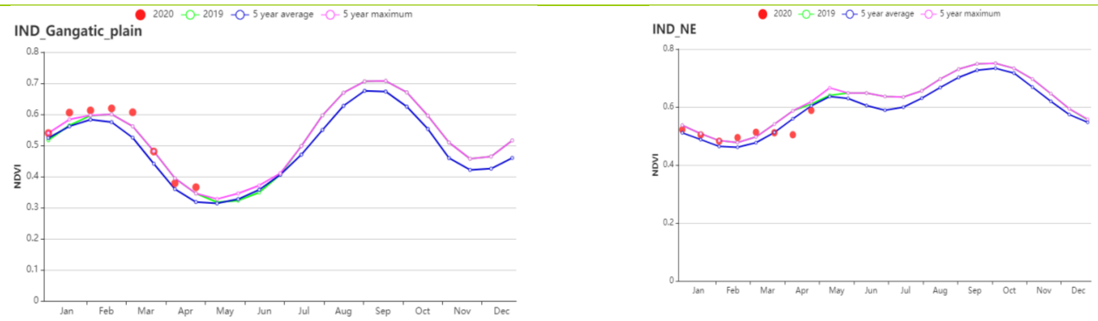




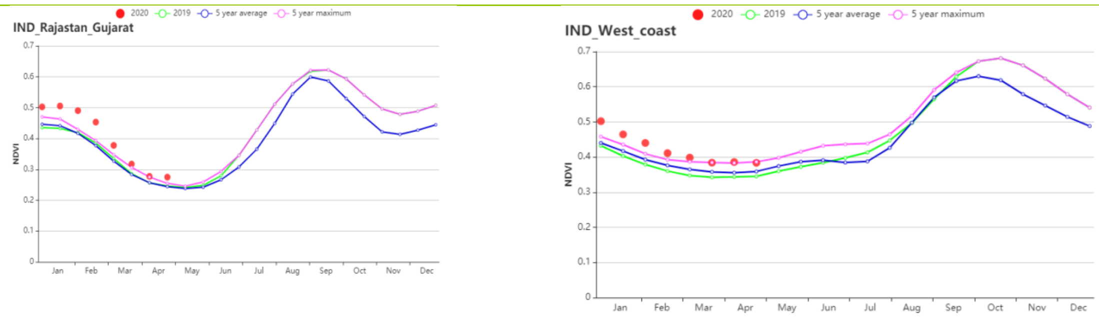
(f) Rainfall profiles (g) Temperature profiles



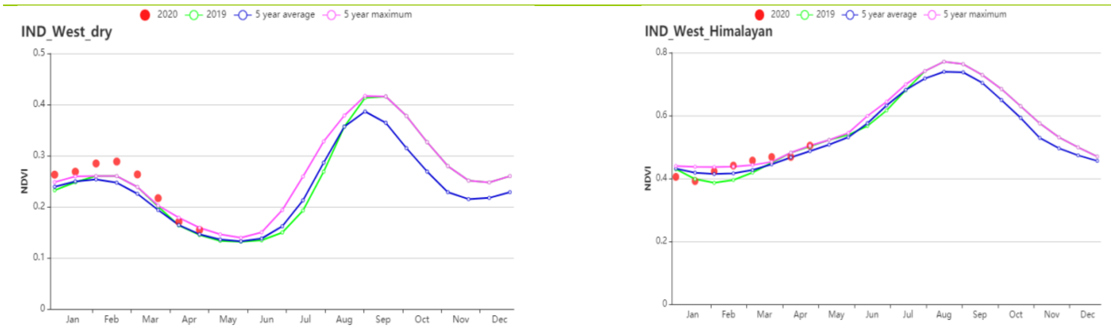
(h) Crop condition development graph based on NDVI (Deccan Plateau (left) and Eastern Coastal Region (right))



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



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



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

Table 3.31 India's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 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	39	47	24.3	-0.7	1189	-6	478	45
Eastern coastal region	74	-15	25.5	-0.4	1240	-4	561	20
Gangatic plain	141	155	20.5	-1.7	1105	-6	502	30
Assam and north-eastern regions	359	12	17.4	-0.9	1052	-4	440	-4
Agriculture areas in Rajastan and Gujarat	16	55	23.9	-0.7	1228	-3	328	50
Western coastal region	50	-41	26.2	0.1	1309	-3	473	21
North-western dry region	35	166	22.6	-0.7	1184	-4	399	65
Western Himalayan region	467	35	7.8	-2.0	995	-5	256	12

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Deccan Plateau	93	62	1.20
Eastern coastal region	88	35	1.05
Gangatic plain	97	15	1.07
Assam and north-eastern regions	93	2	0.89
Agriculture areas in Rajastan and Gujarat	77	57	1.14
Western coastal region	77	65	1.15
North-western dry region	23	82	1.06
Western Himalayan region	86	0	0.93

[IRN] Iran

The crop conditions improved from below average in January and February to average in March and above average in April. Above average rainfall in late March and April combined with temperatures that were slightly below average produced favorable conditions for crop growth. This monitoring period covers the vegetative and early reproductive phases of winter wheat. Rice planting started in April. Accumulated rainfall was significantly above average, (RAIN +47%) while temperature (TEMP -0.5°C) and radiation (RADPAR -5%) were below average over the last four months. The BIOMSS index was average. The national average of maximum VCI index was 0.87, and the Cropped Arable Land Fraction (CALF) increased by 38% as compared to the recent five-year average.

According to the national NDVI development graphs, crop conditions were above average throughout the monitoring period on about 25.9% of the cropland, mainly in the provinces of Khuzestan, Fars, North Khorasan, and Razavi Khorasan in the west and north-eastern regions. 23.6% of the cropland showed close-to-average crop conditions. On 32.2% of the cropland, conditions were below average from January to February, and recovered to above average between mid-March and late April. The remaining croplands experienced below-average crop conditions throughout the monitoring period. Affected regions were mainly located in the north-west and north. They included the provinces of West Azarbaijan, East Azarbaijan, Ardebil, Gilan, and Mazandaran.

Overall, the conditions for the winter crops are favorable.

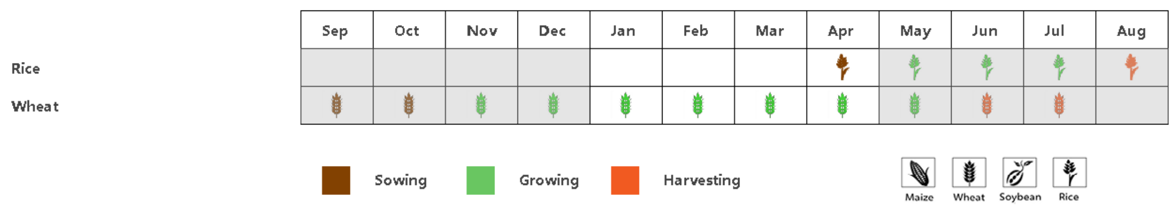
Regional analysis

Based on cropping systems, climatic zones, and topographic conditions, three sub-national agro-ecological regions can be distinguished for Iran, among which two are relevant for crop cultivation. The two regions are referred to as **the Semi-arid to sub-tropical hills of the west and north** (104), and **the Arid Red Sea coastal low hills and plains** (103).

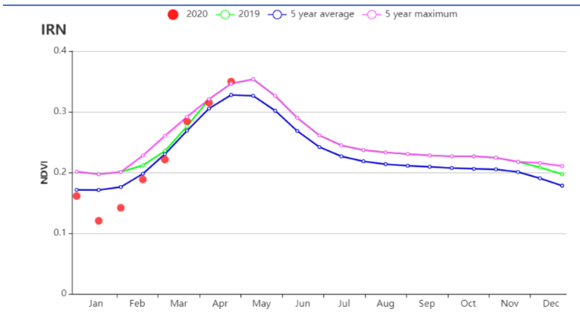
In **the Semi-arid to sub-tropical hills of the west and north** region, NDVI profiles show a similar change of patterns to that of the whole country. The accumulated rainfall was 351 mm (47% above average), while temperature (TEMP, -0.5°C) and radiation (RADPAR, -6%) were below average. The influence of radiation and temperature exceeded that of rainfall, which resulted in a decrease of BIOMSS by 5%. CALF rose 35%. The average VCIx (0.88) indicates promising crop conditions. The outcome for winter crops of this region is estimated to be favorable.

Crop conditions in **the Arid Red Sea coastal low hills and plains** region were overall above the five-year average during this monitoring season. This region received slightly less sunshine (RADPAR, -3%), but rainfall was higher (RAIN, +32%) and totalled 205 mm during this monitoring period. The temperatures (TEMP, -0.5°C) were slightly below average. BIOMSS increased by 23%. The CALF increased by 41% compared to the five-year average, and the national VCIx (0.90) was quite high, indicating the highly favorable outlook for winter crops in this region.

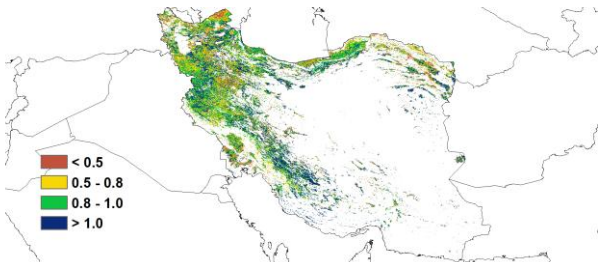
Figure 3.21 Iran's crop condition, January - April 2020



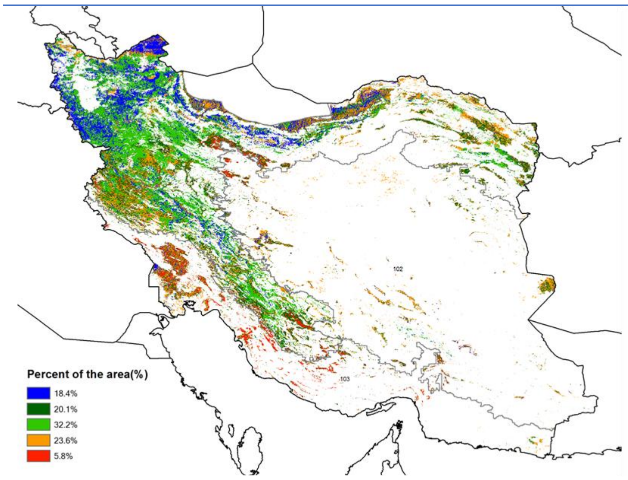
(a) Phenology of major crops



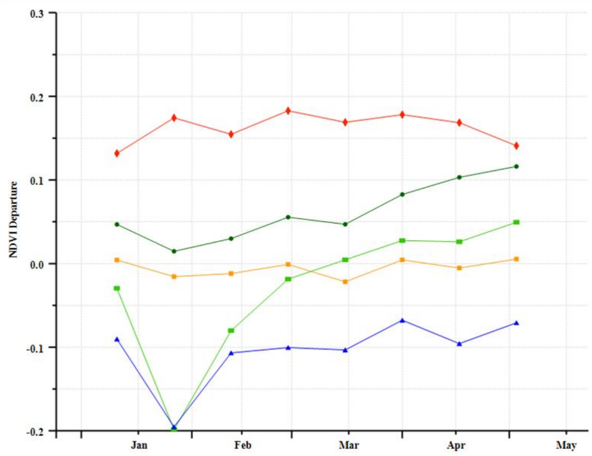
(b) Crop condition development graph based on NDVI



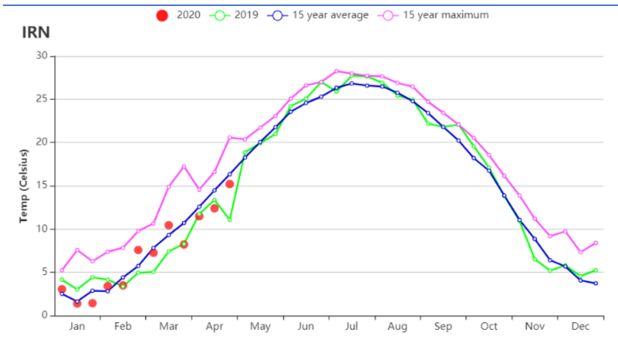
(c) Maximum VCI



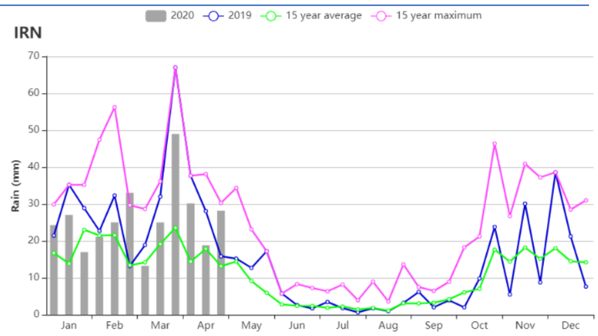
(d) Spatial NDVI patterns compared to 5YA



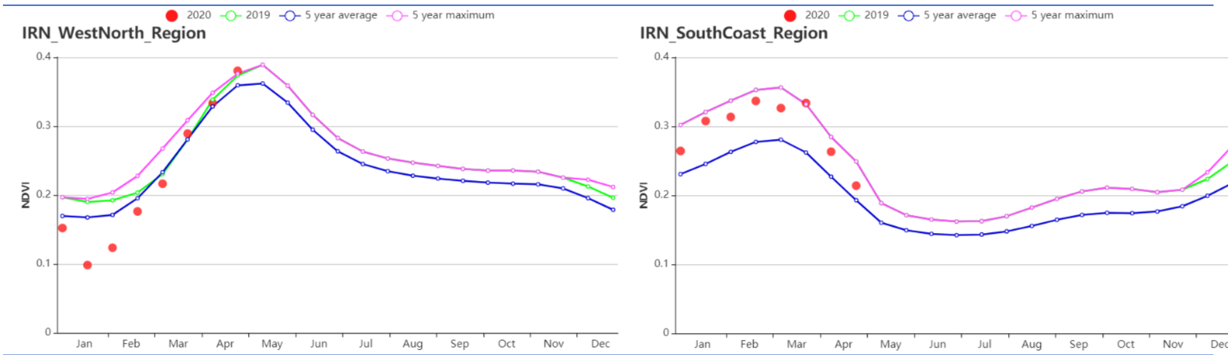
(e) NDVI profiles



(f) Time series temperature profile



(g) Time series rainfall profile



(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))

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

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Semi-arid to sub-tropical hills of the west and north	351	47	5.3	-0.5	911	-6	235	-5
Arid Red Sea coastal low hills and plains	205	32	16.8	-0.5	1035	-3	443	23

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Semi-arid to sub-tropical hills of the west and north	35	32	0.88
Arid Red Sea coastal low hills and plains	41	83	0.90

[ITA] Italy

This reporting period covers the main growing season of winter wheat, sown between October and December.

Generally, according to the NDVI development graph, crop conditions were close to the average of the past five years from January to late March, but below average in April. The agro-climatic indicators of RADPAR and TEMP were above average: RADPAR +8%, and TEMP +0.6°C, while RAIN was below average by 43%, which led to a 5% decrease in BIOMSS compared with the 15-year average, and VCIx was 0.84. Some spatial and temporal detail is provided by the NDVI clusters: NDVI was above average throughout the monitoring period on 19.2% of arable land, and below average on 15.8%, mainly in Northern Italy. The VCIx ranged between 0.5-0.8. In Eastern Italy (about 17.5% of arable land) NDVI was below average from January to mid-April and above average in late April. The VCIx was between 0.8 to 1.0. About 18.1% of arable land was above average from January to February and below average from March to April mainly in Western and Southern Italy. A majority of about 29.3% arable land in Northern and Central Italy was below average in January and April, but then above average in February and March. The overall crop conditions in the country are below but close to average.

Regional analysis

Based on cropping systems, climatic zones, and topographic conditions, four sub-national regions can be distinguished for Italy: Eastern Italy, Po Valley, Islands and Western Italy. The index of cultivated arable land (CALF) in all sub-regions was the same as the 5-year average.

Eastern Italy experienced below-average rainfall (RAIN -39%) and above-average RADPAR (+11%) and TEMP (+0.3°C). As a consequence, BIOMSS decreased by 9% compared with the averages (15YA). VCIx was 0.88. The crop condition development graph indicates that NDVI reached the average of 5 years in early March and late April, but was below the 5-year average for the rest of the monitoring period. Below average production is expected.

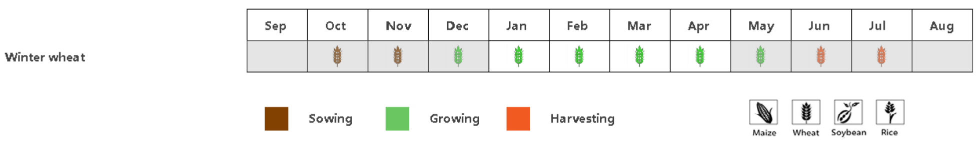
Crop production in **Po Valley** was affected by low rainfall, with RAIN down by 44% compared to average, above average TEMP (+1.0°C) and RADPAR(+10%). BIOMSS was below the 15YA by 7% and VCIx reached 0.79. The crop condition development graph indicates that the crop conditions were above average from January to early March, and below average from mid-March to April. According to the agro-climatic indicators, below average output is expected.

The **Islands** recorded below-average precipitation (RAIN -47%) and TEMP (+0.3°C) and RADPAR (+2%) were above average. BIOMSS decreased by 3% compared with the average (15YA). VCIx was 0.89. NDVI was close to average throughout the monitoring period. The crop production in this region is expected to be below but close to average.

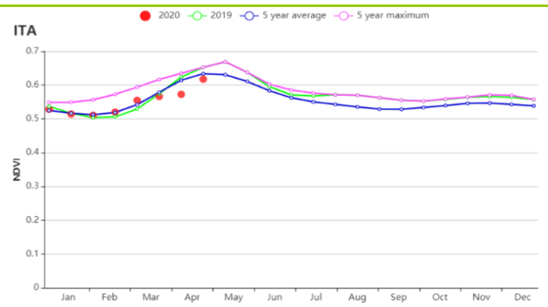
In **Western Italy**, RAIN was 42% below average (RAIN -42%). RADPAR(+10%) and TEMP(+0.3°C) were above average, which resulted in a biomass production potential decrease in this region (BIOMSS -5%). The NDVI reached an average level from January to mid-March, and was below average from late March to April. VCIx reached 0.86. CropWatch expects a below-average production.

Overall, prospects for winter wheat are slightly below normal.

Figure 3.22 Italy's crop condition, January - April 2020

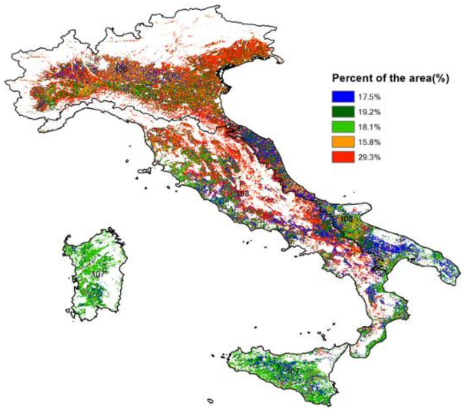


(a). Phenology of major crops

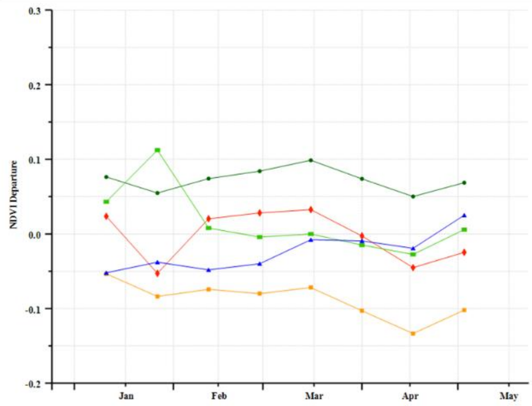


(b) Crop condition development graph based on NDVI

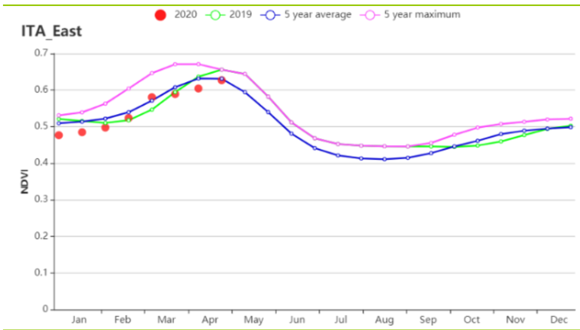
(c) Maximum VCI

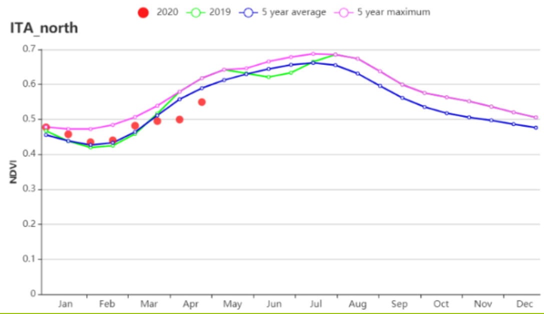


(d) Spatial NDVI patterns compared to 5YA

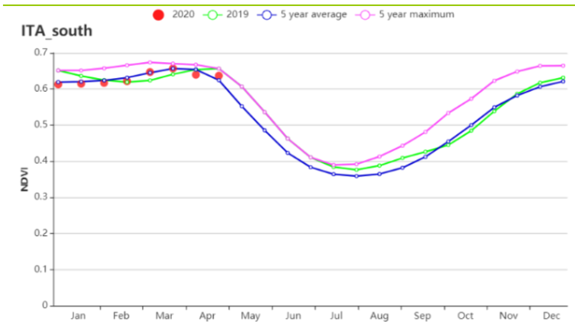


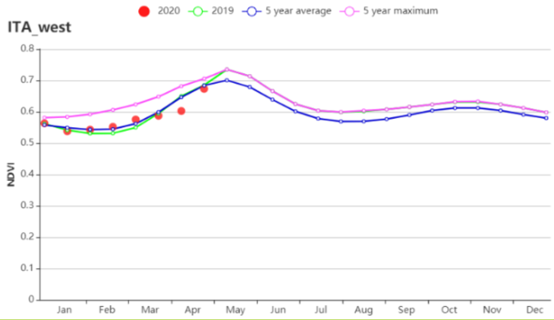
(e) NDVI profiles





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





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

Table 3.35 Italy's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 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	219	-39	7.8	0.3	819	11	216	-9
Po Valley	233	-44	5.1	1.0	733	10	150	-7
Islands	153	-47	10.1	0.3	797	2	261	-3

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Western Italy	243	-42	7.6	0.3	797	10	201	-5

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
East Coast	99	0	0.88
Po Valley	90	0	0.79
Islands	100	0	0.89
Western Italy	100	0	0.86

[KAZ] Kazakhstan

In Kazakhstan, spring wheat sowing will start in May only, and therefore is not covered in this monitoring period. Winter rye and winter wheat make up a small fraction of total cereal production. They are mainly grown in the southern areas of the country. Compared to the fifteen-year average, accumulated rainfall and temperature both went up (RAIN +27%, TEMP +3.9°C), while radiation went down (RADPAR -6%). Precipitation was close to the fifteen-year maximum in late January to early February and in April. The temperature was also close to the fifteen-year maximum in January and February. Favorable agro-climatic conditions resulted in an increase in the BIOMSS index by 10% above average. The abundant precipitation during the two monitoring seasons from October 2019 to April 2020 will largely improve the soil moisture and benefit the planting of spring crops in May.

Overall, the agro-climate conditions were favorable during this monitoring period.

Regional analysis

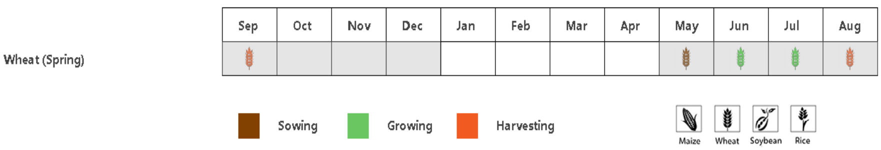
Based on cropping systems, climatic zones and topographic conditions, four sub-national agro-ecological regions can be distinguished for Kazakhstan, among which three are relevant for crop cultivation: the Northern region (112), the Eastern plateau and southeastern region (111) and the South region (110).

The **Northern region** is the main spring wheat production area. Accumulated rainfall (RAIN +41%) and temperature (TEMP +4.8°C) were above average, but RADPAR was below average (-9%). The agro-climatic indicators resulted in an increase of the BIOMSS index by 9% above average. The abundant precipitation will be favorable for the forthcoming planting of the spring crops.

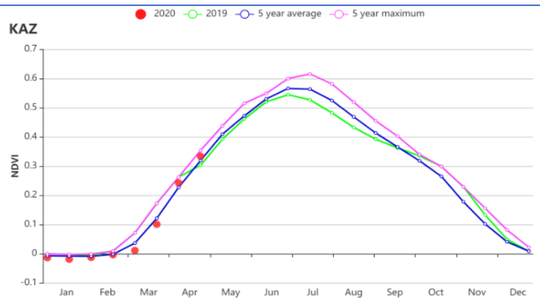
The accumulated rainfall and temperature in the **Eastern plateau and Southeastern region** were above average (12% and 2.2°C, respectively), while RADPAR was close to average. The warmer and rainy weather resulted in an increase of BIOMSS by 10%.

The **South region** received 164 mm of rainfall, which was less than the other two regions. The accumulated rainfall and radiation were close to the fifteen-year average. TEMP was above average (1.5°C). The BIOMSS departure (up 13%) was the highest among the three regions. The agro-climate conditions in this region were favorable for the winter crops during the reporting period.

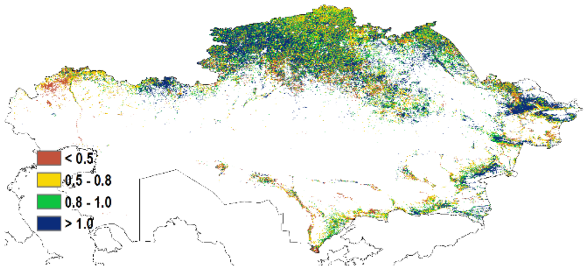
Figure 3.23 Kazakhstan's crop condition, January - April 2020



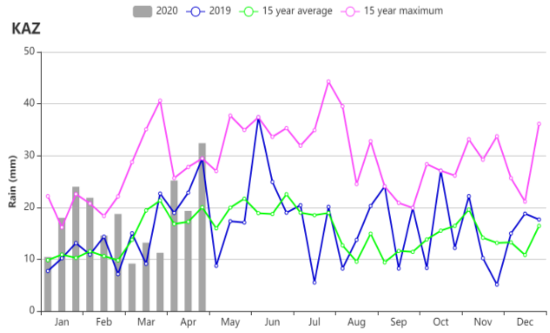
(a). Phenology of major crops



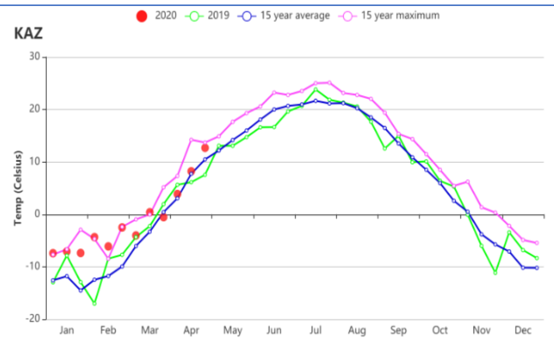
(b) Crop condition development graph based on NDVI



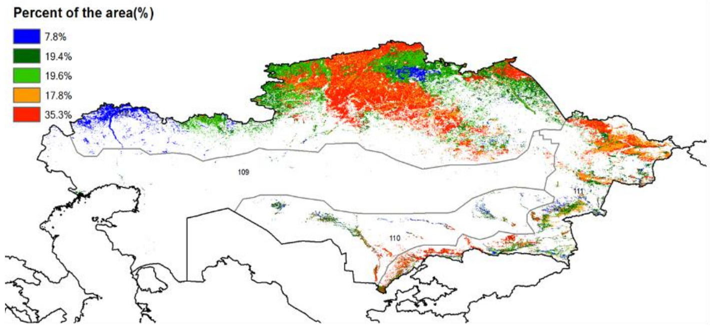
(c) Maximum VCI



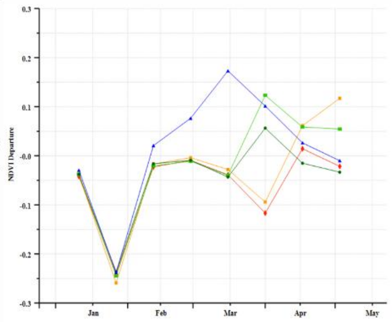
(d) Rainfall Index



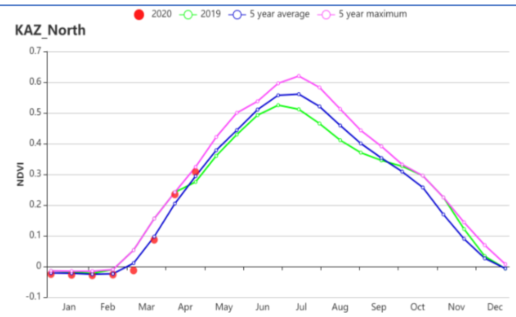
(e) Temperature Index



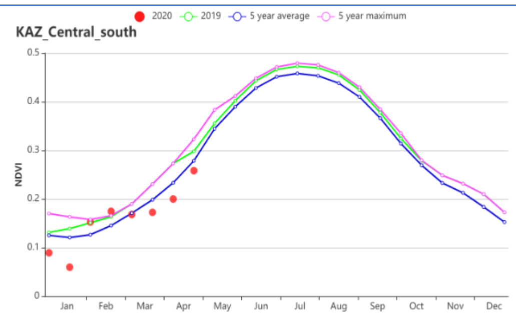
(f) Spatial NDVI patterns compared to 5YA



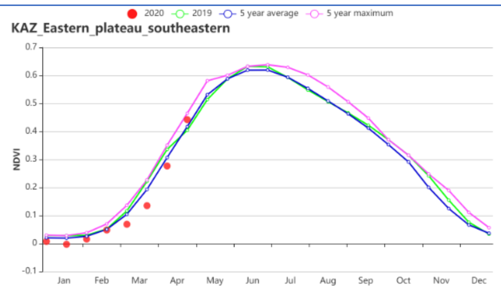
(g) NDVI profiles



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



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



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

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

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Northern region	210	41	-1.7	4.8	537	-9	98	9
Eastern plateau and southeastern region	257	12	-1.0	2.2	754	-1	143	10
South region	164	1	4.2	1.5	762	0	199	13

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Northern region	7	41	0.95
Eastern plateau and southeastern region	44	7	0.93
South region	5	-43	0.74

[KEN] Kenya

Kenya experiences two rainy seasons: the “short rains" and the "long rains." Wheat and maize are two important crops grown during the long rain reason. Wheat planting takes place from May to June, whereas long rain maize is planted from March to April and harvested in October and November. Harvest for short rain maize, which is sown in October to November, falls into this reporting period.

Nationwide, rainfall (RAIN +120%) and CALF (+6%) were above average during this monitoring period. Both the short and long rain maize crops stand to benefit from the abundant rainfall. Favorable conditions for the coming wheat crop are expected for Laikipia, Nakuru, and Trans-Nzioia. The temperature (-0.8°C) and RADPAR (-6%) were below average. Total biomass production (BIOMSS) was estimated to be 2% below the five-year average. The nationwide graph of NDVI development stayed above average until the end of the reporting period. According to NDVI clusters and the map of NDVI profiles, 93.2% of the country experienced favorable crop conditions. However, for the region around Nairobi, the pattern showed a sudden drop at the end of April. It is possible that the satellite images were affected by cloud cover, which may have caused this anomaly. The maximum VCIx reached 1.04. All the CropWatch indicators and NDVI profile show good moisture availability for land preparation for the long rain wheat and maize crops, and good growing condition for the short rain maize. Based on all indicators, the crop conditions are generally assessed as favorable.

Regional analysis

Considering the cropping system, climatic zones, and topographic conditions we divided this country into four agro-ecological regions: The Eastern Coastal area, the Highland agriculture zone, the Northern region with sparse vegetation, and Southwest Kenya.

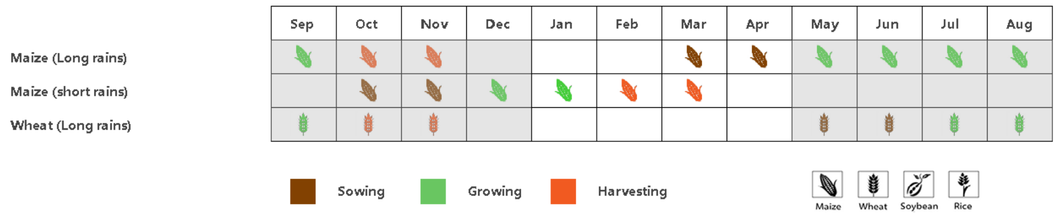
The Coast area includes the districts of Kwale, Kilifi, and Malindi. Except for the temperature, all CropWatch indicators were above average. The total rainfall was 661 mm, up by 92% as compared to the average, while TEMP was below average (-0.2°C). This resulted in an increase of total biomass production (BIOMSS) by 7% as compared to the 5 YA. RADPAR was above average by 3%. The NDVI profile was also above the five-year average. Throughout the monitoring period, CALF was increased by 10% with a maximum VCIx of 1.15. Overall, in the coastal area, the conditions were favorable for livestock production.

In the Highland agriculture region, the NDVI profile was above average during the entire reporting period. Rainfall was recorded at 957 mm, 124% above the 15 YA. Both the temperature (TEMP, -0.7°C) and RADPAR (-8%) were below average. As a result, the total biomass production decreased by -6%. However, CALF was increased by 6% as compared to the 15 YA. The maximum VCIx value was recorded at 1.04. In general, the crop conditions were favorable.

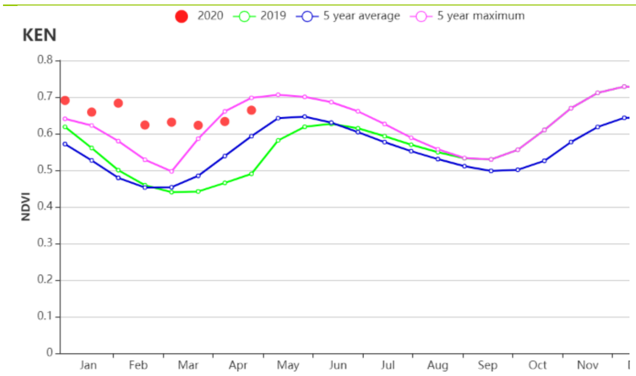
The Northern rangeland area includes Turkana, Samburu, West Pokot, and Baringo. During the reporting period, a high amount of rainfall of 680 mm was recorded, (+130%) above the 15YA average. The agroclimatic indicators temperature (TEMP, -0.5°C) and RADPAR (-4%) were below average. The combination of the three factors led to an increase in total biomass production by 12%, which is favorable for livestock production, as this area is dominated by pastoral land. The NDVI based crop condition development was also above the five-year average. The maximum VCI was 1.08 and CALF at 97%. Overall, the conditions were favorable for livestock production.

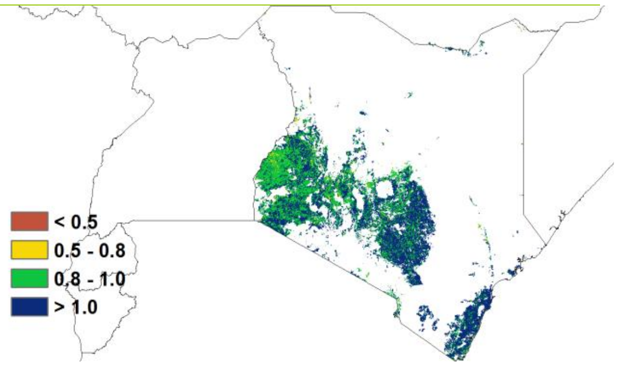
The Southwest of Kenya region contains the districts of Narok, Kajiado, Kisumu, Nakuru, and Embu, which are major producers of long rain wheat and maize. This region received high rainfall (1154 mm) with a high positive departure of 124% above average. Except for rainfall, all the CropWatch agroclimatic parameters were below average. The average temperature was cooler than average (-2.0°C) and RADPAR was also below average (-5%). This resulted in a reduction of total biomass production (BIOMSS, -8%). CALF remained constant. The NDVI −based crop condition development was above the five-year average during the reporting period. A maximum VCI value of 0.98 was recorded. In general, based on the above indicators and fluctuations of the NDVI profile over time, the crop conditions were favorable for the southwest of Kenya.

Figure 3.24 Kenya's crop condition, January - April 2020.

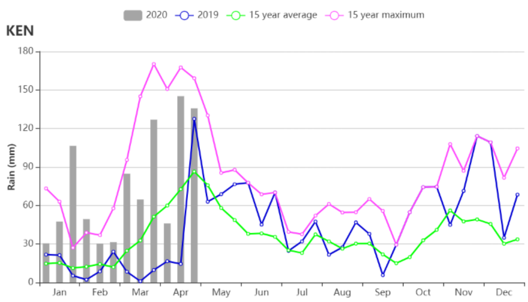


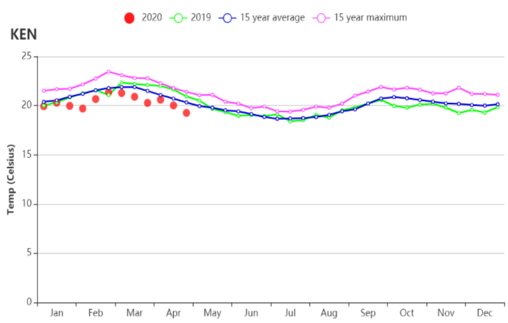
(a). Phenology of major crops



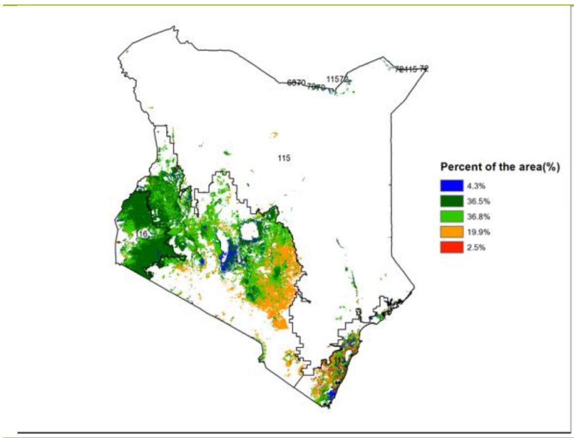


(b) Crop condition development graph based on NDVI (c) Maximum VCI

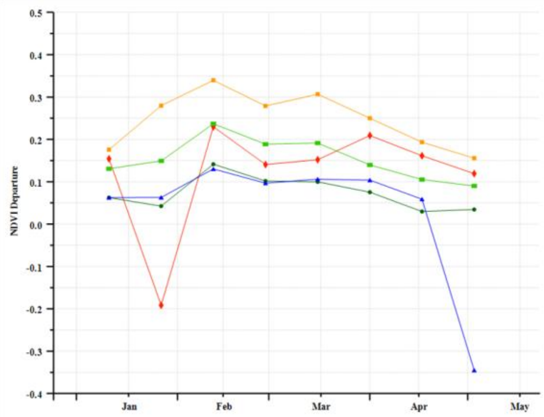




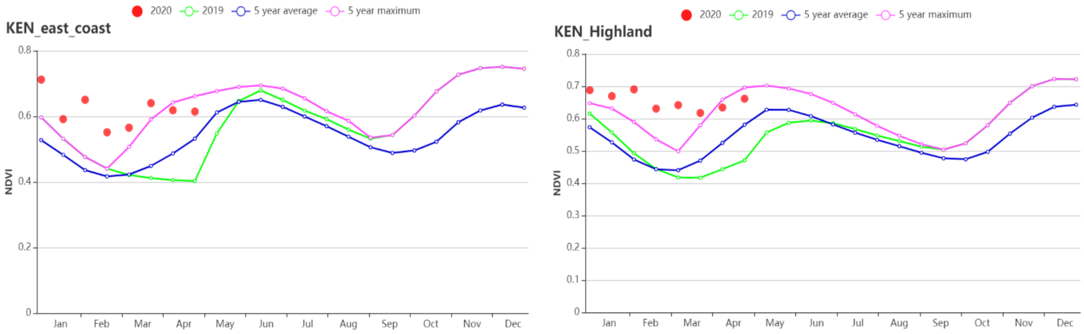
(d) Rainfall index (e) Temprature index



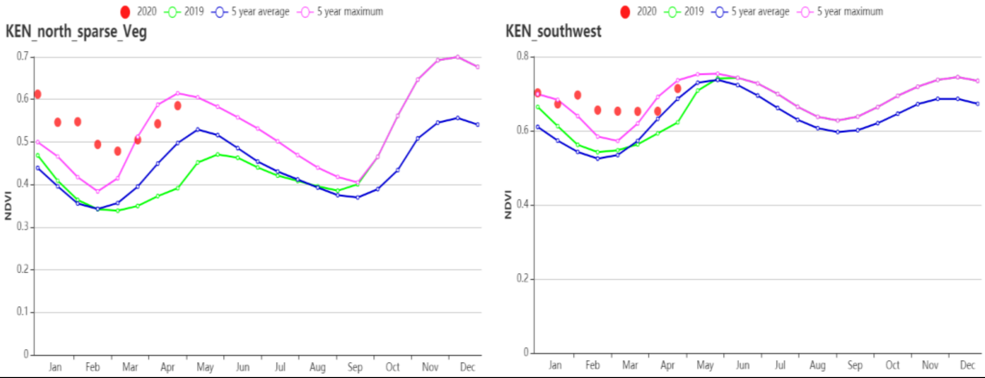
(f) Spatial NDVI patterns compared to 5YA



(g) NDVI profiles



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



(i) Crop condition development graph based on NDVI (Northern range-lands (left) and South-west (right))

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

Region	RAIN		TEMP		RADPAR		BIOMASS	
	Current (mm)	Departure (%)	Current(°C)	Departure (°C)	current (MJ/m2)	Departure (%)	Current (gDM/m2)	Departure (%)
Coast	661	92	26.6	-0.2	1388	3	945	7
Highland Agriculture	957	124	19.0	-0.7	1218	-8	603	-6
Northern rangelands	680	130	23.5	-0.5	1298	-4	780	12
South-west	1151	124	19.0	-2.0	1255	-5	625	-8

Table 3.40 Kenya's agronomic indicators by sub-national regions, current season's values and departure from 5YA/15YA, January – April 2020

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current
Coast	100	10	1.15
Highland agriculture zone	100	6	1.04
Northern rangelands	97	32	1.06
South-west	100	0	0.98

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

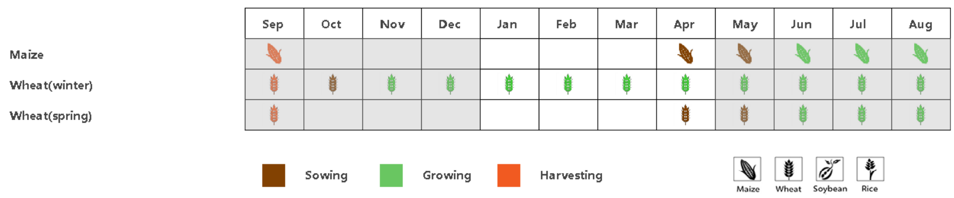
[KGZ] Kyrgyzstan

The country currently cultivates limited amounts of wheat, and spring crops will be planted starting in April in the southern part. In May, planting will start in the Naryn Region. The national average VCIx was at 0.80. The cropped arable land fraction increased by 6%. Among the CropWatch agro-climatic indicators, RAIN (+4%) and TEMP (+1.0 °C) were slightly above average, while RADPAR was near average (+1%). The combination of the factors resulted in average BIOMSS (-1%) compared to the fifteen-year average. As shown by the NDVI development graph, the winter vegetation conditions were close to average. The spatial NDVI clustering profile shows that in the northern region, the large area marked with red and yellow colour experienced a decrease in January to March, and an increase in April. In the eastern region, the area marked with green and blue showed average or above average conditions.

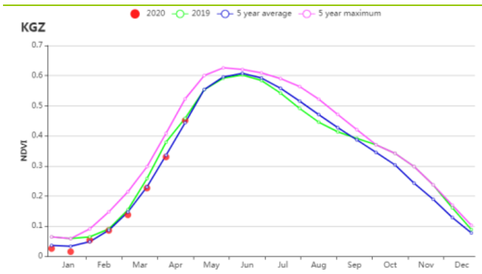
The situation is largely confirmed by the VCIx map which shows high values (>0.8) in the Chuy, Issyk-Kul, and Osh regions, while low values were observed in the Talas Region and the central part of Naryn Region. The nationwide VCIx average was 0.79, which confirms the favorable condition assessed based on NDVI profiles.

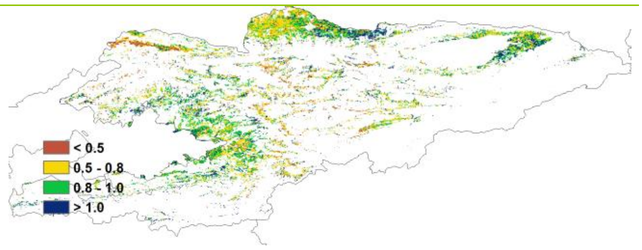
Agro-climatic and agronomic conditions were mixed with CALF at 56%, satisfactory VCIx and BIOMSS. Overall, the crop conditions in Kyrgyzstan are assessed as average.

Figure 3.25 Kyrgyzstan's crop condition, January - April 2020.

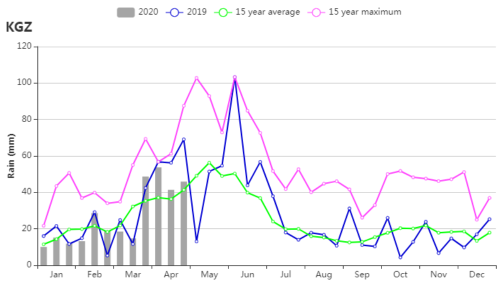


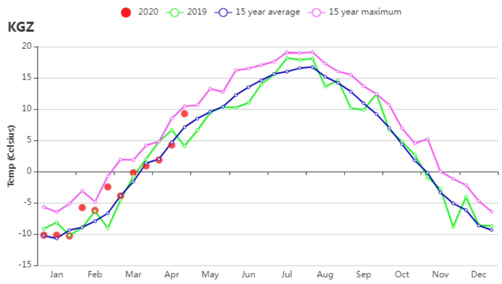
(a). Phenology of major crops



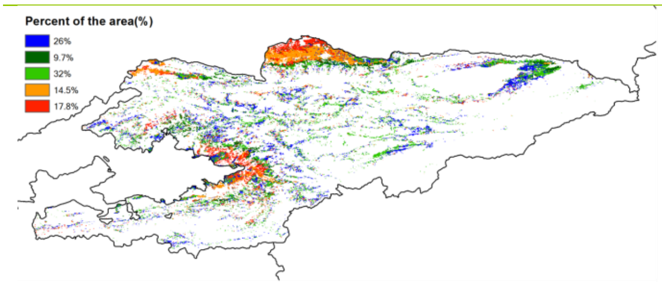


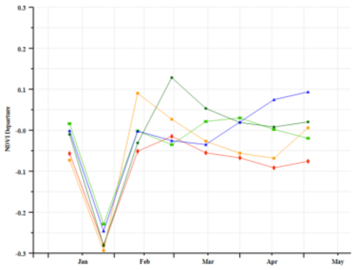
(b) Crop condition development graph based on NDVI (c) Maximum VCI





(d) Rainfall index (e) Temprature index





(f) Spatial NDVI patterns compared to 5YA

(g) NDVI profiles

[KHM] Cambodia

The period from January to April covers the late harvesting of wet season rice, the harvesting of medium, late and floating rice, the late sowing, growing and harvesting of dry season rice, the growing and harvesting of dry season maize and the early growing period of soybean in Cambodia. Dry season rice relies on irrigation and contributes about 20% to total production. Compared to average, Cambodia suffered from a sharp drop in rainfall (RAIN, -46%) but experienced higher temperatures (TEMP +0.8℃) and a slight increase in radiation (RADPAR +5%), which resulted in a 4% decrease in potential biomass production (BIOMSS -4%). Moreover, the fraction of cropped arable land (CALF -18%) was below the 5YA. At the same time, the maximum VCI value for the whole country was at 0.64, which indicates poor crop conditions.

The nationwide NDVI profile showed unfavorable levels as compared with the 5YA. According to the maximum VCI profile, a large fraction of the crop land had a relatively low Maximum VCI index (VCIx<0.8). The Mekong valley, where the main rice growing area in Cambodia is located, suffered from a severe drought (RAIN 175mm -49%). Record low water levels of the Mekong river and in the Tonle Sap lake area hindered irrigation. As a result of that, growth of dry season early rice, dry season maize and soybean were negatively affected.

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**, **the Southwestern Hilly region** along the Gulg of Thailand coast.

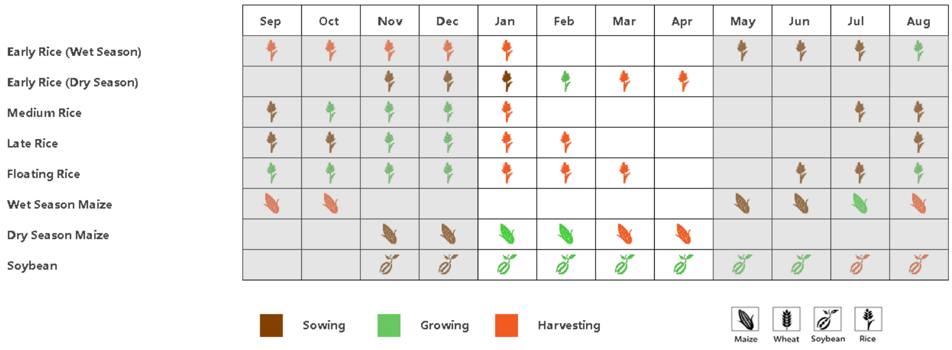
In **the Tonle Sap lake area**, NDVI was below average during the reporting period. Compared to average, the temperature and sunshine were relatively higher (TEMP +1.0℃; RADPAR +4%). However, rainfall (RAIN -43%) and the potential biomass production (BIOMSS, -7%) for the region were below average. The fraction of cropped arable land was below the 5YA (CALF -26%).

The Mekong valley between Tonle-Sap and Vietnam border, the main rice growing area of Cambodia, was affected by low precipitation (RAIN -49%) with relatively higher temperature (TEMP +0.8℃) and above-average radiation (RADPAR +3%). However, the biomass potential for the region was close to average (BIOMASS -1%). The fraction of cropped arable land was below the 5YA (CALF -16%) and the maximum VCI value (VCIx) was at 0.61. According to the NDVI profile, the NDVI of this region was below the 5YA, but it improved in April when the NDVI values started to gradually recover.

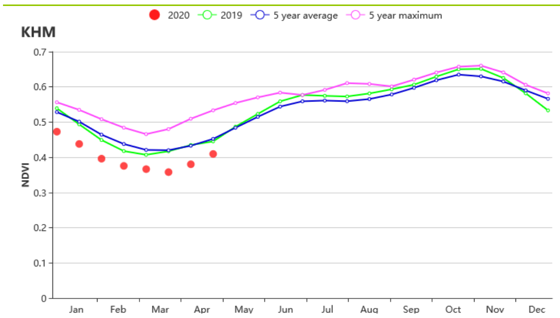
The Northern plain and northeast recorded a great drop of rainfall. It was 56% below the 15YA. Temperature (TEMP +0.7℃) and radiation (RADPAR, +7%) were higher than the 15YA. This region experienced a lower biomass potential (BIOMASS -9%) and the CALF was below average by 6%. The regional maximum VCI value was at 0.61, which means poor crop conditions. The NDVI profile showed that the regional NDVI was below average for the entire reporting period.

The Southwest Hilly region had a deficit of rainfall (RAIN -35%) accompanied by above average temperatures (TEMP +0.9℃) and radiation (RADPAR +3%). The biomass potential production for the region was slightly higher than the 5YA (BIOMASS +3%). The region suffered from a decrease of crop land utilization and the CALF was below average by 5%. The maximum VCI value was at 0.73, which was higher than for the other regions. Like the Mekong valley, the NDVI was below average during the whole reporting period, but it improved in late April when the departure from the average became smaller.

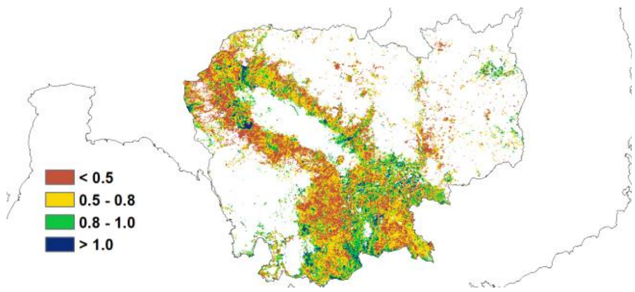
Figure 3.26 Cambodia's crop condition, January - April 2020



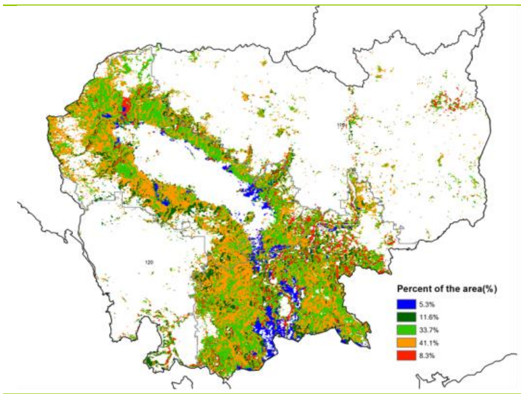
(a). Phenology of major crops



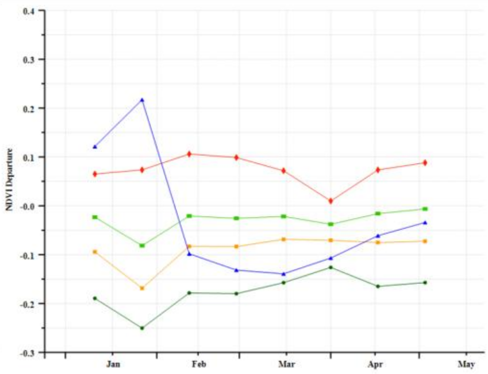
(b) Crop condition development graph based on NDVI



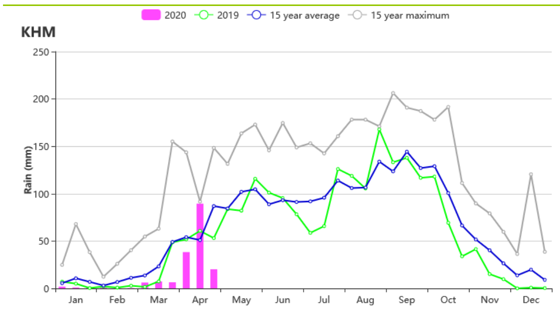
(c) Maximum VCI



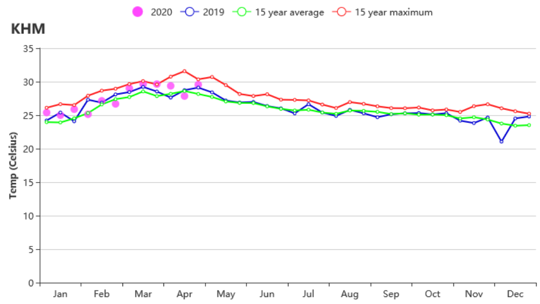
(d) Spatial NDVI patterns compared to 5YA



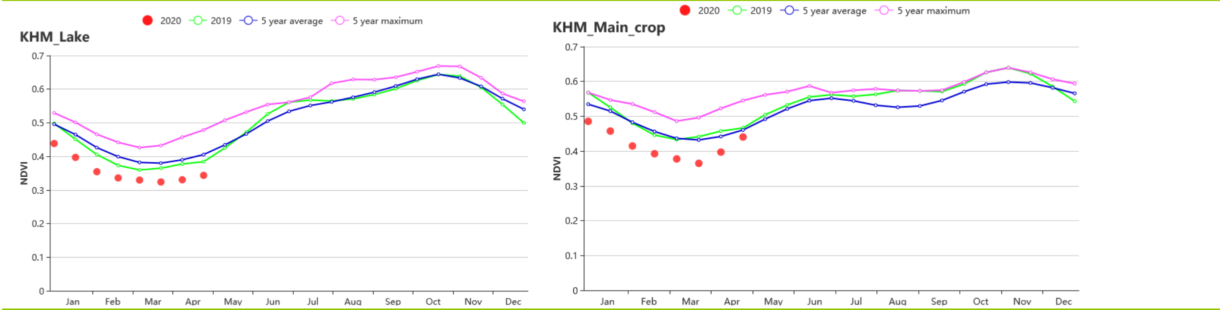
(e) NDVI profiles



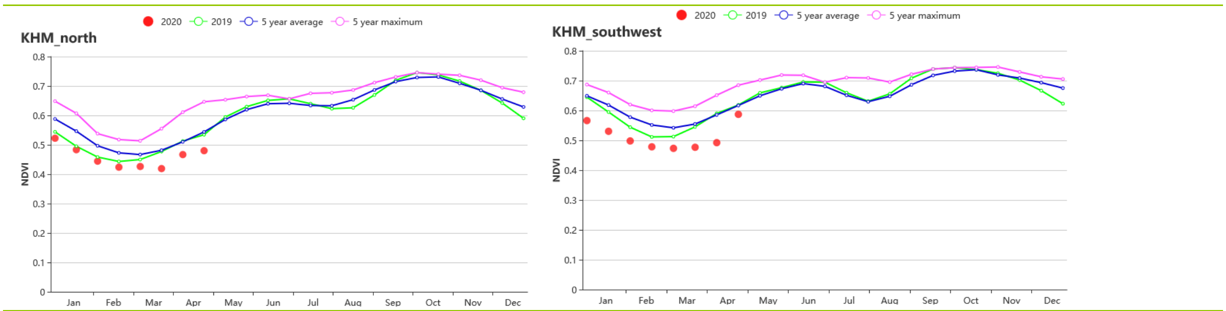
(f) Rainfall profiles



(g) Temperature profiles



(h)Crop condition development graph based on NDVI_Tonle-sap (left) and NDVI_Mekong valley (right)



(i) Crop condition development graph based on NDVI (Northern plain and northeast (left), Southwest Hilly region (right))

Table 3.41 Cambodia's agro-climatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 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	185	-43	27.8	1.0	1210	4	636	-7
Mekong valley	175	-49	28.2	0.8	1208	3	685	-1
Northern plain and northeast	125	-56	27.3	0.7	1249	7	573	-9
Southwest Hilly region	281	-35	25.8	0.9	1207	3	772	2

Table 3.42 Cambodia's agronomic indicators by sub-national regions, current season's values and departure from 5YA, January - April 2020

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Tonle-sap	52	-26	0.61
Mekong valley	70	-16	0.67
Northern plain and northeast	87	-6	0.61
Southwest Hilly region	93	-5	0.72

[LKA] Sri Lanka

The monsoon from the southwest and the mountains in central north and east delineate the climatic zones in Sri Lanka. Mean annual rainfall is less than 900 mm in the south-eastern and north-western dry areas of the island. It reaches over 5000 mm in the western slopes and the central highlands. This monitoring period covers the growing and harvesting season within the main season (Maha) from January to March, both for rice and maize, as well as the early sowing season for crops within the second season (Yala) during April. According to the CropWatch monitoring results, crop conditions were slightly below, but close to average for the whole period.

Influenced by monsoon and topography, the country experienced cold and dry windy weather during January and February, followed by a rainy period from March to April. Compared to 15YA level, precipitation (RAIN -58%) experienced a steep decline, while temperature and radiation both increased (TEMP +0.7℃, RADPAR +7%). The reduction in rainfall mainly happened in February. The fraction of cropped arable land (CALF) remained comparable to 5YA. BIOMSS was up 1% as compared to 15YA. As shown on the NDVI development graph, NDVI values were near average during January and showed a slight decrease to below average levels in March. The values then recovered to the 5YA in April. The below-average NDVI values can be attributed to the large reduction of rainfall in February, which led to insufficient water supply for the crops. However, dry conditions during the harvesting period have little influence on yield. The maximum VCI for the whole country was 0.95.

As shown by NDVI clusters map and profiles, spatial heterogeneity of crop condition was significant throughout the country's cropland. Only 14.3% of cropland showed consistent above-zero NDVI departure values for the entire period, including the area between Anuradhapura and Puttalam and scattered areas in Eastern and Uva Provinces. The other croplands almost showed negative NDVI departure values to different extents for the whole period except for January. These croplands were mainly distributed in Provinces of North Western, western of North Central, Uva and coastal areas. The VCIx map exhibited similar patterns as the NDVI clusters map.

Regional analysis

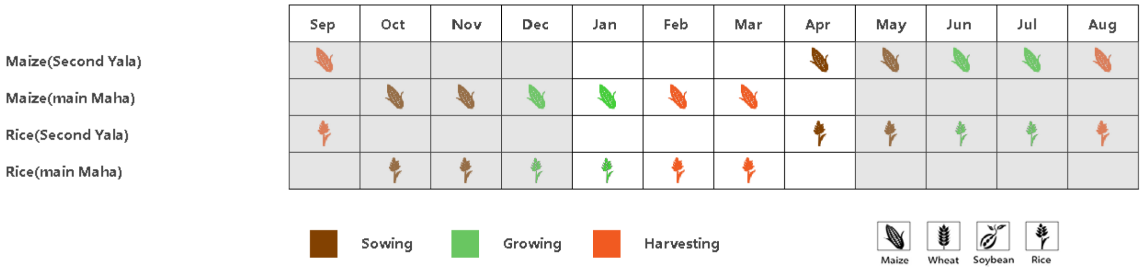
Based on the cropping system, climatic zones and topographic conditions, three sub-national agroecological regions can be distinguished for Sri Lanka. They are the Dry zone, the Wet zone, and the Intermediate zone.

In the **Dry zone**, the recorded RAIN (197mm) was 58% below average and amounted to less than 2 mm per day, which was insufficient for the growth of maize in this region. TEMP was 0.6°C above average with RADPAR up as well, by 7%; BIOMSS decreased by 3% compared to average. CALF was the same as the 5YA level (100%) and cropland was fully utilized. NDVI followed a similar trend as the whole county. The VCIx for the zone was 0.94. Overall, crop conditions were below-average due to the shortage of rainfall.

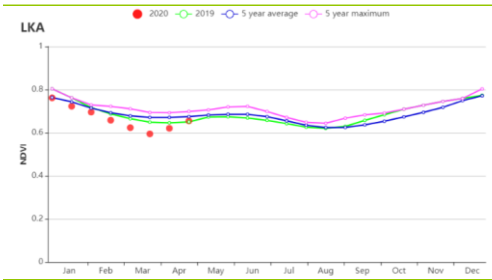
The **Wet zone** went through the first rainy season during March and April. RAIN (352mm) was 57% down compared to 15YA. TEMP (+0.9°C) and RADPAR (+9%) were higher. For BIOMSS, a 10% rise was recorded and cropland was fully utilized as usual. NDVI was near average for the whole period. The VCIx value for the zone was 0.93. Crop conditions were fair for this zone and a bit better than for the other two sub-national regions.

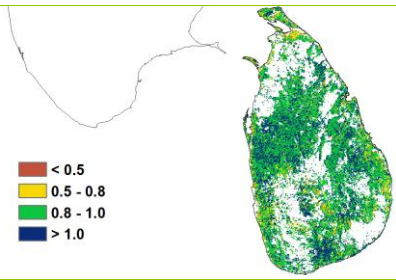
The **Intermediate zone** also experienced dry conditions with RAIN at 280 mm, 59% below 15YA. Less than 3mm precipitation per day could not meet the need of water for rice and maize. TEMP and RADPAR were up 0.6°C and up 8% above average respectively. With full use of cropland, BIOMSS was 3% above average. The variation of NDVI was analogous to the Dry zone. The VCIx value for the zone was 0.96. The condition of crop was assessed as slightly below-average.

Figure 3.27 Sri Lanka's crop condition, January - April 2020



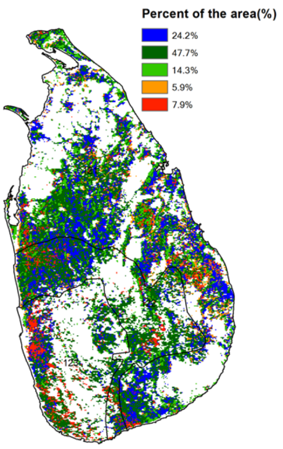
(a). Phenology of major crops

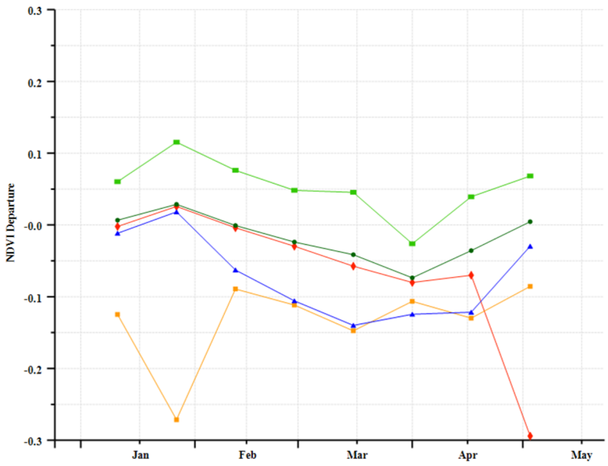




(b) Crop condition development graph based on NDVI

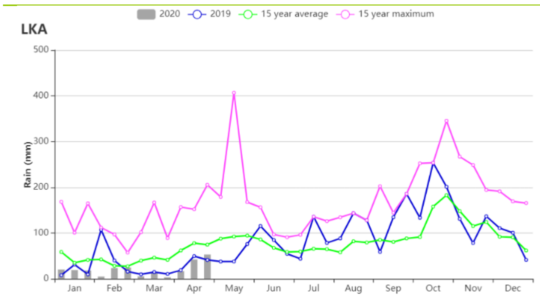
(c) Maximum VCI

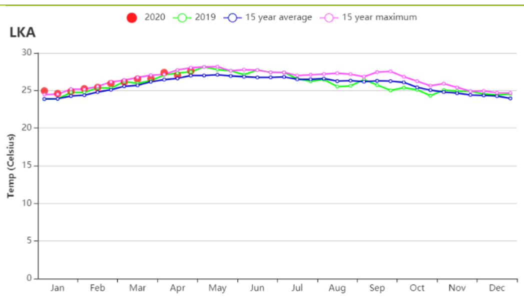




(d) Spatial NDVI patterns compared to 5YA

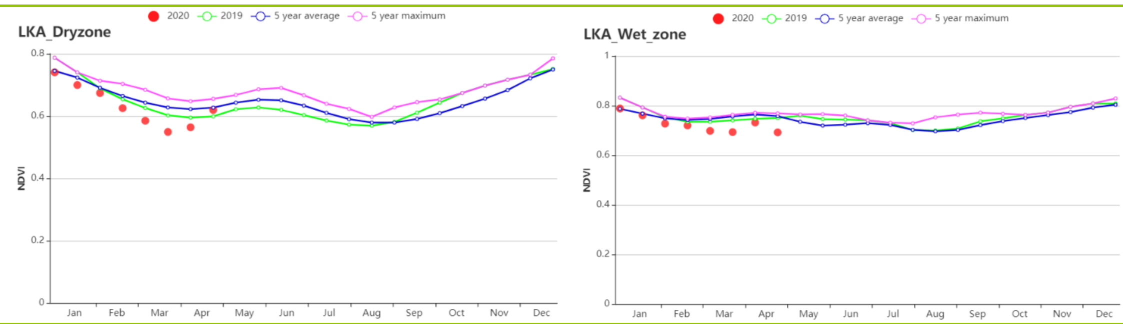
(e) NDVI profiles



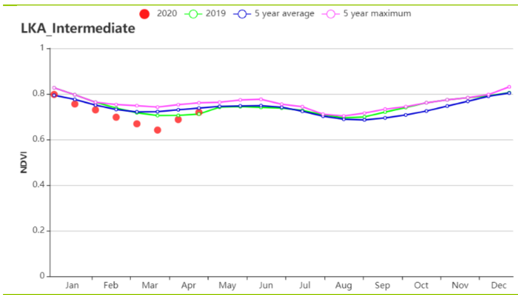


(f) Rainfall profiles

(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 3.43 Sri Lanka's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 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	197	-58	26.3	0.6	1351	7	819	-3
Wet zone	352	-57	25.5	0.9	1278	9	852	10
Intermediate zone	280	-59	24.6	0.6	1275	9	800	3

Table 3.44 Sri Lanka's agronomic indicators by sub-national regions, current season's values and departure from 5YA, January - April 2020

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Dry zone	99	0	0.94
Wet zone	100	0	0.93
Intermediate zone	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

[MAR] Morocco

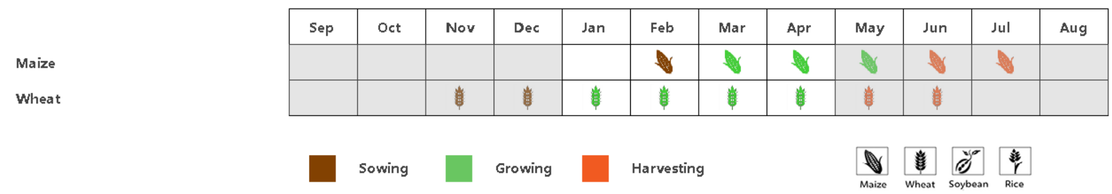
This reporting period for January to April covers the main growing period of winter wheat, which had reached the early grain filling stage in late April. Maize was sown in February. Rainfall was 21% below the average while the temperature was 0.7°C above the average. In addition, rainfall was poorly distributed. Conditions were very dry from January to mid-March. After that, above average rains were observed. The estimated RADPAR was slightly above the average (+0.1%), while the BIOMSS was reduced (-12%) as a result of the lack of rain. The CALF was below the average by 2% with a medium VCIx at 0.67. The nation-wide NDVI-based crop development graph shows that the conditions of the crops initially were around the average and then got worse and stayed below the 5YA until the end of the reporting period. The NDVI profile map indicates that the conditions of about 24% of cultivated areas were above average. These areas were located in the north of the country. In all other parts, NDVI had dropped to below average levels at some point during the growth cycle. The south was most hit by the drought, where 21% of the area was below average throughout the entire monitoring period. Nationwide, the estimated VCIx was moderate (0.67). All in all, crop conditions were very poor in the south but a bit more favorable in the north.

Regional Analysis

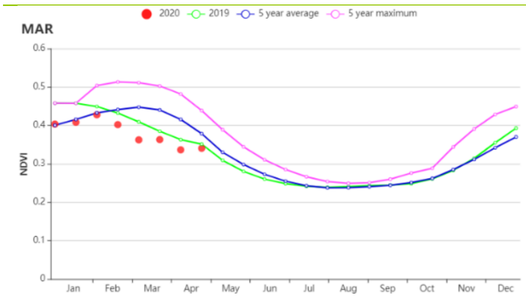
Based on the cropping system, climatic zones and topographic conditions, four sub-national agro-ecological regions (AEZs) can be distinguished for Morocco. Only three of them are relevant for crops: **Sub-humid northern highlands** including central Centre-Nord Region and northern Centre-Sud, **Warm semi-arid zone** covering the regions of North-Oriental and the broad Tensift Region, and **Warm sub-humid zone** of the Nord-Ouest Region.

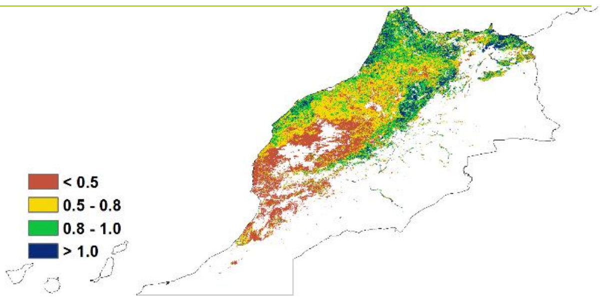
The agroclimatic indicators for the three AEZs show a reduction in rainfall (-9%, -28%, and -19%, respectively) while the temperature was +1°C above the average for the three zones. RADPAR was -2% and +1% for the first and the second zone respectively while it was at the average for the third zone. The estimated BIOMSS was below the average for the three zones: -14% for the first zone; -11% for the second and the third zone as a result of the lack of rainfall. The CALF was above the average for the first and third zones (11 and 6%, respectively) but 17% below the average for the second zone. Also, the maximum VCI was high for the first and the third zone (0.82 and 0.80%, respectively) but moderate (0.53) for the second zone. The NDVI development graph of the Sub-humid northern highlands and Warm sub-humid zones was above the average during January and February then dropped to average until the end of the season while for the Warm semi-arid zone, the NDVI development graph was below the average throughout the whole reporting period. In short, the Warm semi-arid zone was suffering more than the other zones due to low rainfall.

Figure 3.28 Morroco's crop condition, January - April 2020

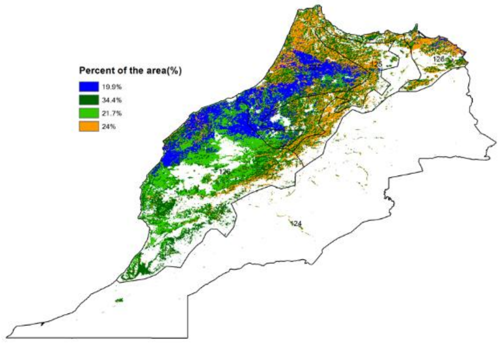


(a). Phenology of major crops

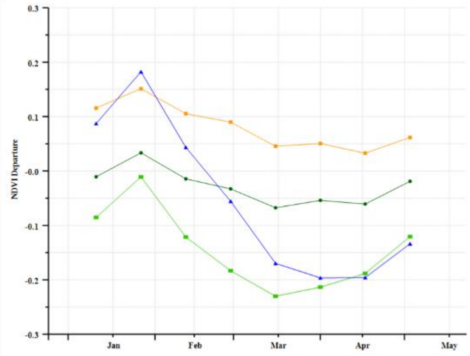




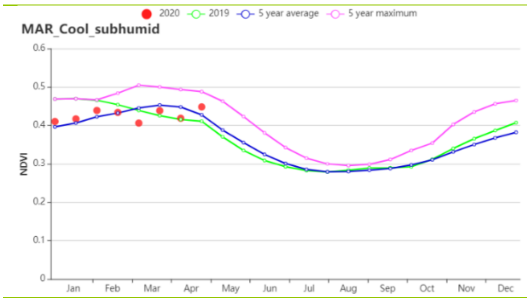
(b) Crop condition development graph based on NDVI



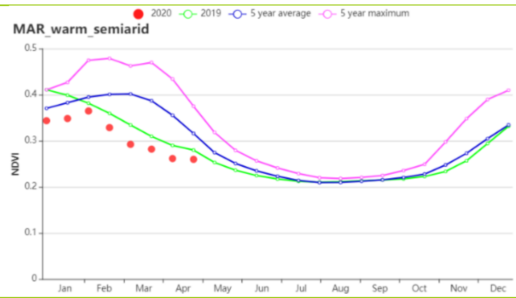
(c) Maximum VCI



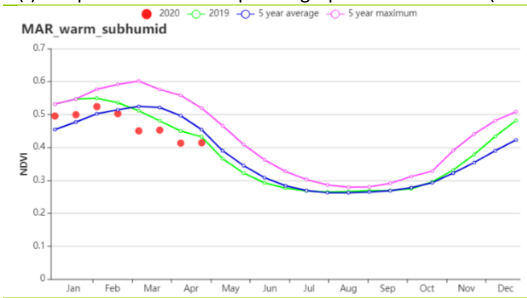
(d) Spatial NDVI patterns compared to 5YA



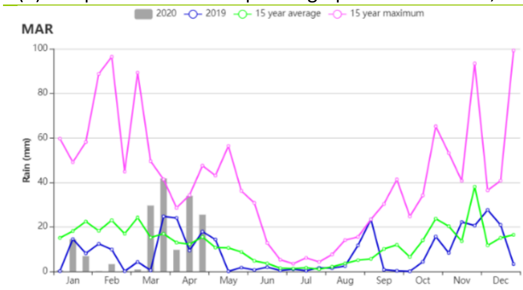
(e) NDVI profiles

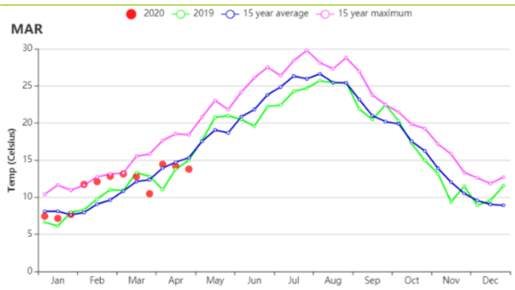


(f). Crop condition development graph based on NDVI (Sub-humid northern highlands).and (g). Warm semiarid zones)



(h) . crop condition development graph based on NDVI, Warm subhumid zones.





(i) Time series profile of rainfall

(j) Time series profile of temperature

Table 3.45 Morocco's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January-April 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 (%)
Sub-humid northern highlands	267	-9	10	1	947	-2	236	-14
Warm semiarid zones	99	-28	12	1	1077	1	272	-11

Warm sub-humid zones	218	-19	11	1	966	0	267	-11

Table 3.46 Morocco's agronomic indicators by sub-national regions, current season's values and departure from 5YA, January-April 2020

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current
Sub-humid northern highlands	72	11	0.82
Warm semiarid zones	38	-17	0.53
Warm sub-humid zones	82	6	0.80

[MEX] Mexico

This report covers the production of irrigated wheat, typically sown in November and December, as well as of irrigated winter maize, sown roughly one month earlier. Maize and wheat were at the harvesting stage in March and April, respectively. Rice and soybean sowing began in April.

According to the crop condition development graph based on NDVI, conditions were close to average between January and April. The CropWatch agroclimatic indicators show that RAIN, TEMP, RADPAR and BIOMSS were close to average (RAIN 125mm, +4%; TEMP 19.7°C, + 0.8°C; RADPAR: 1200MJ/m², - 3%; BIOMSS: 422gDM/m2, +5%). CALF increased by 8% compared with the previous 5-year's average and maximum vegetation condition index (VCIx) was 0.87.

Crop conditions displayed obvious differences in their spatial distribution. According to the spatial pattern of VCIx, it was relatively low in northeastern Mexico compared to other regions. Very high values (greater than 1.0) could be found mainly in northwestern Mexico (including Sonora, Sinaloa and Baja California Sur), whereas extremely low values (less than 0.5) occurred in the north-east and center of the country (northwestern Coahuila, northern Nuevo León and northern Tamaulipas). The VCIx 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 41.3% of the total cropped areas were below average during the entire monitoring period, mainly distributed in the east of Coahuila, Veracruz and Nuevo León while 43.8% of the total cropped areas, mainly in Sinaloa and Sonora provinces, were above average.

Combining the agronomic and agroclimatic indicators, crop condition was close to average during the monitoring period and CropWatch estimates that maize and wheat grew well during the monitoring period and average output is expected.

Regional analysis

Based on cropping systems, climatic zones and topographic conditions, Mexico is divided into four agro-ecological regions. These regions include Arid and semi-arid regions (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 provide more detail for the production situation in Mexico.

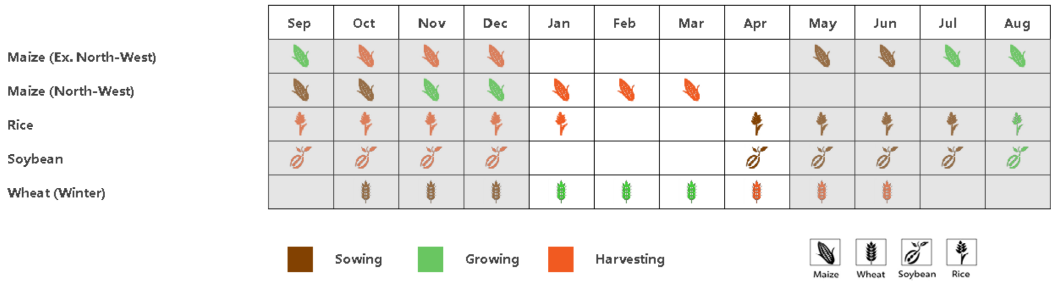
The Arid and semi-arid regions located in northern and central Mexico account for about half of planted areas in the country. According to the NDVI development graph, crop condition in this region was generally close to average during the reporting period. VCIx was 0.87 and CALF increased by 21% compared with average, RAIN and TEMP increased by 50% and 0.4°C, respectively and RADPAR decreased by 6%, which all resulted in an increase of BIOMSS (+17%).

The Sub-humid temperate region with summer rains is located in central Mexico. According to the NDVI development graph, crop conditions stayed close to average in this region. The agro-climatic condition showed that RAIN and TEMP increased by 2% and 1.0°C, respectively and RADPAR decreased by 2% compared to average. BIOMSS also increased by 8% and CALF was 52%. VCIx was relatively low with a value of 0.73.

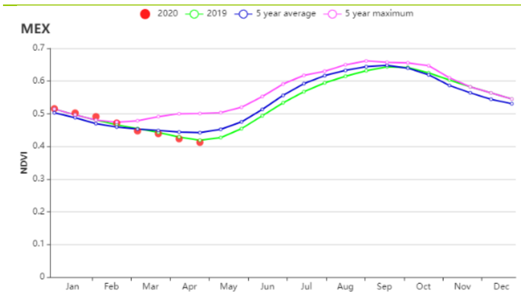
The Sub-humid hot tropics with summer rains are located in southern Mexico. During the monitoring period, crop conditions were close to average since January, as shown by the NDVI time profiles. Agro-climatic conditions showed that RAIN was significantly above average (+22%), while TEMP and RADPAR were near average (+0.9°C and -2%). The VCIx in these areas was 0.92 and BIOMSS was on average, which indicate favorable conditions.

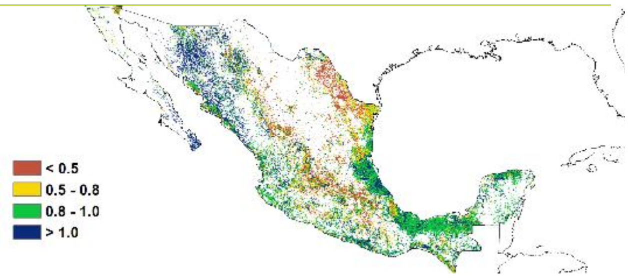
Humid tropics with summer rainfall are located in southeastern Mexico. RAIN was significantly below average (-32%), TEMP was 1.3℃ warmer and RADPAR up 2%. As shown in the NDVI development graph, crop condition was close to average from January to February and below average after March. BIOMSS decreased (-12%) but CALF reached 99%. The VCIx (0.93) confirmed favorable crop condition in these regions.

Figure 3.29 Mexico's crop condition, January - April 2020



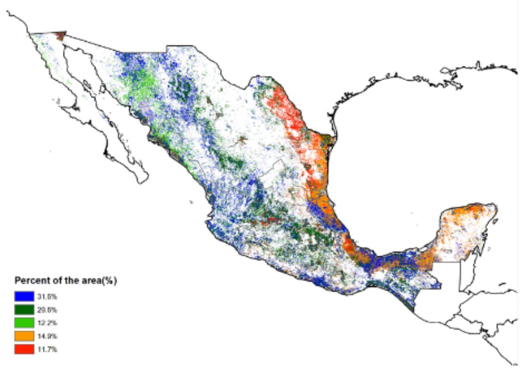
(a). Phenology of major crops

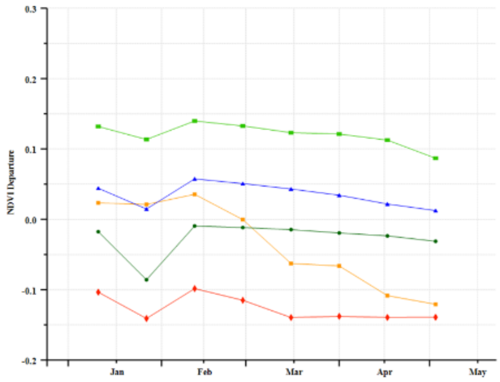




(b) Crop condition development graph based on NDVI

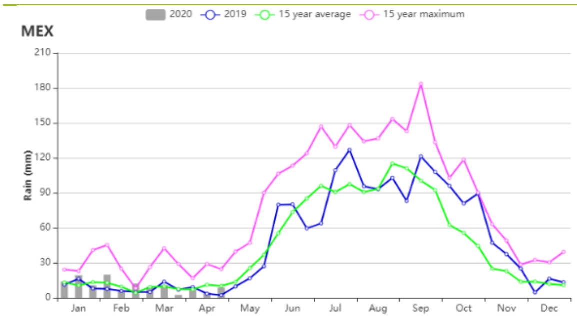
(c) Maximum VCI

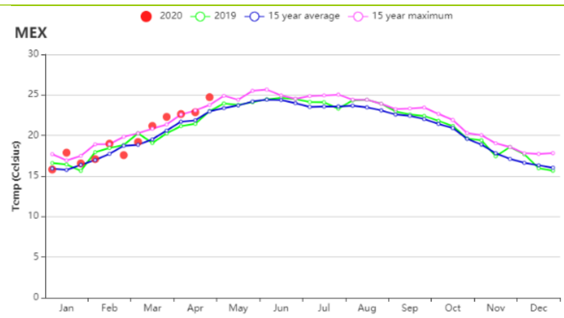




(d) Spatial NDVI patterns compared to 5YA

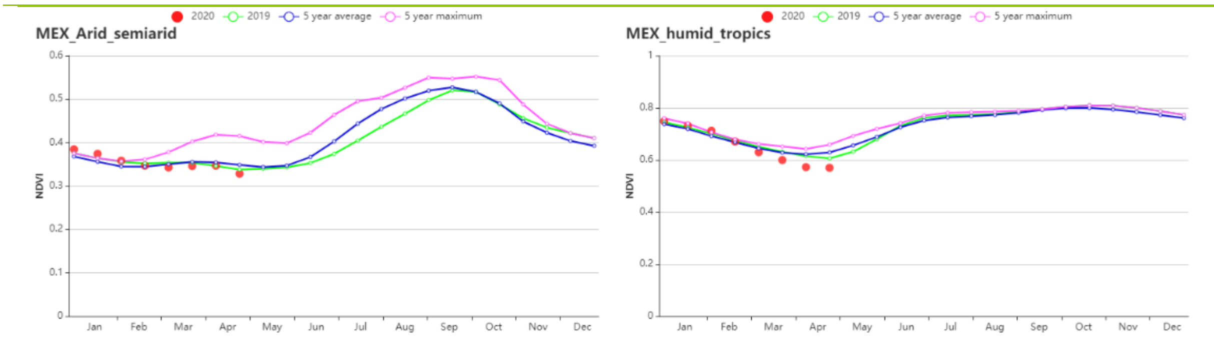
(e) NDVI profiles



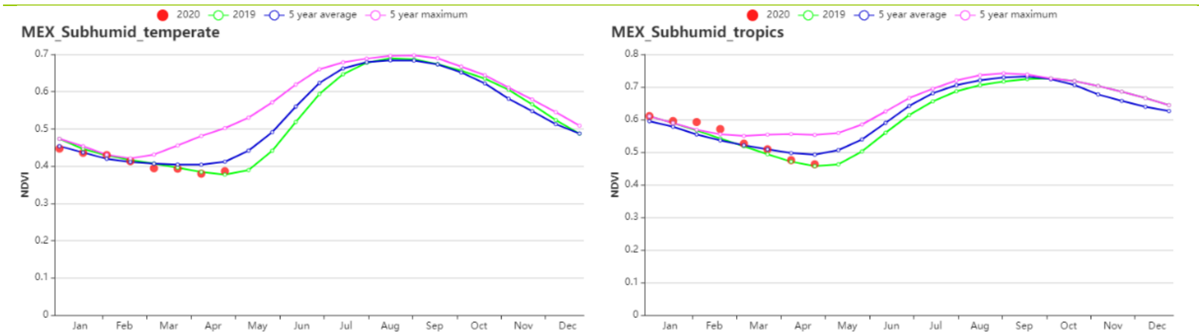


(f) Rainfall profiles

(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 3.47 Mexico's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 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	104	50	16.4	0.4	1152	-6	386	17
Dry region	106	2	19	1	1287	-2	445	8
Dry and irrigated cultivation region	142	22	21.2	0.9	1231	-2	400	-1
Dry and grazing region	161	-32	24.4	1.3	1185	2	603	-12

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Central region	48	21	0.87
Dry region	52	0	0.73
Dry and irrigated cultivation region	87	7	0.92
Dry and grazing region	99	1	0.93

[MMR] Myanmar

This monitoring period covers the generally dry winter months in Myanmar. Pre-monsoon rains typically start in April. The main crops being cultivated are second rice, maize and wheat. Most of these winter crops are irrigated. Maize sowing and therefore harvest occurs over a prolonged period, but its harvest was concluded by the end of April. Similarly, wheat and second season rice also reached maturity by then. This is in agreement with the declining NDVI curves.

Compared to the 15YA level, precipitation (RAIN) increased by 7%. This was due to heavy rainfall in late April. Otherwise, the conditions were drier than normal. Temperature was a bit cooler (-0.2℃). Radiation (RADPAR) was also close to average (+1%). Potential cumulative biomass (BIOMSS) underwent a 26% reduction as compared to the 15YA level. The arable land was the same as the 5YA level and was not fully utilized according to the monitoring results in sub-national regions. As shown in the NDVI development graph, NDVI values were always slightly below the 5YA level for the whole monitoring period. Myanmar suffered from drought due to lack of precipitation until late April, which had a negative effect on crop conditions of second rice and wheat in temperate highlands and central dry zone.

Crop condition underwent marked spatial variations according to the NDVI cluster and profile maps. 31.5% of cropland showed zero NDVI departure values throughout the monitoring period except for late January, including central dry zone and part of Ayeyarwady Region and Shan State. 30.5% of cropland showed negative NDVI departure values that range from -0.1 to 0 during the whole period. These croplands were mainly distributed in Magwe Region and eastern highland, as well as the scattered areas in central dry zone. 11% of cropland in Ayeyarwady Delta displayed positive NDVI departure values for the entire period, while 8.5% of cropland in eastern highland showed negative NDVI departure values of less than -0.1. The VCIx map shows values between 0.5 and 0.8 over central dry zone and high values in Ayeyarwady Delta generally. CropWatch has assessed the crop condition of Myanmar during this monitoring period as close to average.

Regional analysis

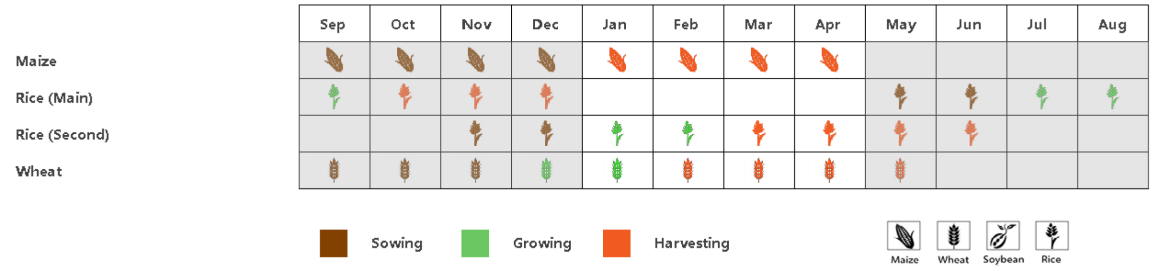
Based on the cropping system, climatic zones and topographic conditions, three sub-national agro-ecological zones (AEZ) can be distinguished for Myanmar. They are the Delta and southern-coast, the Central plain, and the Hills.

The **Delta and southern-coast region** experienced a dry season with an extremely low RAIN (41 mm), a 70% decrease compared to the 15YA. TEMP and RADPAR increased by 0.1℃ and 3%, respectively. BIOMSS decreased by 42% and this was the largest decrease among the three sub-national regions. CALF rose by 3%. Most fields are irrigated, and therefore, NDVI was only slightly below average during the whole period. The maximum VCIx was 0.84 for this region. The crop condition was close to average in general.

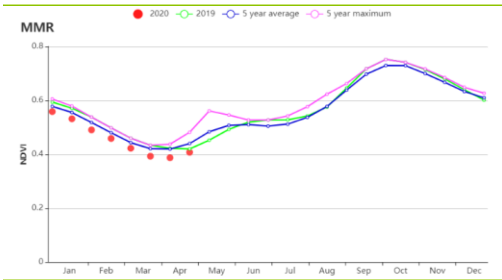
The **Central plain** was also short of RAIN (85 mm, 23% above the 15YA) while TEMP (-0.1℃) and RADPAR (+2%) were near 15YA level. BIOMSS was 25% below the 15YA. CALF (69%) was far away from full utilization, but only 1% down below average. NDVI was slightly below the 5YA level during the whole period. The maximum VCIx was 0.77 for the region. The crop condition is assessed as below the 5YA.

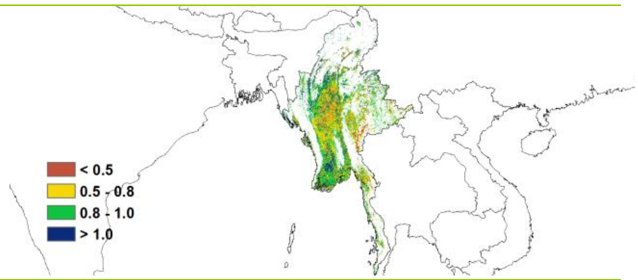
The **Hills** region had more RAIN (194 mm) than the other two sub-national regions, 31% above the 15YA. Temperature was lower (TEMP -0.4℃) than the 15YA level and radiation was average. Even with the cropland almost fully used (CALF 92%), BIOMSS was 20% down compared to the 15YA. The variation of NDVI was similar to the other sub-national regions. The maximum VCIx was 0.82 for the region. The crop condition for this region is slightly below-average in general according to the agroclimatic indicators.

Figure 3.30 Myanmar's crop condition, January - April 2020



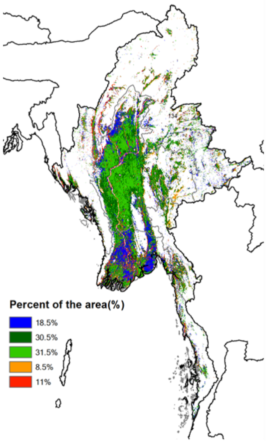
(a). Phenology of major crops

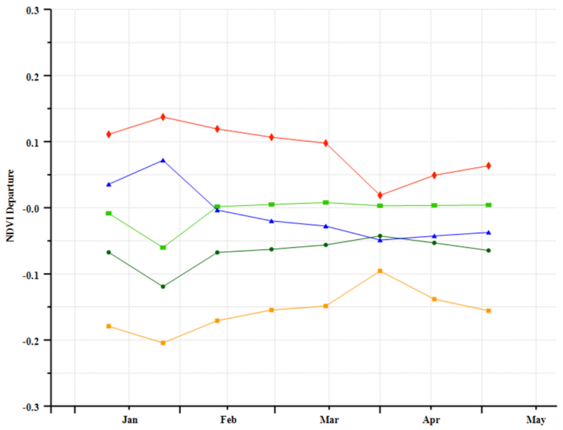




(b) Crop condition development graph based on NDVI

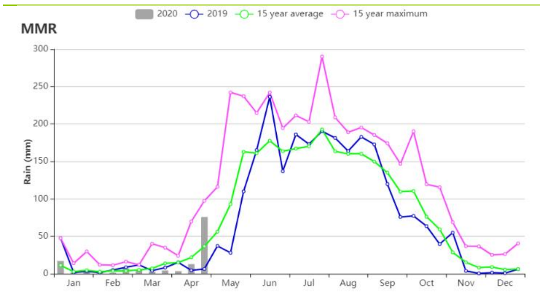
(c) Maximum VCI

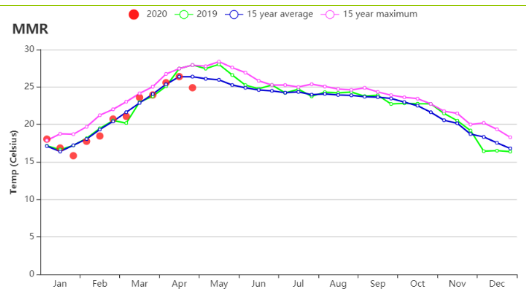




(d) Spatial NDVI patterns compared to 5YA

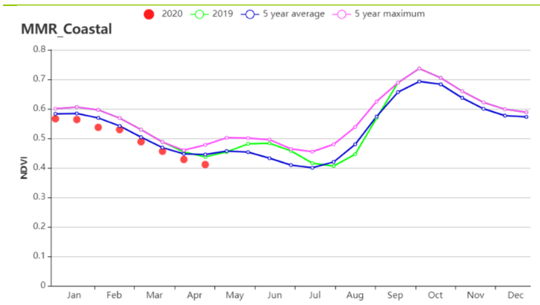
(e) NDVI profiles

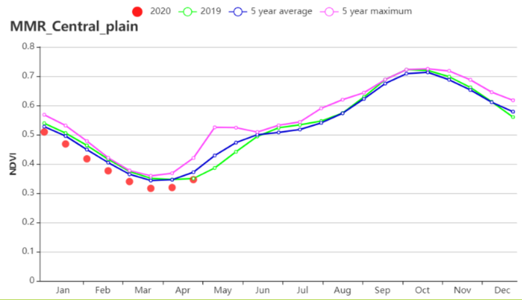




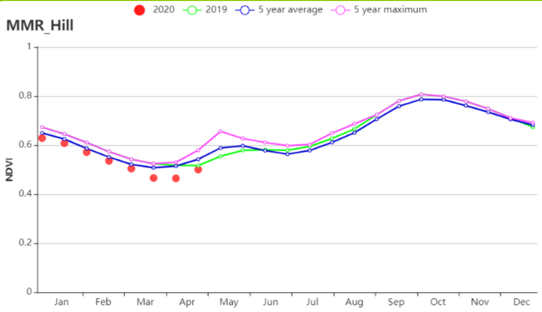
(f) Rainfall profiles

(g) Temperature profiles





(h) Crop condition development graph based on NDVI (Coastal region (left) and Central plain (right))



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

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

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Delta and southern-coast	41	-70	26.2	0.1	1327	3	266	-42
Central plain	85	23	22.0	-0.1	1285	2	300	-25
Hills	194	31	18.6	-0.4	1221	0	342	-20

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Delta and southern-coast	90	3	0.84
Central plain	69	-1	0.77

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

[MNG] Mongolia

The main crops of Mongolia, spring wheat and potato are cultivated in the summer growing season. Average temperatures rose above 0°C in early April, when land preparation for the summer crops started. The crops are generally sown in May. According to the CropWatch agro-climatic indicators, the conditions were suitable for early sowing in the primary agricultural regions of Selenge-Onon, Khangai-Khuvsgul, and Central and Eastern Steppe due to warmer weather (TEMP +2.5°C) with high precipitation (RAIN +31%). RADPAR was near average (-1%). The agro-climatic conditions resulted in an increase of the BIOMSS index (+10%) above the fifteen-year average.

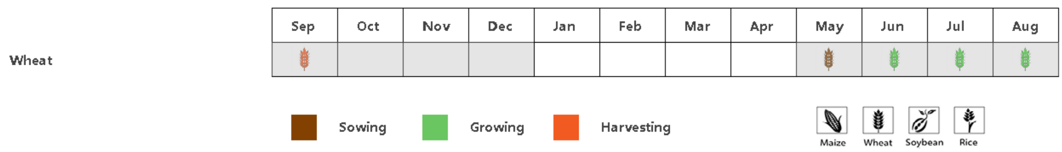
Regional analysis

The agro-climatic conditions in the sub-regions follow various patterns, but TEMP was higher in all regions by +2.0% to +2.6%. In the Altai and Gobi regions, precipitation was lower than the fifteen-year average by -8% and -10% respectively. The BIOMSS index increased by 18% and 25% as compared to the five-year average, respectively. The agro-climate conditions were normal, despite the slightly lower than average precipitation.

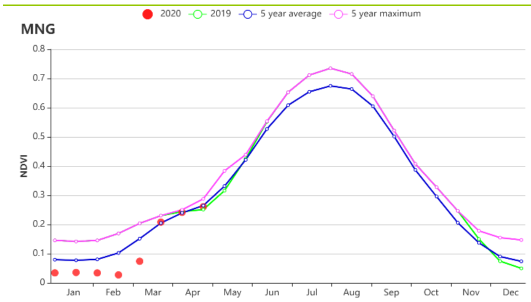
In the Selenge −Onon region, RAIN was up by 42%, while the temperature was higher than the fifteen-year-average (TEMP 2.5°C), and RADPAR was slightly lower (-2%). The BIOMSS index was 8% below the fifteen-year average. The agro-climatic conditionds were favorable due to higher rainfall.

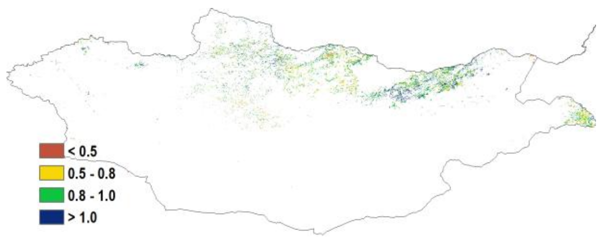
In the Central-Eastern Steppe and Khangai Region, the meteorological variables were above average (RAIN +20% and +24%), and RADPAR was slightly below the fifteen-year average (-1% and 0%). BIOMSS was up (+5% and +11%). Overall, the conditions were above average.

Figure 3.31 Mongolia's crop condition, January - April 2020



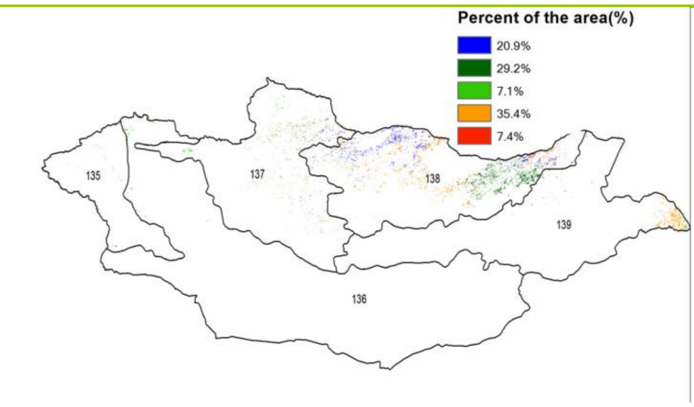
(a). Phenology of major crops

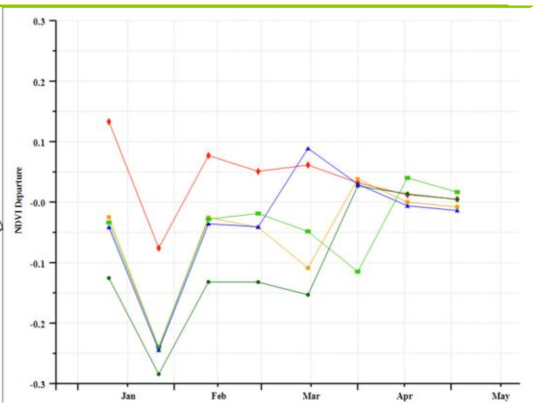




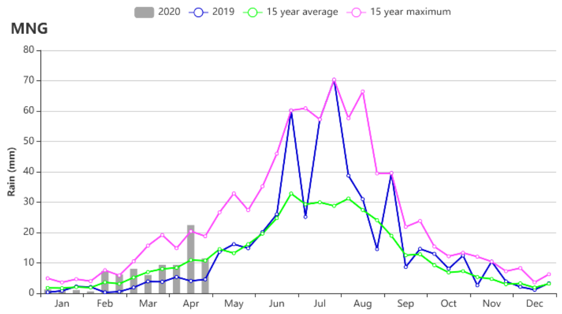
(b) Crop condition development graph based on NDVI

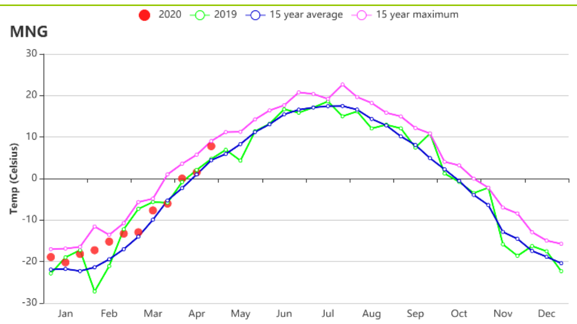
(c) Maximum VCI



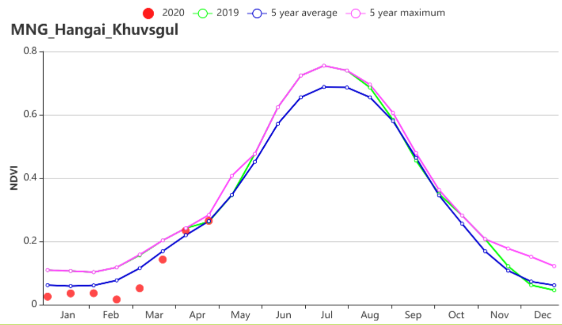


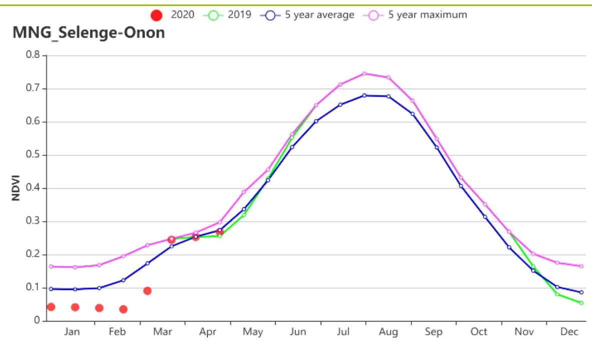
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



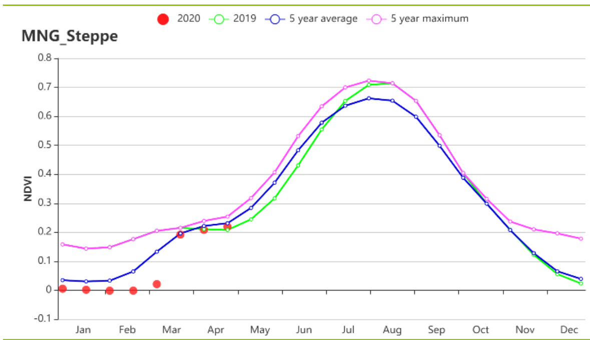


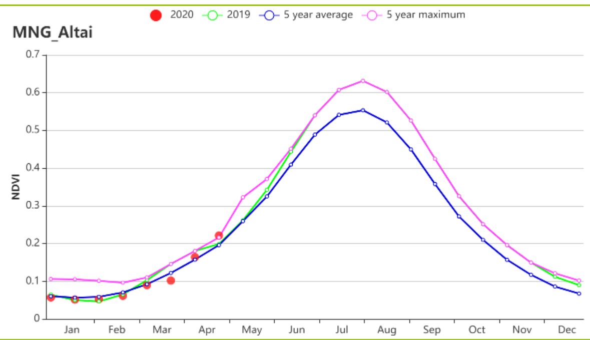
(f) Rainfall profiles (g) Temperature profiles



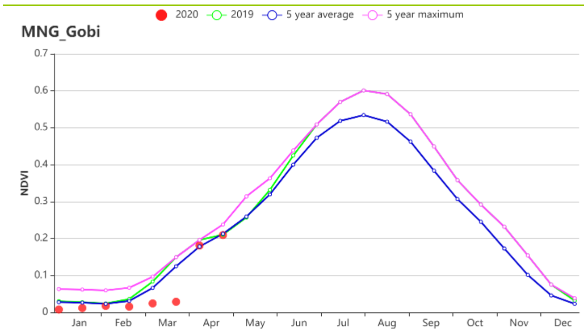


(f) Crop condition development graph based on NDVI (Hangai Khuvsgul Region (left) and Selenge-Onon Region (right))





(g) Crop condition development graph based on NDVI (Central and Eastern Steppe Region (left) and Altai Region (right))



(h) Crop condition development graph based on NDVI (Gobi Region)

Table 3.51 Mongolia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 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	108	-8	-10.1	2.3	743	0	93	18
Selenge-Onon Region	55	-10	-10.0	2.0	759	1	97	25
Central and Eastern Steppe Region	76	24	-11.5	2.3	805	0	87	11
Altai Region	91	42	-9.3	2.5	775	-2	96	8
Gobi Desert Region	76	20	-9.6	2.6	809	-1	98	5

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current (%)
Hangai Khuvsgul Region	0	150	0.93
Selenge-Onon Region	1	3900	0.88
Central and Eastern Steppe Region	2	393	0.93
Altai Region	2	160	0.94
Gobi Desert Region	0	275	0.84

[MOZ] Mozambique

This report for January to April 2020 covers the growing period of rice and maize in the northern and central provinces of Mozambique. In the southern provinces, these two crops were completely harvested, while wheat, which was sown in January only, was still in the growing period (figure 3.32a). Nationwide, rainfall showed a negative anomaly of 4%. With no changes recorded for temperature, RADPAR increased by about 2%. BIOMSS showed a decrease by 4% compared to the 15YA. Overall, the country recorded below-average crop conditions.

During this period, a significant drop in rainfall (-46%) and an increase in temperature (+0.9ºC) was observed in Inhambane Province. In Gaza province, the rainfall was also below average (-6%), whereas temperature (+ 0.3ºC) and radiation (+0.2%) were above average. These two provinces had already suffered from drier-than-normal conditions during the sowing period and a large fraction of cropped area had a low VCIx, with values below 0.8. The drought conditions in these two provinces negatively affected the crop production of the 2019/2020 agricultural campaign.

Maputo and Maputo city are the other two provinces that deserve special attention. They recorded above-averge rainfall of 616 mm and 658 mm (about 45% and 56% above the 15YA, respectively). Conditions were therefore quite favorable. A flood event which occurred in Sofala province (especially in the Nhamatanda district) in February 2020 had limited the production in that region.

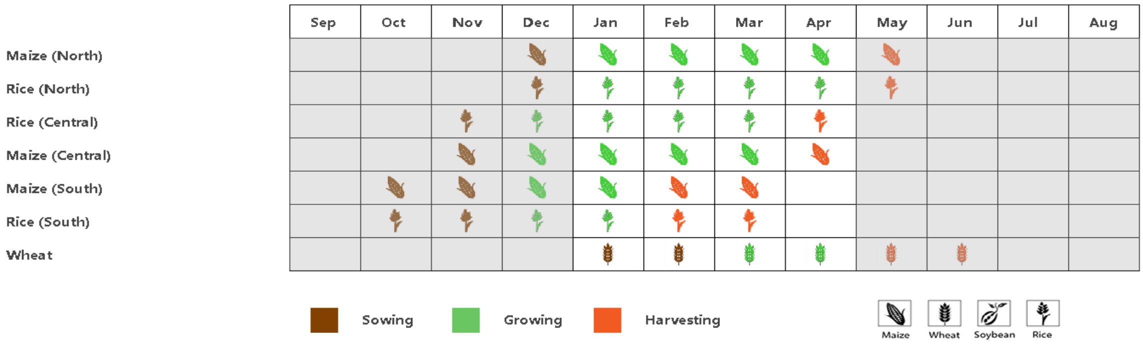
The crop condition development graph based on NDVI suggests below average crop conditions throughout the entire monitoring period. The spatial NDVI profiles and distribution map show that 38% of the cropped areas (mostly in the Provinces of Tete, Zambézia, Nampula, and Cabo Delegado) were above average by mid-March, declining from that point till the end of April. For the remaining areas (about 62%), the crop conditions were below average during almost the entire monitoring period. Regardless of these factors, the CALF was stable and a maximum VCIx 0.89 was observed, with high values being recorded in northern Tete, Zambézia, Nampula, and Cabo Delegado provinces.

Regional analysis

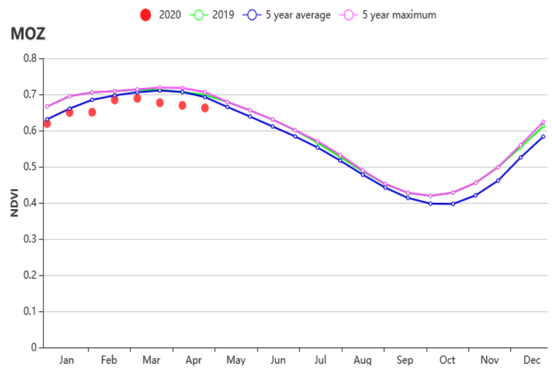
According to the cropping system, topography and climate, CropWatch had subdivided Mozambique into five agro-ecological zones (AEZ): Buzi Basin, Northern High-altitude Areas, Low Zambezi River Basin, Northern Coast, and Southern Region.

The sub-regions' development graphs based on the NDVI indicate that crop conditions in all agro-ecological zones were generally below the 5YA. According to the agroclimatic indicators, Southern region and Northern coast zones were the two zones with decreases in rainfall of about 15% and 5%, respectively. The decrease in rainfall combined with the increase in temperature limited crop growth in this region. Except for the Southern region (with BIOMSS near average), all other regions recorded a decrease in BIOMSS by 9%, 8%, 7% and 1% for the Buzi basin, Northern high-altitude areas, Low Zambezia River basin, and Northern coast, respectively. CALF was near average in all agro-ecological zones, except for the Southern region, where an increase of 1% was observed. As expected, the maximum VCIx was lowest in the Southern region (with 0.81) followed by the Buzi basin (with 0.88). High VCIx values were recorded in the Northern high-altitude areas (0.95).

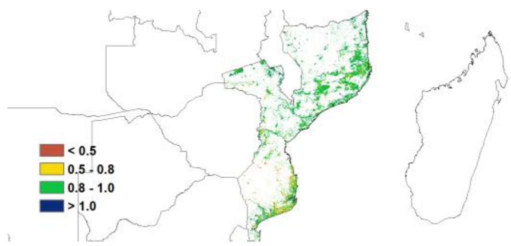
Figure 3.32 Mozambique's crop condition, January - April 2020



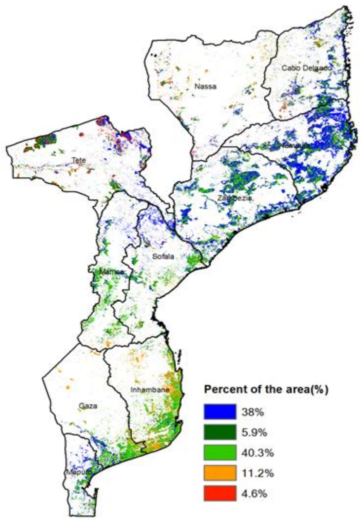
(a). Phenology of major crops

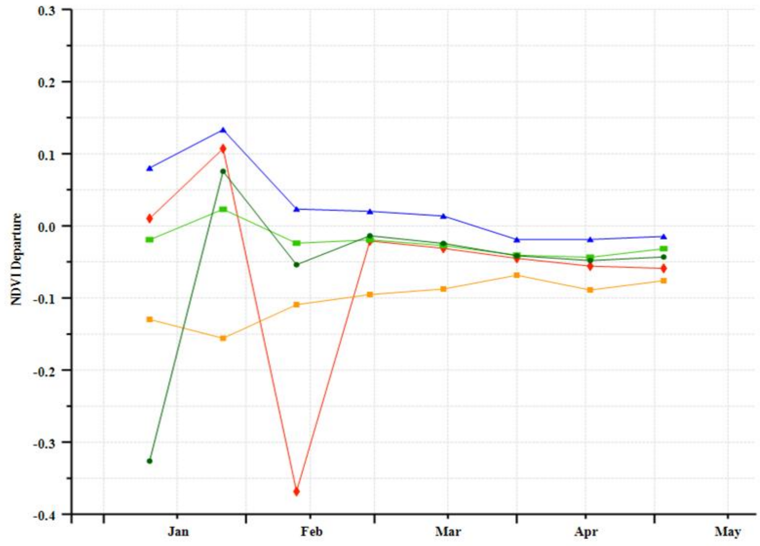


(b) Crop condition development graph based on NDVI



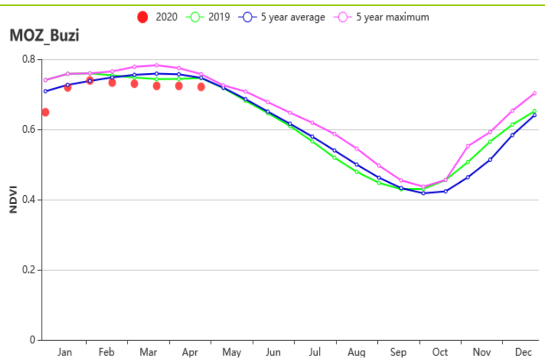
(c) Maximum VCI

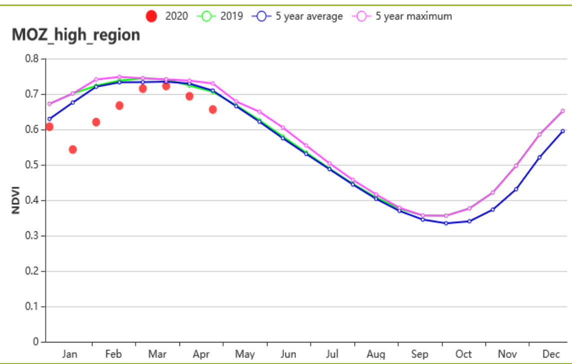




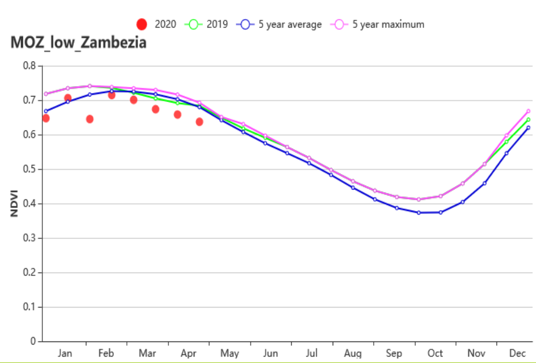
(d) Spatial NDVI patterns compared to 5YA

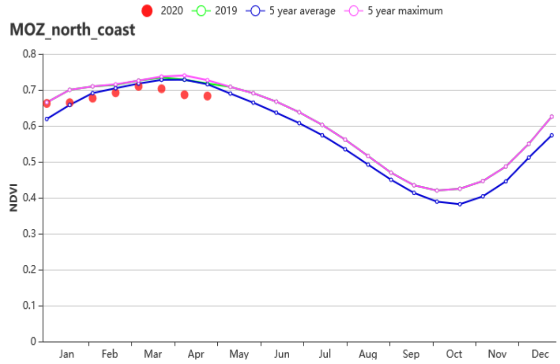
(e) NDVI profiles



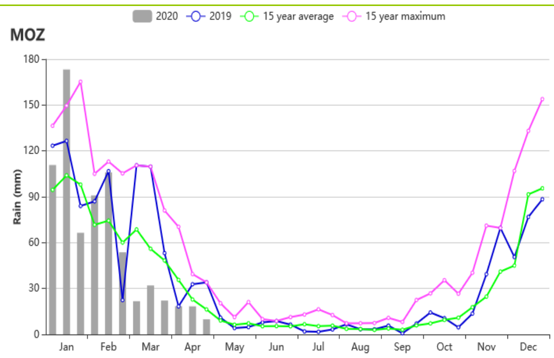


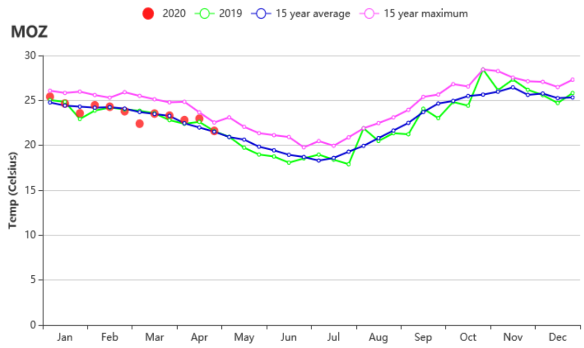
(f) Crop condition development graph based on NDVI- Buzi basin (g) Crop condition development graph based on NDVI- Northern high altitude areas





(h) Crop condition development graph based on NDVI- Lower Zambezi River basin (i) Crop condition development graph based on NDVI- Northern coast region





(j) Rainfall index (k) Temperature index

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

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (mm)	Departure from 15YA (°C)	Departure from 15YA (%)	Current (°C)
Buzi Basin	696	5	21.7	0.0	1262	2	738	-9
Northern High-altitude Areas	1003	3	22.0	0.0	1152	1	686	-8
Low Zambezia River basin	749	0	23.3	-0.2	1198	0	735	-7
Northern	797	-6	23.8	-0.1	1249	4	803	-1

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (mm)	Departure from 15YA (°C)	Departure from 15YA (%)	Current (°C)
coast								
Southern region	397	-15	25.3	0.5	1228	2	811	0

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current
Buzi Basin	100	0	0.88
Northern High-altitude Areas	100	0	0.95
Low Zambezia River basin	99	0	0.92
Northern coast	100	0	0.91
Southern region	99	1	0.81

[NGA] Nigeria

The previous reporting period from October to January was marked by harvesting activities of the rainfed and irrigated crops, which were completed by the end of January. Satisfactory rainfall throughout the country resulted in an above-average cereal production. In the North-East, North-Central and North-West, agricultural activities continue to suffer from persisting insecurity accompanied by large scale displacement of people. The conflict has blocked access to land and farming inputs and resulted in a loss of crop production.

In general, the country received 90 mm of rainfall (-31%), average temperature was 26.9°C (-0.4°C) and the recorded radiation was 1354 MJ/m^2. The observed maximum vegetation condition index (VCIx) was 0.98. Due to a decline in precipitation, the biomass production potential was reduced to 313 gDM/m^2 (-20%).

In the southern part of the country, the timely onset of the rainy season created favorable conditions for maize, yams and rice planting.

Regional analysis

The analysis focused on four agro-ecological zones found in Nigeria: Sudano-Sahelian zone in the north with the driest climate, the Guinean savanna and Derived savanna in the center and the Humid forest zone in the south.

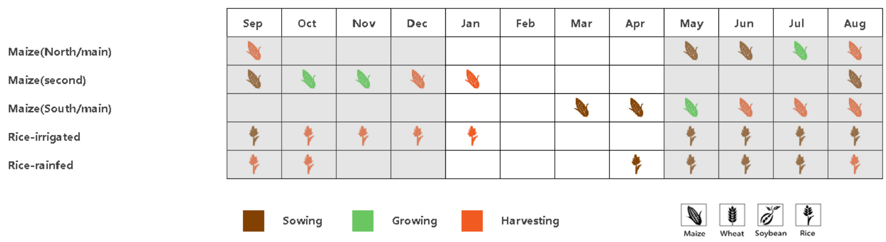
The **Sudano-Sahelian** zone, The region received almost zero mm of rainfall and the overall temperature was 26.4°C (-0.2°C). Radiation was near average (-1%) at 1371 (MJ/m2). The total estimated biomass production decreased by 33%, and the CALF was 3% (+89%).

In the **Guinean savanna**, the rainfall was 71% below the 15YA, the temperature recorded was 26.5ºC (-0.1°C) and the radiation remained constant at 1379 MJ/m2. The estimated biomass was 236 g DM/m^2 with a 12% decrease and the CALF was 12% (+53%). For the current period, vegetation was generally good as shown by the NDVI graph where values were near the average and the maximum VCI for this region was 0.96.

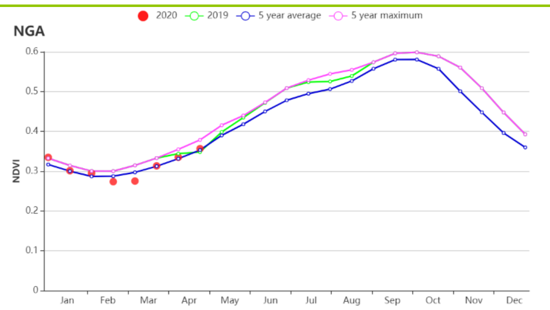
In the **Derived savanna**, which is known as the transition zone between the Guinean savanna and Humid forest zones, the rainfall was 84 mm (-28%) and the temperature was 27.4°C (-0.4°C), while the radiation was 1346 MJ/m2 (+3%). Due to a shortage of rainfall, the total biomass production was reduced by 26 % compared to the 5YA. The cropped land was reduced by -3% and maximum VCIx was 0.82. Vegetation conditions at the national level, based on the NDVI development graph were below average in February only, but subsequently recovered to average values by the end of April.

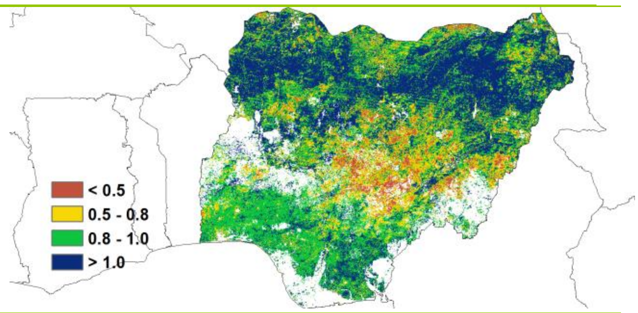
The precipitation in the **Humid forest** zone was 312 mm (-31%) and the temperatures were higher by 0.2°C. On the other hand, radiation was reduced by 12% from the 15YA. Biomass production was also 12% below average. The CALF remains constant at 98% and the maximum VCI was 0.95. NDVI trended below average from January up to March and then shifted closer to average in April.

Figure 3.33 Nigeria's crop condition, January - April 2020

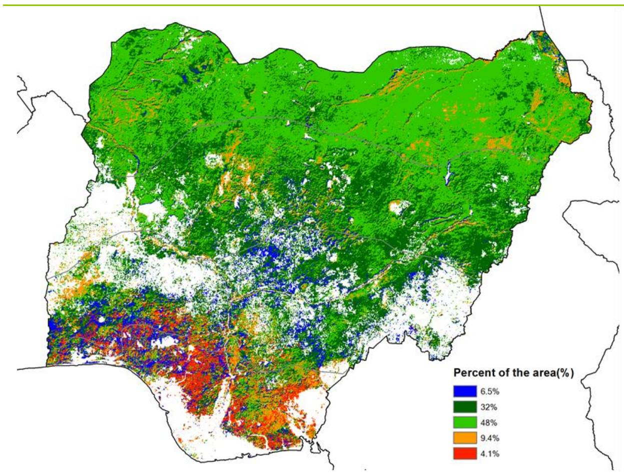


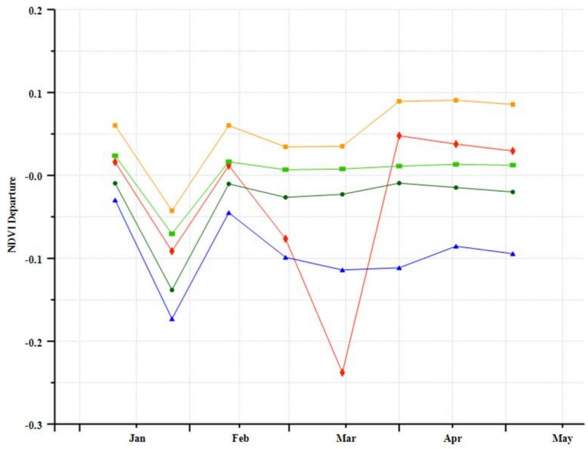
(a). Phenology of major crops



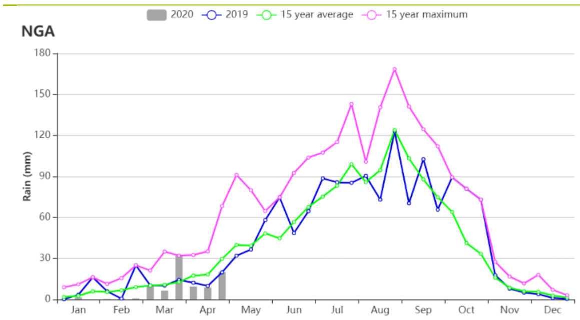


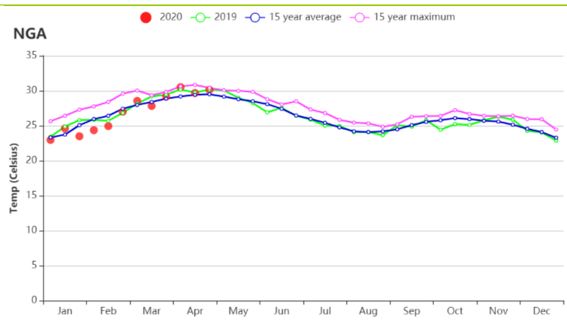
(b) Crop condition development graph based on NDVI (c) Maximum VCI



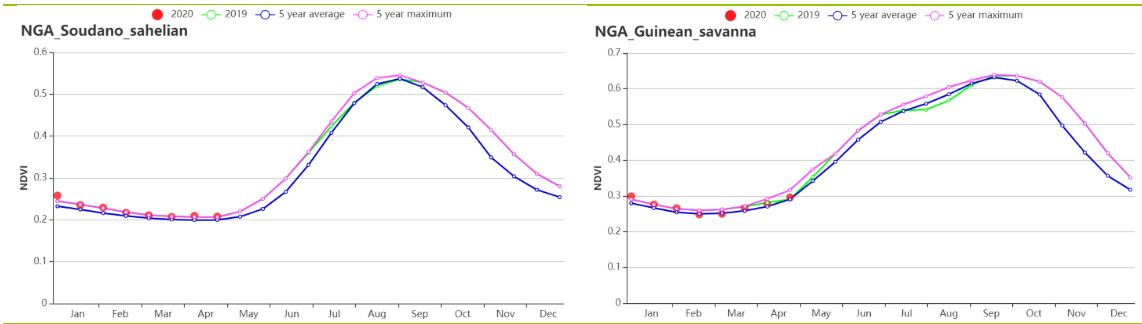


(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles

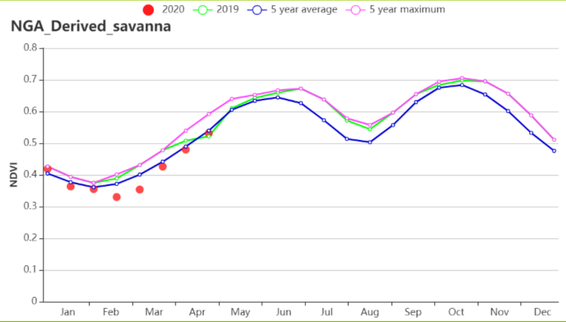


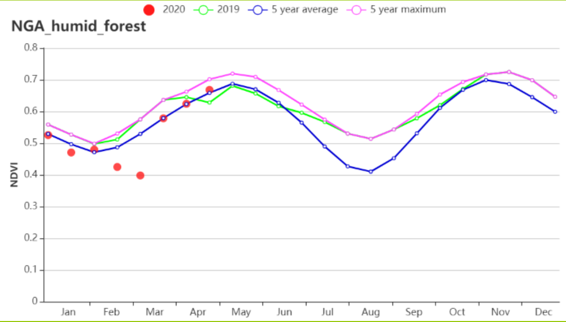


(f) Rainfall profiles (g) Temperature profiles



(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 3.55 Nigeria's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 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	84	-28	27.4	-0.4	1346	3	453	-26
Guinean savanna	7	-71	26.5	-0.1	1379	0	236	-12
Humid forest	312	-31	27.5	0.2	1307	4	705	-11
Soudano sahelian	0	-90	26.4	-0.2	1373	-1	61	-33

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Derived savanna	70	-3	0.82
Guinean savanna	12	53	0.96
Humid forest	98	0	0.95
Soudano sahelian	3	89	1.13

[PAK] Pakistan

The monitoring period covers most of the winter wheat cycle from vegetative stages to harvest. It also touches the field preparation and the sowing of maize. Crop conditions were generally satisfactory from January to April.

Pakistan had abundant precipitation (+43%), cooler temperatures (-1.5°C) and lower photosynthetically active radiation (-5%), as compared to the average for the same period over the past fifteen years. The combination of all the agro-climatic indicators resulted in BIOMSS exceeding the fifteen-year average by 11%. The fraction of cropped arable land (CALF) increased by a very significant 15%， which supports expectations of favorable winter wheat output. As shown by the NDVI development graph at the national level, crop conditions were slightly below average in January due to cooler tempratures, then increased to average or close to the maximum of the last five year period from February to April. The spatial NDVI patterns and profiles showed that 25.6% of the cropped areas were below average, essentially in the north-eastern areas and the sporadic areas of the Center. Punjab and the Indus river basin, two major wheat producing areas, presented an above-average NDVI during the key crop growing period from February to April. Similarly the maximum VCI value of 0.97 for the whole country indicated good conditions at the national level. The values of agronomic indicators show favorable condition so far, and winter wheat prospects are promising. Wheat crop harvesting is completed throughout the Sindh and good yield levels are expected.

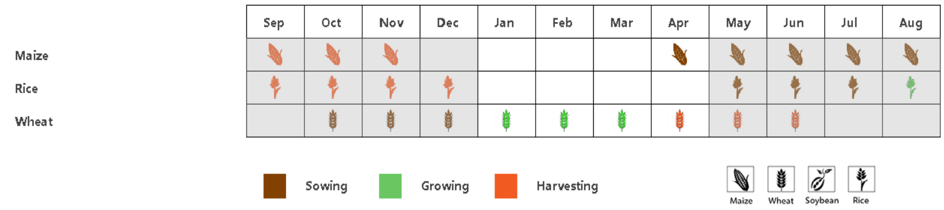
Regional analysis

In the **Northern highlands**, RAIN was 38% below average. RADPAR and TEMP were low compared to the average (-8% and -1.7°C respectively). Accordingly, BIOMSS (-14%) was below average level. The region achieved a relative low CALF of 62% among the three AEZs, but still 33% above 5YA. The NDVI development graph shows above-average or maximum crop condition from February to April. A very favorable VCIx of 1.00 was confirmed.

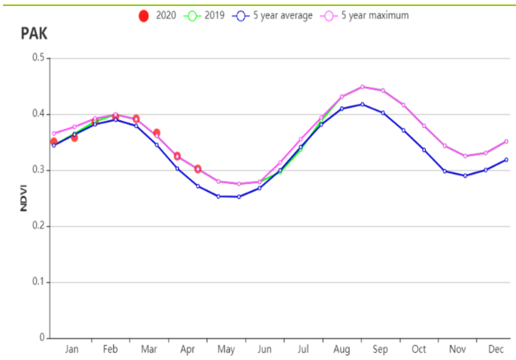
Northern Punjab is the main winter wheat region in Pakistan. It recorded abundant RAIN of 424 mm (131% above average). TEMP was below average by 2.4°C, and the RADPAR departure was -7%. The resulting BIOMSS exceeded the recent fifteen-year average by 6%. From February to early March, crop conditions assessed through NDVI showed lower values than the five-year average, which was caused by rains, hail and windstorms, especially in particular areas of the upper half. They may influence harvesting activities and reduce yields in some regions. But overall the area had a very favorable VCIx of 0.87 and CALF of 90% (4% above 5YA), the projected wheat output is above average.

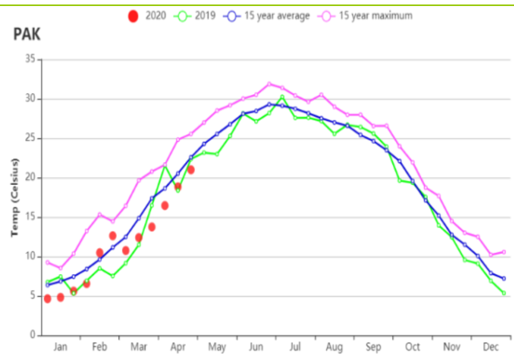
In the **Lower Indus river basin in south Punjab and Sind**, RAIN was significantly above average (+176%), while TEMP was below average by 1.3°C and sunshine was below average as well (RADPAR -4%).The estimated BIOMSS of +34% as compared to the fifteen-year average is probably optimistic, even considering that the vast majority of crops are irrigated. Crop conditions based on the NDVI profile were close to or above average, together with an increase in CALF (72%) over the recent 5YA (+13%); VCIx at 0.94 indicates favorable crop condition. Overall, prospects remain favorable for the region.

Figure 3.34 Pakistan crop condition, January 2020 - April 2020



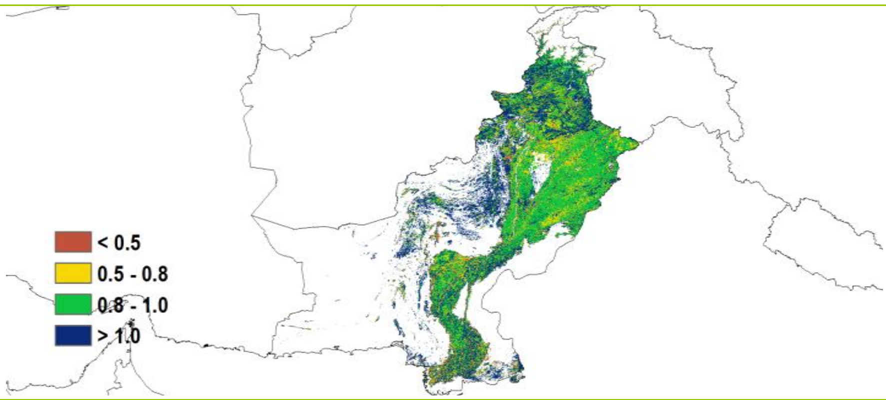
(a). Phenology of major crops



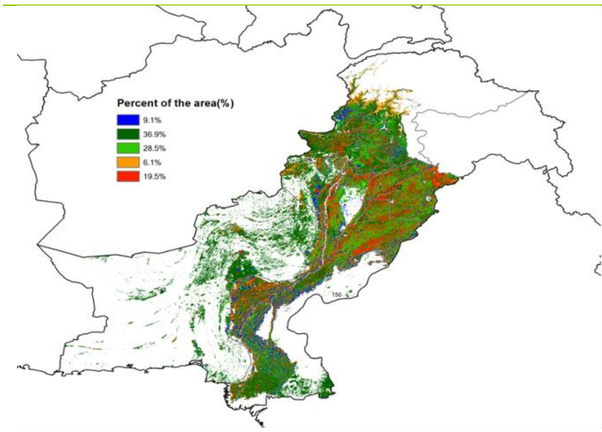


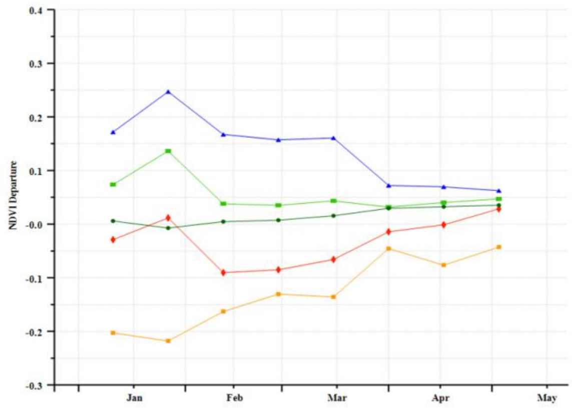
(b) Crop condition development graph based on NDVI

(c) Time series temperature profile



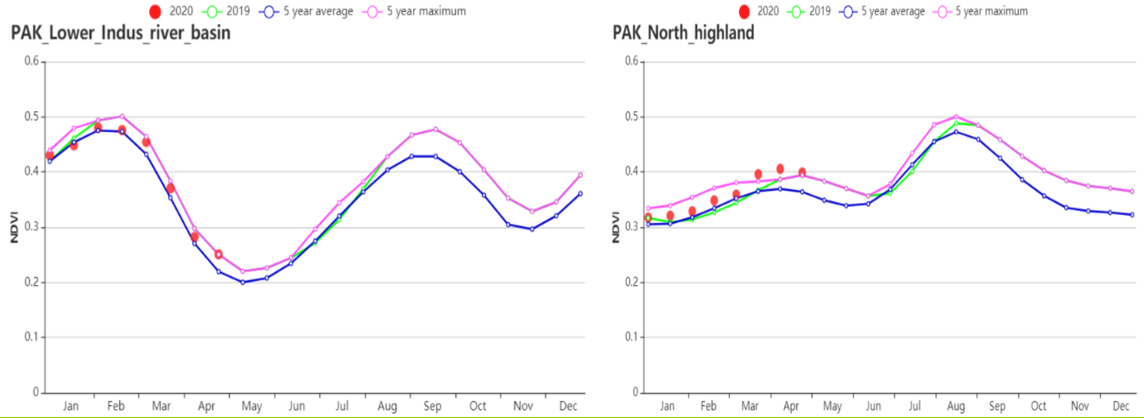
(d) Maximum VCI



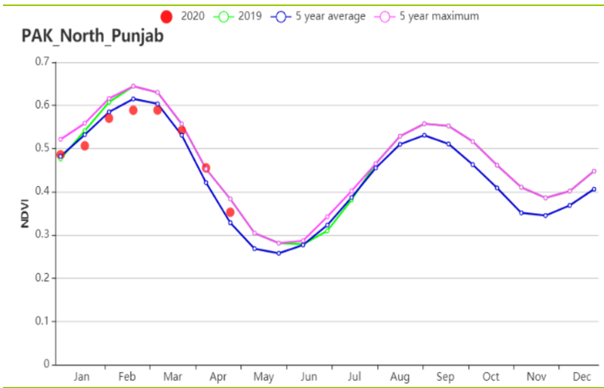


(e) Spatial NDVI patterns compared to 5YA

(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 3.57 Pakistan's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 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	124	176	20.9	-1.3	1121	-4	419	34
Northern highlands	601	38	6.4	-1.7	874	-8	237	-14
Northern Punjab	424	131	16.1	-2.4	947	-7	443	6

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Lower Indus river basin in south Punjab and Sind	72	13	0.94
Northern highlands	62	33	1.00
Northern Punjab	90	4	0.87

[PHL] Philippines

This reporting period covers the early sowing of main maize and main rice, the growth and early harvesting of secondary maize and the harvesting of secondary rice in the Philippines. As the national NDVI profile shows, it was close to average throughout the monitoring period. All in all, the crop conditions for the country were stable and close to average.

Nationwide, this country suffered a great precipitation deficit (RAIN, -46%) compared to 15YA. However, the temperature (TEMP, +0.3℃) and radiation (RADPAR, +6%) for the country were higher than average, resulting in an above-average potential biomass production (BIOMASS, +3%). The cropped arable land fraction (CALF) for the country was almost 100% and the national maximum VCI value was at 0.95.

Considering the spatial patterns of NDVI profiles, about 4% of crop land, mainly around Davao city, Mindanao island, had a lower NDVI, which dropped up to 0.45 NDVI units from late January to the middle of February, and recovered in the middle of March, as compared to average. This drop is presumably due to cloud cover in the satellite images or smog. A similar anomaly was observed for another 6.5% of the crop land, mainly located in the east of Vigan and Baguio, Luzon island. Around 89.5% of crop land had a stable NDVI, which is close to the average. According to maximum VCI graph, most parts of the country had a high maximum VCI value (VCIX > 0.8), which means the prospects for second maize and second rice will be favorable.

Regional analysis

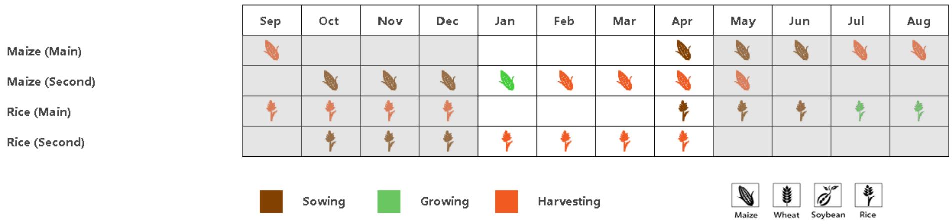
Based on the cropping systems, climatic zones and topographic conditions, three main agro-ecological regions can be distinguished for the Philippines. They are the **Lowlands region** (northern islands), **the Hilly region** (Island of Bohol, Sebu and Negros), and **the Forest region** (mostly southern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

The Lowlands region shared an average temperature (TEMP +0.2℃) and above-average RADPAR (+5%), however, the rainfall (RAIN -38%) for the region was less than average. The potential biomass production (BIOMASS) for the region was close to the average of the previous 5 years. The regional maximum VCI value (VCIx) was at 0.94. As the NDVI profile shows, the NDVI for the region was close to average the whole reporting period except for early January and early April, when it had a lower NDVI than the 5YA.

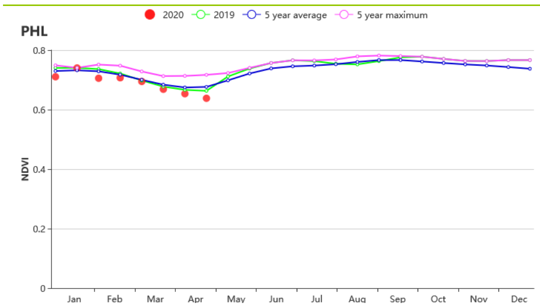
The Negros and central Visayas Islands region had a great rainfall deficit (RAIN -53%), relatively higher temperature (TEMP +0.5℃) and above-average radiation (RADPAR +8%). The potential biomass production (BIOMASS, +6%) for the region was higher than the 5YA. The regional maximum VCI value (VCIx) was at 0.96. According to the NDVI profile, the NDVI for the region was less than average in early February and in late April. From the middle of March to early April, the NDVI was about average. At other times, the regional NDVI was slightly higher than the 5YA.

The Forest region experienced a great rainfall deficit (RAIN -49%), slightly above average temperature (TEMP +0.4°C) and above-average radiation (RADPAR +8%). The potential biomass production there was above average by 5% (BIOMASS +5%) and the maximum VCI index was at 0.95, which shows a great crop production. According to the NDVI profile, the regional NDVI was close to average in January and less than average in early February. After that, it was close to average from the middle of February to the middle of April and it was less than the average of the past 5 years in late April.

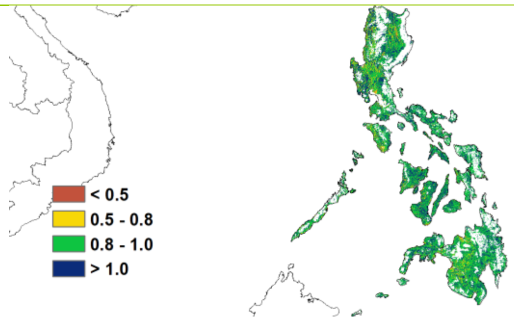
Figure 3.35 Philippines' crop condition, January - April 2020



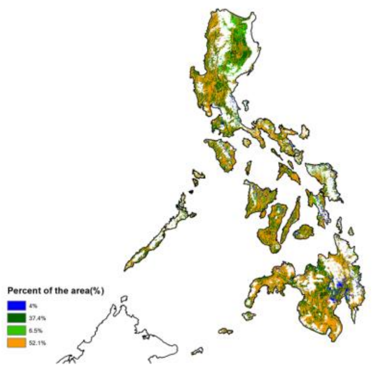
(a). Phenology of major crops



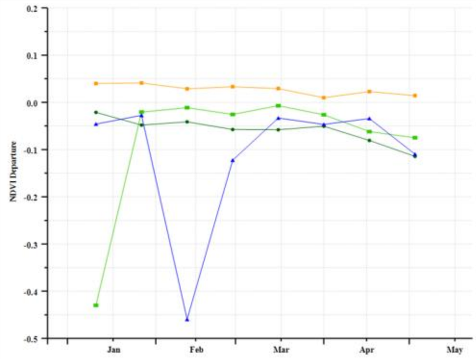
(b) Crop condition development graph based on NDVI



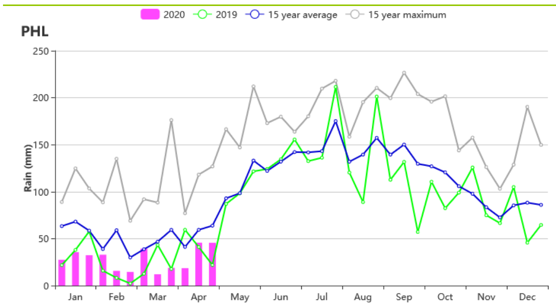
(c) Maximum VCI



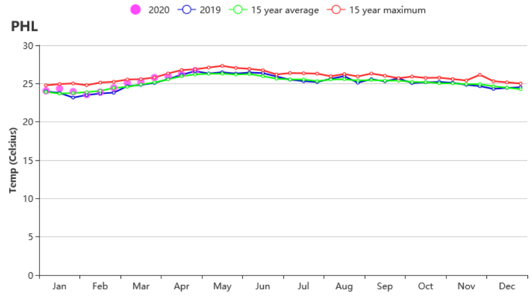
(d) Spatial NDVI patterns compared to 5YA



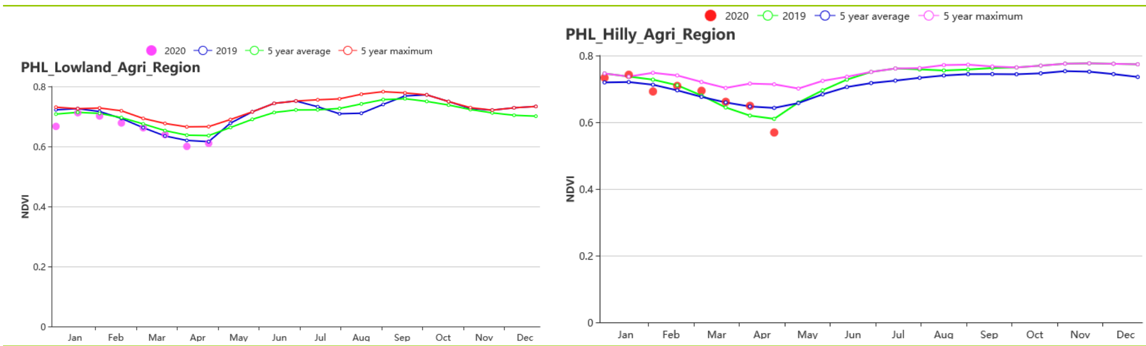
(e) NDVI profiles



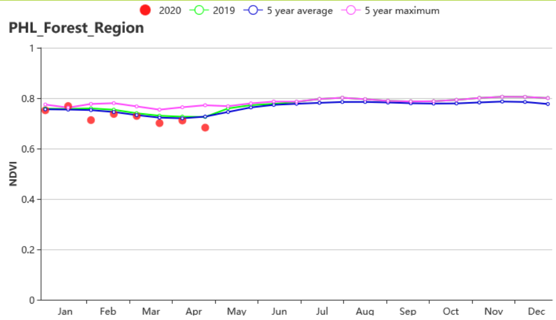
(f) Rainfall profiles



(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 3.59 Philippines' agro-climatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 2020

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Forest region	429	-49	25.1	0.4	1246	6	833	5
Hilly region	274	-53	26.9	0.5	1341	8	895	6
Lowlands region	256	-38	24.5	0.2	1167	5	723	0

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Forest region	100	0	0.95
Hilly region	100	0	0.96
Lowlands region	99	0	0.94

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[POL] Poland

During this monitoring period, winter wheat went from the spring green-up to the stem elongation phase in Poland. Due to warmer weather (TEMP: +2.0°C) and abundant sunshine (RADPAR: +11%), the potential biomass level was 10% higher despite below average precipitation (RAIN: -11%). Except for a few areas in the south and central part of the country, the VCIx was above 0.80 for most of the cultivated land. Overall, winter crop growth appears to be average, but precipitation will be needed to supply crop growth in the coming weeks.

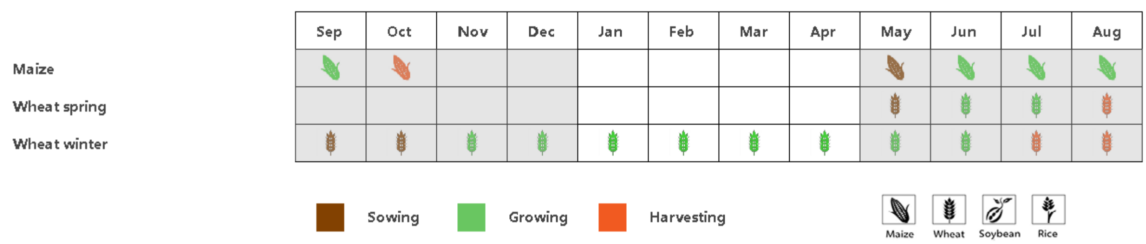
As can be seen from the crop growth graph, NDVI levels were above average throughout the country till April due to the warm climate and heavy precipitation in January and February. Subsequently NDVI dropped to below average in April due to the low precipitation starting March. The NDVI cluster map shows that only 15.1% of the cultivated land NDVI was consistently below average, mainly sporadically distributed in the southern, northern and western regions, but with the drought since March, 72.5% of the NDVI pixels were below average in late April.

Regional analysis

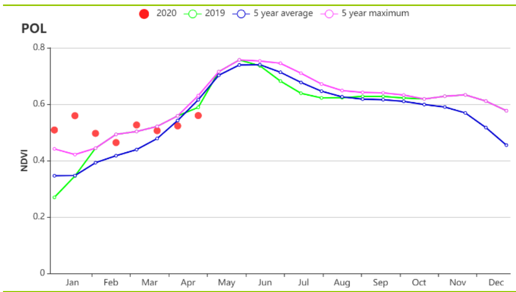
Four agro-ecological zones (AEZ) are examined more closely below. They include the **Northern oats and potatoes area** (the northern half of: west Pomerania, eastern Pomerania and Warmia-Masuria), the **Northern-central wheat and sugar-beet area** (Kuyavia-Pomerania to the Baltic sea), the **Central rye and potatoes area** (Lubusz to South Podlaskie and northern Lublin), and the **Southern wheat and sugar-beet area** from southern Lower Silesia to southern Lublin and Subcarpathia along the Czech and Slovak borders. The listed administrative units correspond to voivodeships.

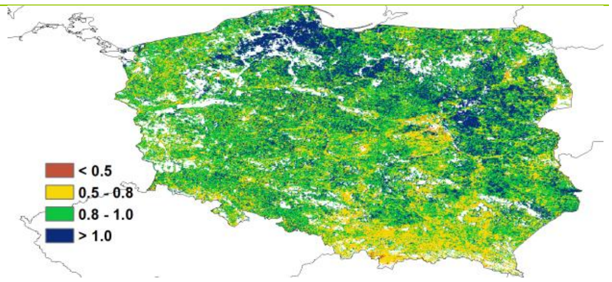
In terms of agroclimatic and agronomic indicators, the four subregions (Northern oats and potatoes area, Northern-central wheat and sugar-beet area, Central rye and potatoes area and Southern wheat and sugar-beet area) showed almost identical characteristics, with low precipitation (mainly in March and April, RAIN: -10%, -11%, -9% and -14%, respectively), high average temperature and sunshine (TEMP: +2.3°C, +2.3°C, +2.1°C and +1.7°C, respectively; RADPAR: +7%, +7%, +11% and +14%, respectively) and high potential biomass (+11%, +10%, +12% and +8%, respectively). The cultivated land with low VCIx is mainly located in the central and southern wheat producing regions. Its VCIx was lower than in the other three subregions, but still relatively high at 0.84.

Figure 3.36 Poland's crop condition, January-April 2020



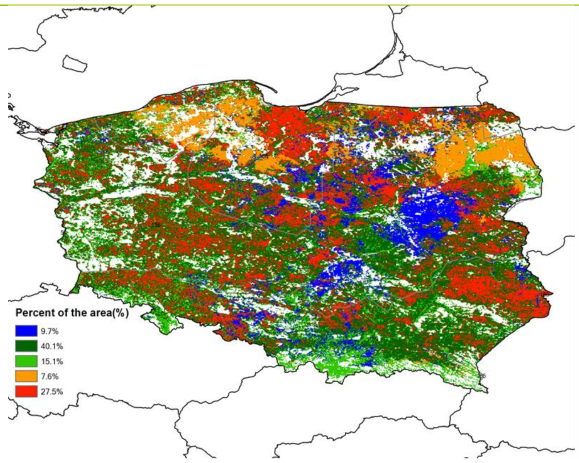
(a). Phenology of major crops

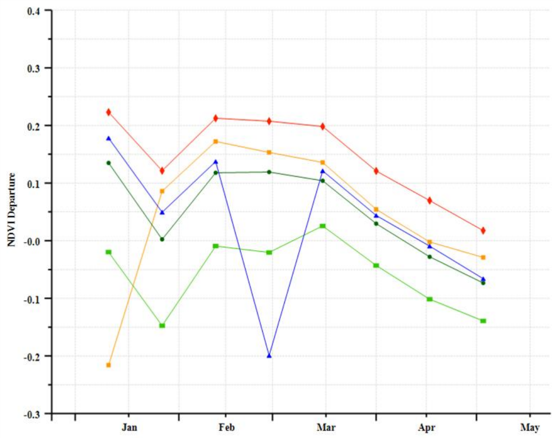




(b) Crop condition development graph based on NDVI

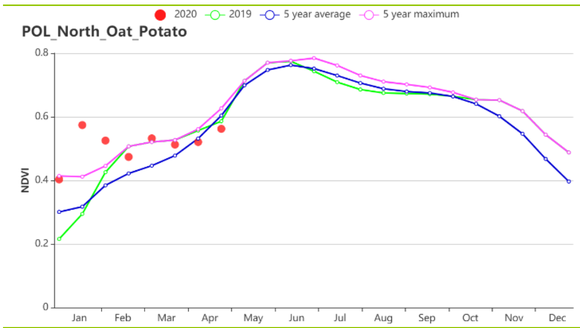
(c) Maximum VCI

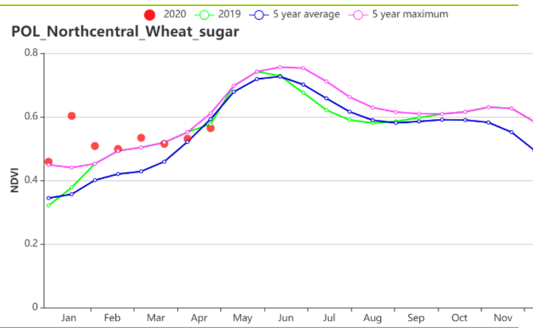




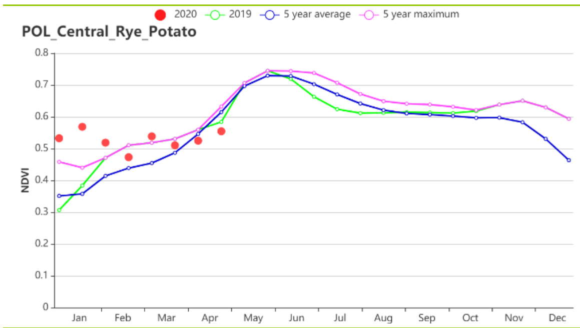
(d) Spatial NDVI patterns compared to 5YA

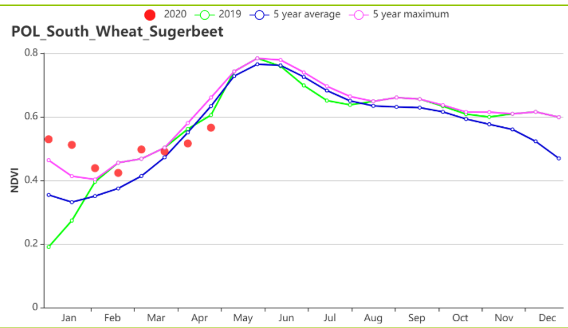
(e) NDVI profiles



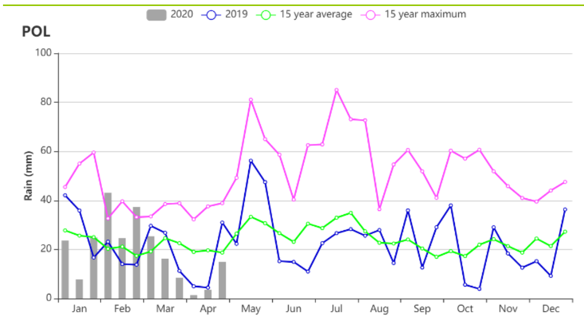


(f) Crop condition development graph based on NDVI, Northern oats and potatoes area (left) and Northern-central wheat and sugar beet area (right).

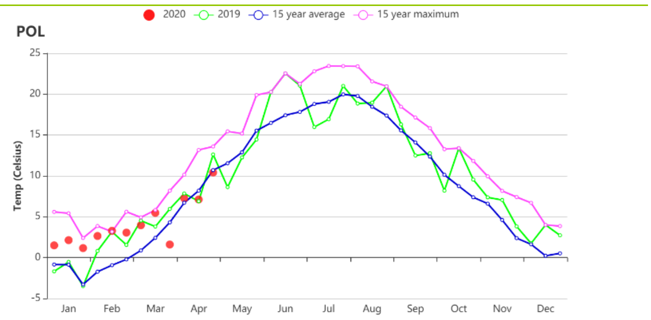




(g) Crop condition development graph based on NDVI, Central rye and potatoes area (left) and Southern wheat and sugar beet area (right).



(h) Rainfall index



(i) Temperature Index

Table 3.61 Poland's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January-April 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/m^2)	Departure from 15YA (%)
Northern oats and potatoes areas	243	-10	4	2.3	471	7	101	11
Northern-central wheat and sugarbeet area	218	-11	4.5	2.3	493	7	110	10
Central rye and potatoes area	231	-9	4.6	2.1	518	11	118	12
Southern wheat and sugarbeet area	231	-14	3.5	1.7	582	14	121	8

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

Region	Cropped arable land fraction		Maximum VCI
	Current	Departure from 5YA (%)	Current
Northern oats and potatoes areas	99	1	0.94
Northern-central wheat and sugarbeet area	99	1	0.98
Central rye and potatoes area	99	0	0.90
Southern wheat and sugarbeet area	98	-1	0.84

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[ROU] Romania

Winter wheat is the main crop that is grown in Romania during this reporting period. It was sown in last October. At the national level, rainfall was 34% below average, down to 179 mm; average temperature was 1.2℃ higher and radiation 11% above average. With fair temperature and radiation conditions, the influence of low rainfall should be noted, as water supply is vital for wheat growth. Due to the low rainfall, biomass decreased by 2%. The CALF of Romania decreased by 8% and current maximum VCI is at 0.77, which is unfavorable for production. According to the NDVI at the country level, crop conditions were above average in March and lower than average in April, which was consistent with the low rainfall in April.

Regional analysis

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

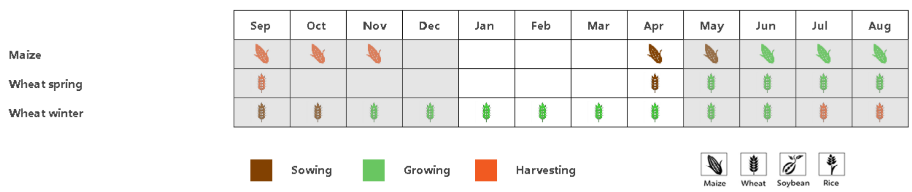
For the **Central mixed farming and pasture Carpathian hills**, compared to the 15YA, rainfall decreased by as much as 28%, while temperature and radiation were both up (TEMP +1.0℃ , RADPAR +12%) and BIOMSS increased by 1%. According to the NDVI development, crop conditions were better than average in January and February but lower than average in March and April. The regional average VCI maximum was at 0.76. The NDVI spatial distribution shows that the NDVI was decreasing in March to April. As the central mixed farming and pasture Carpathian hills occupy only a small fraction of cropland in Romania, this region's low NDVI is not significant for Romania's crop production.

For the **Eastern and Southern maize, wheat and sugar beet plains**, rainfall decreased by 43%, temperature increased 1.7 ℃, radiation increased 8% and biomass increased 3% as compared to the 15YA. The NDVI development graph shows that crop condition dropped to below average after March. The VCI max value of this region was 0.78 and according to the distribution map, the blue and red line shows that VCI values were decreasing in March in most of the central and middle region, especially in the southeast area of this sub-region (counties of Tulcea and Constanta), representing about 14.3% of the national cropland. They indicate slightly unfavorable crop conditions.

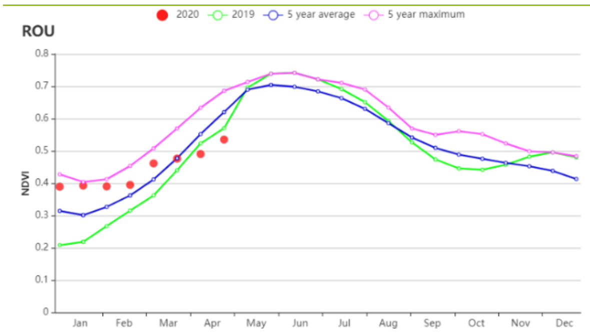
For the **Western and central maize, wheat and sugar beet plateau**, rainfall was lower than average by 25%, temperature and radiation were somewhat higher (TEMP +0.4℃, RADPAR +9%) and biomass decreased by 11%. Maximum VCI of this region was 0.77 and the spatial distribution was between 0.5 and 0.8 near the middle region. NDVI dropped below the 5YA starting in mid March.

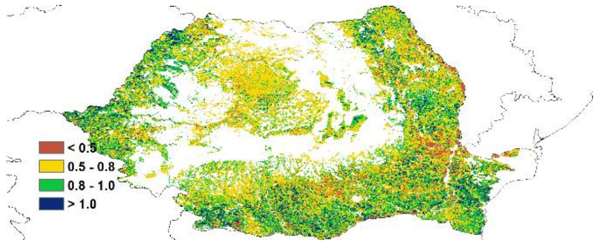
Overall, crop conditions were not optimal in Romania during this reporting period. Winter wheat already suffered from drier-than-normal conditions between October and January. Rainfall in the coming months will be critical for sustained crop growth. Currently, the outlook for the 2020 wheat harvest in Romania is unfavorable.

Figure 3.37 Romania's crop condition, January – April 2020



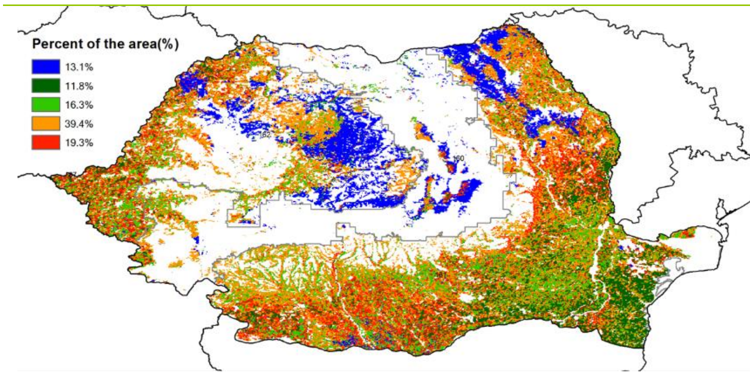
(a). Phenology of major crops

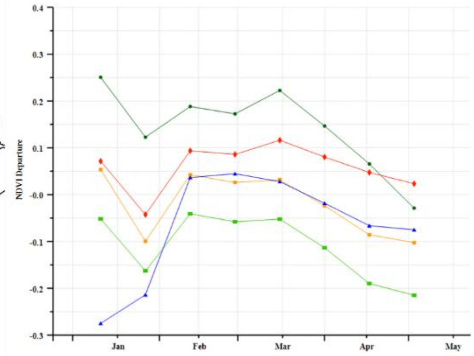




(b) Crop condition development graph based on NDVI

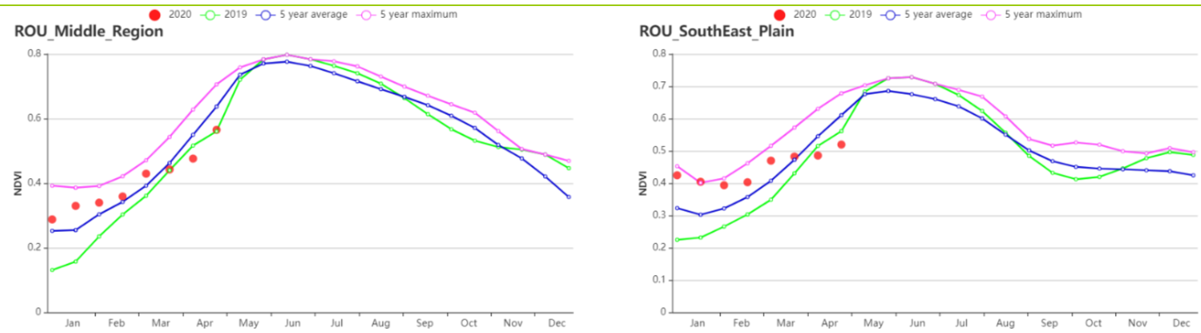
(c) Maximum VCI



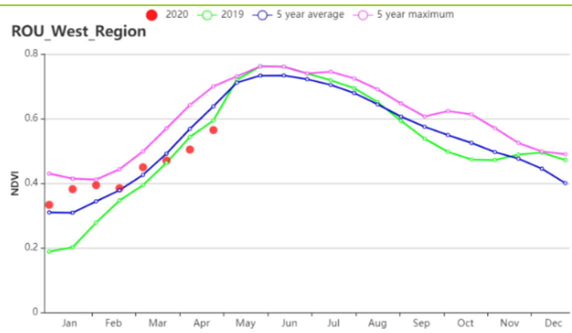


(d) Spatial NDVI patterns compared to 5YA

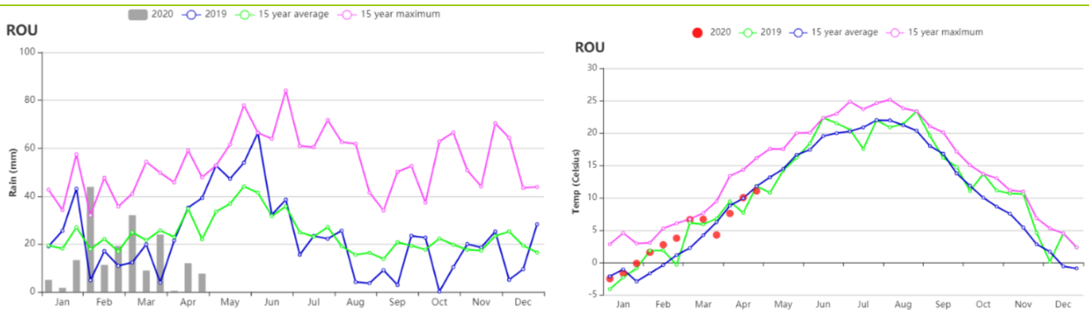
(e) NDVI profiles



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



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



(h) Rainfall index (i) Temperature index

Table 3.63 Romania's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January – April 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 (%)
Central mixed farming and pasture Carpathian hills	220	-28	2.4	1	702	12	130	1
Eastern and southern maize, wheat and sugar beet plains	144	-43	5.3	1.7	722	11	162	3
Western and central maize, wheat and sugar beet plateau	212	-25	3.4	0.4	690	9	130	-11

Table 3.64 Romania's agronomic indicators by sub-national regions, current season's values and departure from 5YA, January – April 2020

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current
Central mixed farming and pasture Carpathian hills	93	-5	0.76
Eastern and southern maize, wheat and sugar beet plains	85	-9	0.78
Western and central maize, wheat and sugar beet plateau	92	-6	0.77

[RUS] Russia

This period covers the spring green up of winter wheat and the beginning of the sowing periods for maize and spring wheat.

At the national level, NDVI stayed near the 15-year maximum until mid-March. Subsequently, it dropped to the long-term average. Precipitation was generally also above the 15-year average. Especially April was wetter than normal, but not in all parts of the country. Temperatures followed a similar trend: they were above average until March and then followed the long-term average.

The main regions of winter crop production showed positive NDVI departures during most of this monitoring period. In Middle Volga VCI was above 1. In April NDVI departure was negative in Central Russia and Central black soil regions, as well as in some parts of Northern and Southern Caucasus. VCI for these areas varied from <0.5 to 1.

Regional analysis

Southern Caucasus

Rainfall was below the 15YA (RAIN, -28%), whereas TEMP (+0.9°C) and RADPAR (+6%) were above average. The severe rainfall shortage resulted in a biomass decrease by 1% as compared to the 15YA. CALF was 10% below the 5YA. VCI was 0.77.

In February and March NDVI was above the level of the previous year and the 5YA. In April it was close to the level of the previous year but below the 5YA.

Northern Caucasus

Similar to the Southern Caucasus, precipitation was also lower in this region (-24%) as compared to the 15-year average. Temperature was 2°C above the 15YA and RADPAR was 5% above the 15YA. Nevertheless, estimated biomass production exceeded the 15YA by 3%. CALF was 16 % below the 5YA. VCI was 0.74.

In February and March NDVI was mainly above the 5-year maximum. In April it dropped below the 5YA and the level of the previous year.

Central Russia

Precipitation was 17% above the 15YA. Air temperature was 3.8°C above the 15YA. RADPAR was 14% below the 15YA. Modeled biomass (BIOMSS) was 17% below the 15YA. CALF was also below the 5YA (-23%) and VCI was 0.88.

In February and March NDVI was above the 5-year maximum. In April it decreased to the level of the previous year which was close to the 5YA.

Central black soil area

Rainfall was 8% above the 15YA. Temperature was 3.4°C above the 15YA. RADPAR was 8% below the 15YA. These factors led to a decrease in estimated biomass (BIOMSS) by 9% as compared to the 15YA. CALF was 23 % below the 5YA. VCI was 0.75.

During the main part of the analyzed period, NDVI was above the 5-year maximum. In April it dropped to the level of the previous year and the 5YA.

Middle Volga

Precipitation exceeded the 15YA by 38 %. Air temperature was 4.3 °C above the 15YA. RADPAR was 8 % below 15-year average. Increase in rainfall combined with RADPAR shortage resulted in biomass decrease by 13 % compared to the 15YA. CALF was 2% above the 5YA. VCI was 0.92.

From February to March NDVI stayed close to the 5-year maximum. In April it decreased to the 5YA.

Ural and western Volga

Rainfall exceeded the 15YA by 34%. Temperature was 4.9°C above the 15YA. RADPAR decrease by 15%

as compared to the 15YA. Shortage of RADPAR led to biomass reduction by 4% as compared to the 15YA. CALF was 5% below 5YA. VCI was 0.97.

Except the drop in March, NDVI stayed close to the level of the previous year and 5YA.

Western Siberia

Rainfall was 39% above the 15YA. Air temperature exceeded the 15YA by 5.6 °C. RADPAR was 12% below the 15YA. Biomass increased by 11% as compared to the 15YA. CALF was 191 % above the 5YA.

In February and March NDVI stayed below the 5YA and the level of the previous year. In April it increased significantly reaching the 5-year maximum.

Middle Siberia

Precipitation was slightly above the 15YA (+ 6%). Air temperature was 3.6°C above the 15YA. RADPAR was close to the 15YA. Due to favorable agroclimatic conditions biomass increased by 19% as compared to the 15YA. CALF was 219 % above the 5YA. VCI was 1.

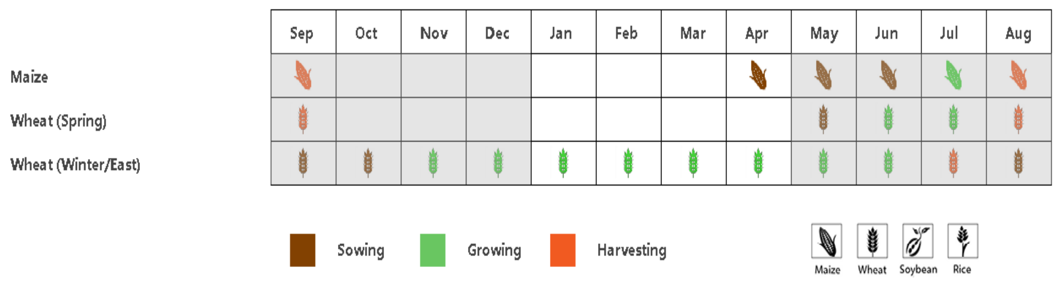
In February and March NDVI stayed below the level of the previous year and the 5YA. In April it increased, reaching the 5YA.

Eastern Siberia

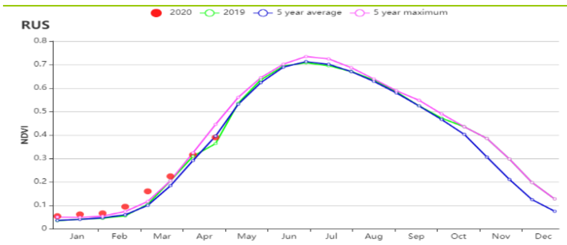
Rainfall was 22 % below the 15YA. Air temperature was 2.6°C above the 15YA. RADPAR was 1% above the 15YA. Biomass was 7% above the 15YA. CALF was 48% above the 5YA. VCI was 0.88.

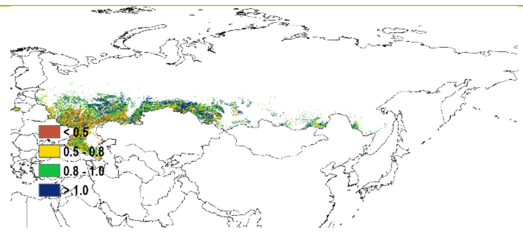
During the analyzed period NDVI was at the level of the 5YA.

Figure 3.38Russia's crop condition, January - April 2020

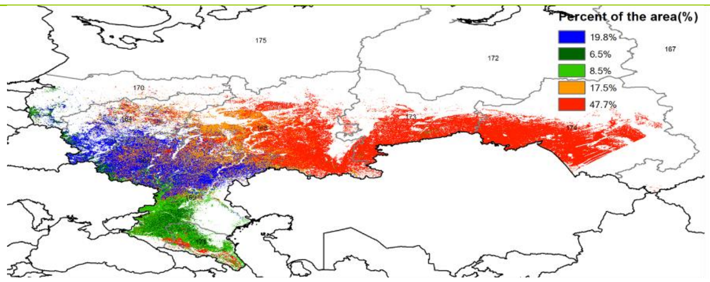


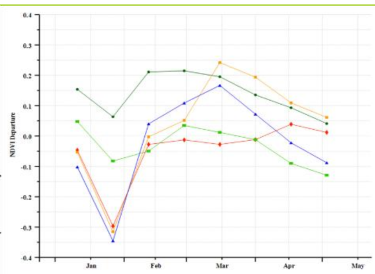
(a) Phenology of major crops



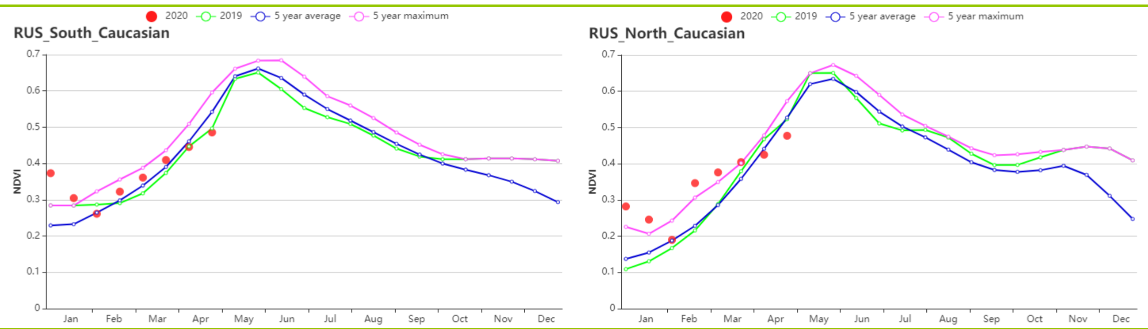


(b) Crop condition development graph based on NDVI (c) Maximum VCI

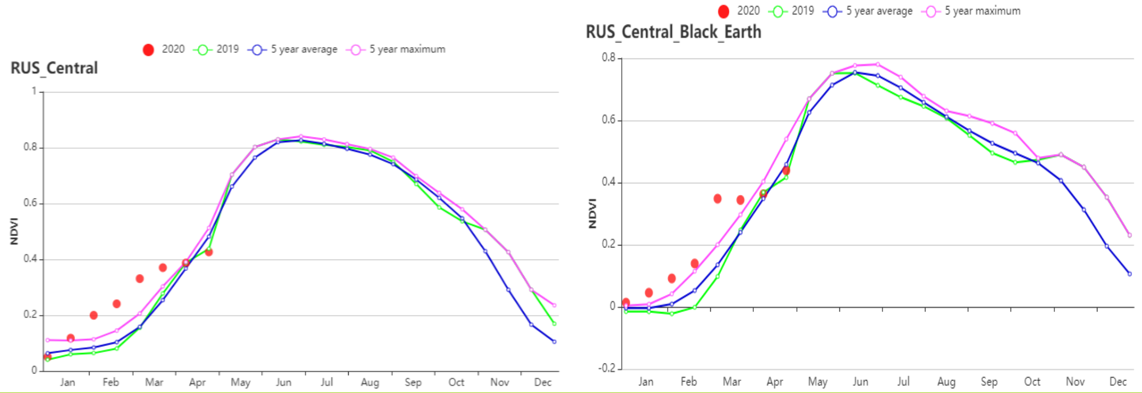




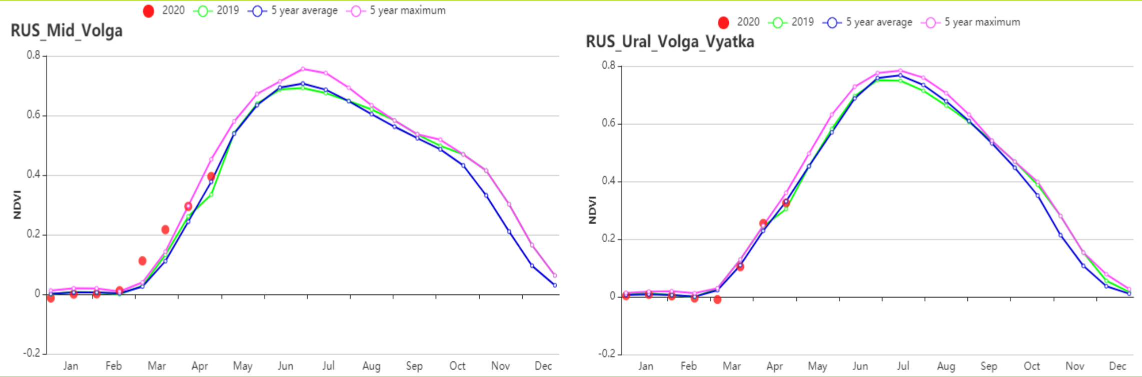
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



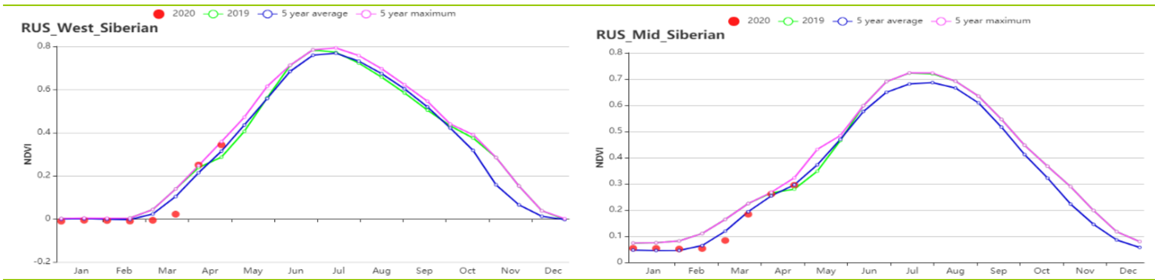
(f) Crop condition development graph based on NDVI (Southern Caucasus (left) and Northern Caucasus (right))



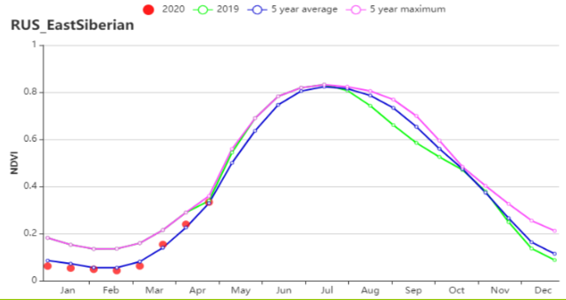
(g) Crop condition development graph based on NDVI (Central Russia (left) and Central black soils area (right))

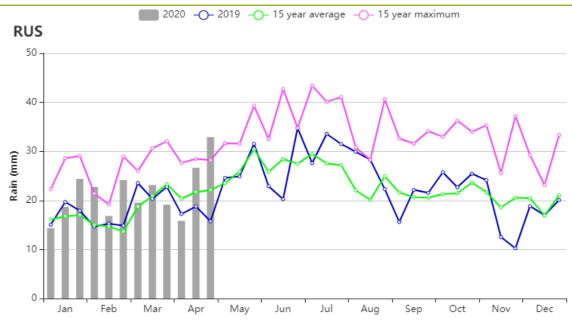


(h) Crop condition development graph based on NDVI (Middle Volga (left) and Ural and western Volga region (right))

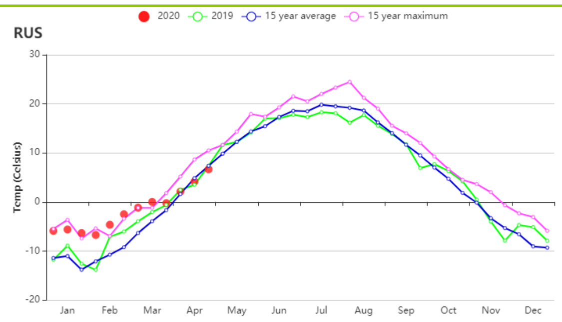


(i) Crop condition development graph based on NDVI in the Western Siberia (left) and the Middle Siberia (right)





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



(l) Temperature index

Table 3.65 Russia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 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	122	-1	-7.9	2.8	680	-2	86	2
Central Russia	305	17	0.5	3.8	333	-14	56	-17
Central black soils area	278	8	1.1	3.4	422	-7	78	-9
Eastern Siberia	159	-22	-7.7	2.6	650	1	81	7
Middle Siberia	130	6	-8.3	3.6	632	0	82	19
Middle Volga	343	38	-1.1	4.3	360	-18	61	-13
Northwest Region including Novgorod	313	17	0.7	3.5	337	-7	56	-10
Northern Caucasus	194	-24	3.3	2.1	618	5	132	3
Southern Caucasus	206	-28	2.1	0.9	712	6	140	-1
Ural and western Volga region	248	34	-2.7	4.9	372	-15	60	-4
Western Siberia	253	39	-2.9	5.6	428	-12	75	11
West subarctic region	342	25	-2.4	3.8	274	-8	38	-9

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Amur and Primorsky Krai	4	-7	0.90
Central Russia	53	-23	0.88
Central black soils area	43	-23	0.75
Eastern Siberia	26	47	0.88
Middle Siberia	10	219	1.01
Middle Volga	27	2	0.92
Northwest Region including Novgorod	62	-10	0.82
Northern Caucasus	59	-16	0.74
Southern Caucasus	68	-10	0.77
Ural and western Volga region	8	-5	0.97
Western Siberia	11	191	1.02

West subarctic region	17	-5	0.82

[THA] Thailand

During the monitoring period from January to April, the harvest of Thailand's main (monsoon) rice was completed in early January, while the second season rice was ready for harvest in April. Monsoon crops (maize and rice) are in their very early stages.

According to CropWatch agroclimatic indicators, Thailand experienced drier weather compared to the 15YA. The rainfall from January to April was significantly below average by 40%, while temperature (+0.7°C) and radiation (+4%) were up, which led to a decrease of biomass production potential (BIOMSS) by 4%. As shown in the development of NDVI graph, crop conditions at the country level were considerably below the 5-year average. According to the NDVI profiles, crop condition was above average in some patches in Nong Khai, Roi Et, Si Saket, Ubon Ratchathani, Surin and Sa Kaeo, covering 19.1% of total arable land. This was confirmed by VCIx map. Crop conditions in 40.9% of the arable land, mostly located in the northeast and center of Thailand, were below average until mid-March. Subsequently, they improved to close to, but still below average levels in early April. The crop conditions in the remaining areas were always below average during the monitoring period. Due to the ongoing drought, the government had restricted irrigation, which in combination with far below-average levels of rainfall until mid-April, caused unfavorable conditions. A rather low VCIx of 0.70 and a CALF decrease by 5% in combination with generally below average NDVI levels, indicate poor conditions for second season rice production.

Regional analysis

The regional analysis below focuses on some of the already mentioned agro-ecological zones of Thailand, of which some 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 numbers correspond to the labels in the VCIx and NDVI profile maps.

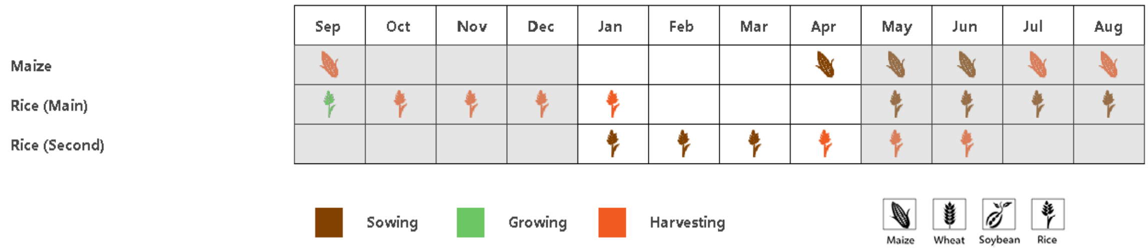
Indicators for the **Central double and triple-cropped rice lowlands** follow the same patterns as those for the country as a whole: temperature (TEMP +0.9C) and radiation (RADPAR +2%) were above average, and accumulated rainfall was significantly below (RAIN -34%), resulting in an average biomass production potential (BIOMSS, +1%). According to the NDVI development graph, crop conditions were below the 5YA. Overall, the situation was below average considering the unfavorable VCIx value of 0.57 and a large decrease in the fraction of cropped arable land (CALF) by 22%.

The rainfall of the **South-eastern horticulture area** suffered a decrease of 12%, while temperature (TEMP +0.7°C) and radiation (RADPAR +5%) experienced the same changes as the whole country, which led to an increase of biomass production potential by +10%. However, according to the NDVI development graph, crop conditions were below average. Fair VCIx value of 0.78 and slightly lower fraction of cropped arable land (CALF -2%) confirm that crop conditions were unfavorable during this monitoring period.

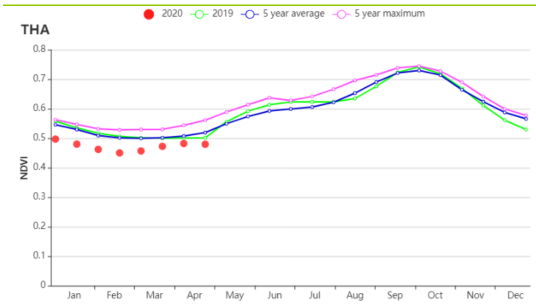
Crop condition in the **Western and southern hill areas** were unfavorable according to the agroclimatic indicators (TEMP +0.6°C, RADPAR +3%, and BIOMSS -9%), mainly due to the deficit of rainfall (-48%). According to the NDVI development graph, crop conditions were below average.

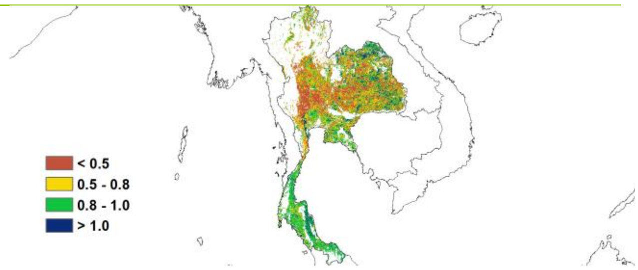
Finally, the situation in the **Single-cropped rice north-eastern region** was also unsatisfactory. According to CropWatch indicators, rainfall (RAIN -35%) was below average, while temperature (TEMP +0.9°C) and radiation (RADPAR +5%) were above average, leading to a slightly subnormal production potential (BIOMSS -1%). According to the NDVI development graph, crop conditions were slightly below average. However, they improved slightly in early April.

Figure 3.39 Thailand's crop condition, January - April 2020



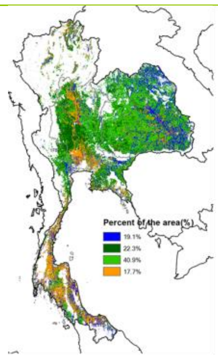
(a). Phenology of major crops

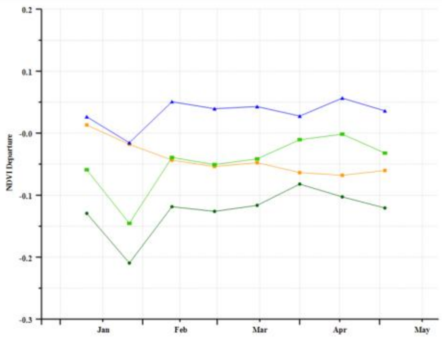




(b) Crop condition development graph based on NDVI

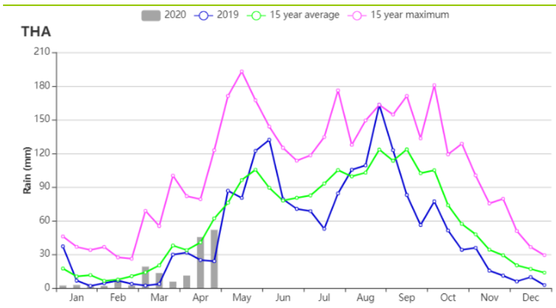
(c) Maximum VCI

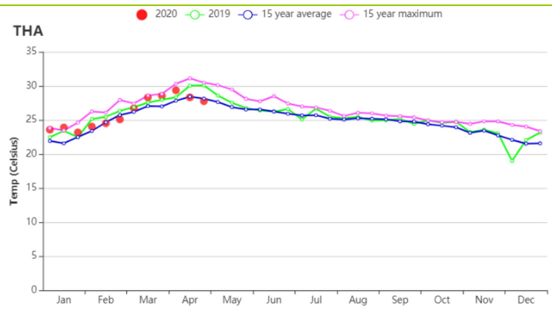




(d) Spatial NDVI patterns compared to 5YA

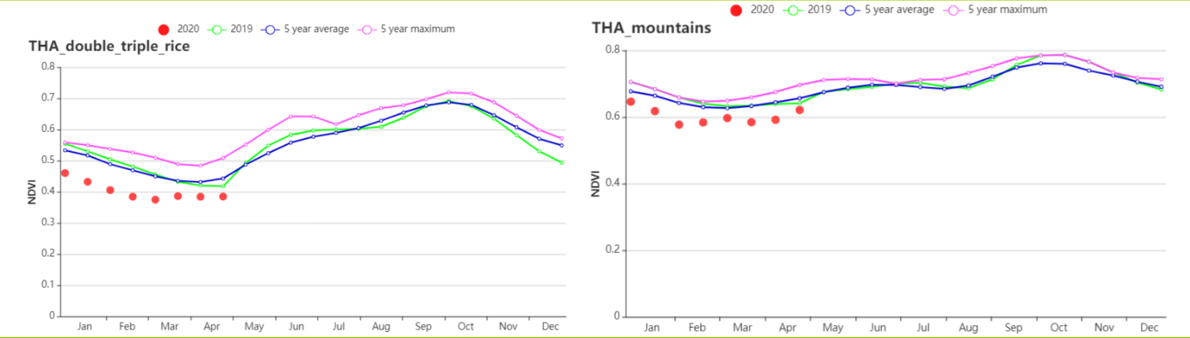
(e) NDVI profiles



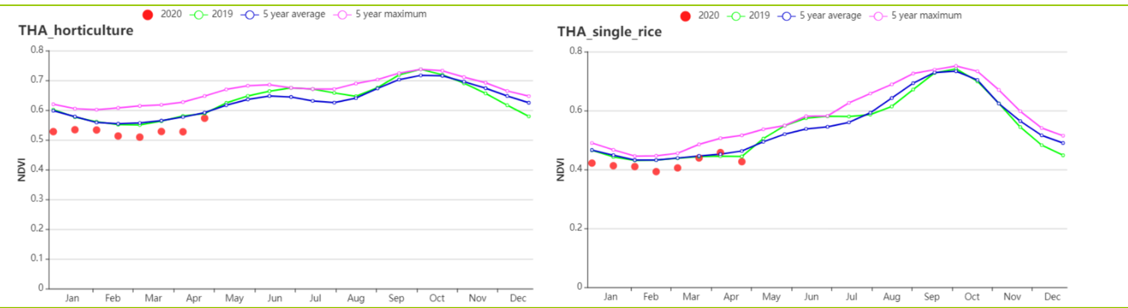


(f) Rainfall profiles

(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 3.67 Thailand's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 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	130	-34	27.9	0.9	1191	2	604	1
South-eastern horticulture area	298	-12	27.3	0.7	1245	5	810	10
Western and southern hill areas	158	-48	24.9	0.6	1254	3	589	-9
Single-cropped rice north-eastern region	154	-35	26.7	0.9	1161	5	588	-1

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Central double and triple-cropped rice lowlands	68	-22	0.57
South-eastern horticulture area	93	-2	0.78
Western and southern hill areas	93	-4	0.78
Single-cropped rice north-eastern region	68	4	0.71

[TUR] Turkey

Crop conditions in Turkey were below average during the whole monitoring period, but improved to close to average in late April. Maize and rice were planted at the end of the reporting period, while winter wheat was still at the late vegetative stage. Rainfall (RAIN, +5%) was above average, while sunshine (RADPAR, -2%) and temperature (TEMP, -0.3°C) were somewhat below average, which led to the below-average potential biomass (BIOMSS, -10%). The cropped arable land fraction (CALF) decreased by 3% and the maximum VCI was 0.77.

According to the spatial NDVI patterns map, crop conditions were above average mainly in and around the provinces of Edirne, Tekirdag, Kirklareli, Balikesir, Manisa, Izmir, and Aydin in western and north-western Turkey and in some areas including the provinces of Hatay, Sanliurfa and Mardin in south-eastern Turkey. The situation of consistently below-average NDVI prevailed in the eastern, central and west of central parts of Turkey, mainly in the provinces of Bolu, Bilecik, Kutahya, Eskisehir, Afyonkarahisar, Sivas, Bingol, Mus, Erzurum and Bitlis. Overall, the production of winter crops can be expected to be close to average if rainfall is normal in the coming months.

Regional analysis

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

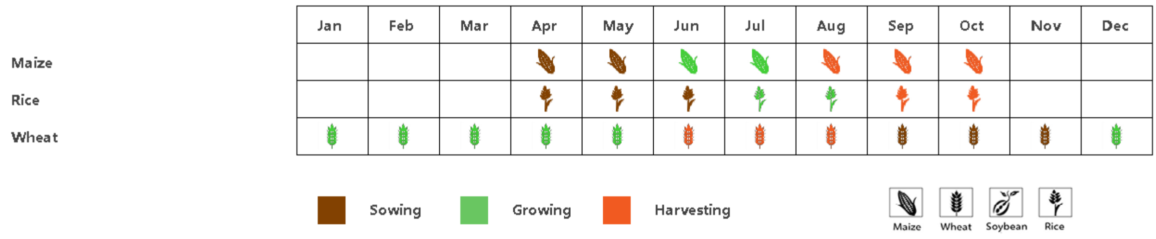
In **the Black Sea** zone, the NDVI was close to and below average during the reporting period, except for early January. Temperature and sunshine were below average (TEMP -0.2℃, RADPAR -1%). The biomass was below average (BIOMSS -14%). The VCIx reached 0.78 and CALF is down 4%. The output of the crops will be below average.

Central Anatolia is the main grain production region of Turkey. It had below average NDVI throughout the whole monitoring period. Both temperature and sunshine were below average (TEMP, -0.3℃, RADPAR -2%). Rainfall (RAIN, +1%) was almost average, but the region had suffered from water deficits early in the year. The potential biomass production decreased by 11%. CALF fell 16% below average, which was the steepest fall among the four AEZs in Turkey, and the VCIx was 0.72. The condition of crops is assessed as average to below average.

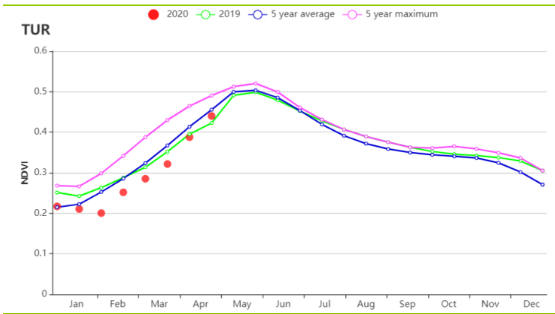
In **the Eastern Anatolian plateau**, the NDVI was above and close to average in early and mid-January, but subsequently fell below average. This zone also suffered from lower temperatures and less sunshine (TEMP, -0.2℃, RADPAR, -5%). But overall rainfall was 14% above average. CALF decreased by 4% and the VCIx was 0.72. All indicators agree in describing the conditions as fair for this AEZ.

As shown by the NDVI profile in **the Marmara Aegean Mediterranean lowland zone**, the NDVI was average or slightly above during the reporting period. The temperature, rainfall and radiation were all slightly below average (TEMP, -0.3°C, RAIN, -1%, RADPAR -2%). The CALF was above average (+8%), which was the only positive deviation from the mean among the four AEZs of Turkey. Also, the VCIx is the highest at 0.88. Crop production prospects are estimated to be quite favorable.

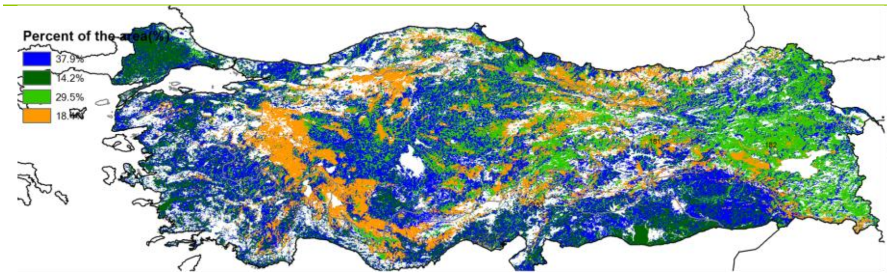
Figure 3.40 Turkey's crop condition, January-April 2020

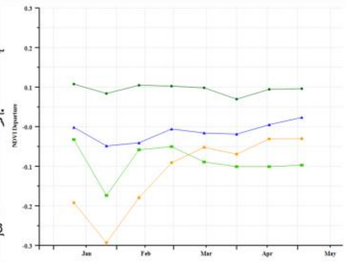


(a). Phenology of major crops

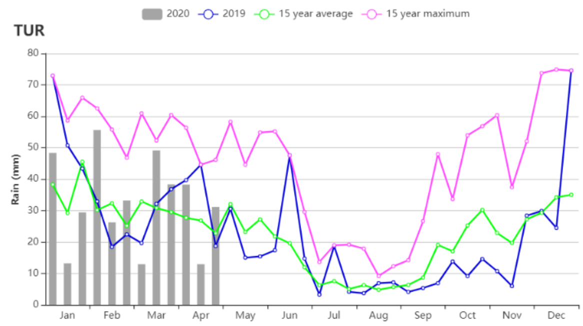


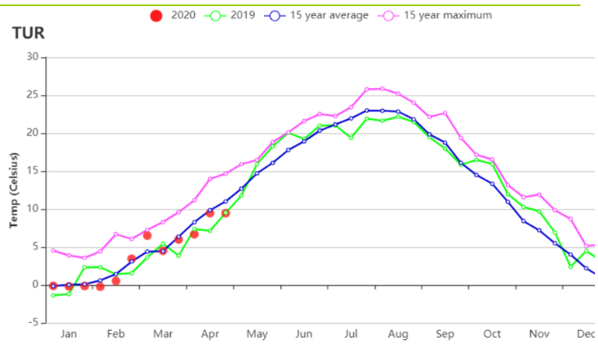
(b) Crop condition development graph based on NDVI (c) Maximum VCI



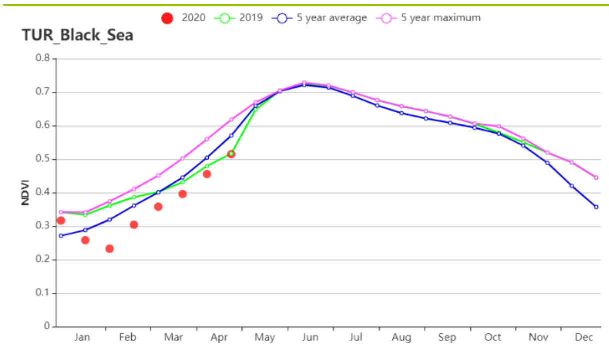


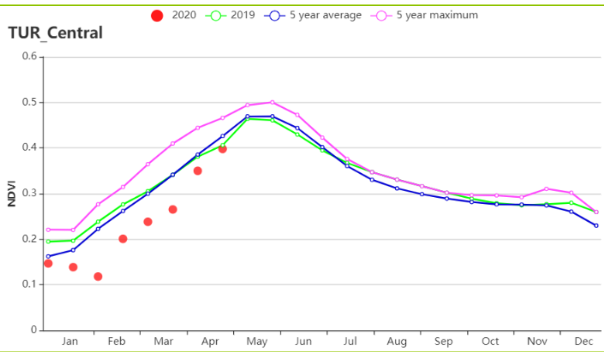
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



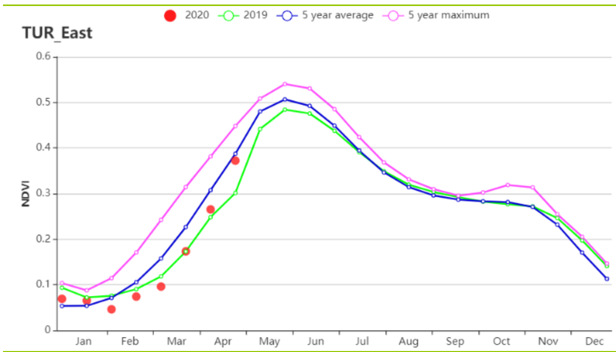


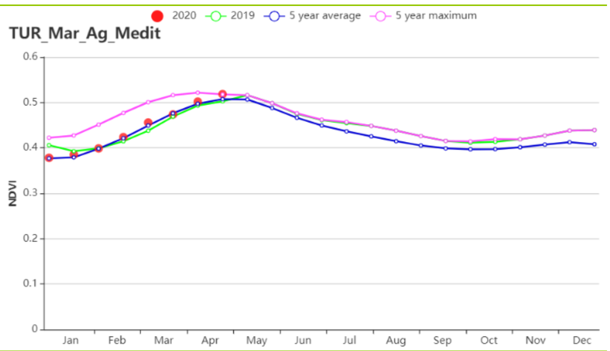
(f) Time series rainfall profile (g) Time series temperature profile





(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))

Table 3.69 Turkey's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 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	470	10	2.1	-0.2	705	-1	138	-14
Central Anatolia region	303	1	2.8	-0.3	805	-2	167	-11
Eastern Anatolia region	486	14	0.0	-0.2	786	-5	138	-12
Marmara Agean Mediterranean lowland region	387	-1	7.0	-0.3	820	-2	219	-7

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

Region	Cropped arable land fraction		Maximum VCI
	Current	Departure from 5YA (%)	Current
Black Sea region	73	-4	0.78
Central Anatolia region	39	-16	0.72
Eastern Anatolia region	38	-4	0.72
Marmara Agean Mediterranean lowland region	79	8	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

[UKR] Ukraine

The main crop of the Ukraine being monitored for this report is winter wheat. Maize planting will start in May only. According to the agroclimatic indicators, rainfall was deficient (RAIN 183 mm, -25%), with significant above average temperatures (TEMP, 3.5℃, +2.2℃) and sunshine (RADPAR 585MJ/m², +11%). Although rainfall was relatively lower in this period, warm temperature and abundant sunshine still provided favorable conditions for crop growth until March. Estimated biomass was above the 5YA (BIOMSS, 125 g DM/m², +5.7%). The other agronomic indicators include a fair maximum vegetation condition index at the national level (VCIx, 0.77). However the cropped arable land fraction had decreased by 12% to 70%. Overall crop conditions were below average due to low precipitation starting in March.

The NDVI development curve at the national level remained above the 5YA values until late March. In 14.4 % of arable land concentrated in the center-south NDVI was persistently higher than average by 0.1 units throughout this period. For another 28.1% of the area located in Crimea, east and south west Ukraine, NDVI was generally below average. Low VCI values (<0.5) were also detected in this area..

In general, due to lack of precipitation, overall conditions for winter wheat are moderate. Attention should be paid to precipitation in the coming months.

Regional analysis

Regional analyses are provided for four agro-ecological zones (AEZ) defined by their cropping systems, climatic zones and topographic conditions. They are referred to as **Central wheat area** (184) with the Poltava, Cherkasy, Dnipropetrovsk and Kirovohrad Oblasts; **Northern wheat area** (186) with Rivne, **Eastern Carpathian hills** (185) with Lviv, Zakarpattia and Ivano-Frankivsk oblasts, and the Southern **wheat and maize area** (187) with Mykolaiv, Kherson and Zaporizhia oblasts.

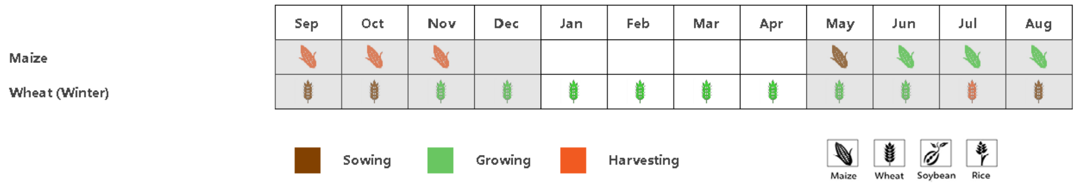
The Central wheat area recorded lower rainfall (173 mm, -26%) but significant increased radiation (573 MJ/m2, +10%) and temperature (3.2℃, +2.5℃). Warm weather condition benefited wheat growth and the biomass production potential increased by 6% (120g DM/m2) as compared to the 5-year average. Agronomic indicators show a low CALF (64%, -8%) and fair VCIx (0.78). Similar to national NDVI development trend, crop growth was persistently higher than the 5-year average until March. Production prospects are below average, mainly due to the drop in CALF and lack of rainfall.

The **Northern wheat area** was also highly deficient in rain (193 mm, -24%), had higher temperature of about 2.4℃ as well as 10.2% higher radiation in comparison to 15YA. Weather based projected biomass was 5.3% higher than 5YA. This area had a moderate CALF of only 71% (down 12% below 5YA) and a fair VCIx of 0.79. The NDVI development curve was continuously higher than the 5-year average until mid March, when it dropped to below-average levels. Production prospects are below average.

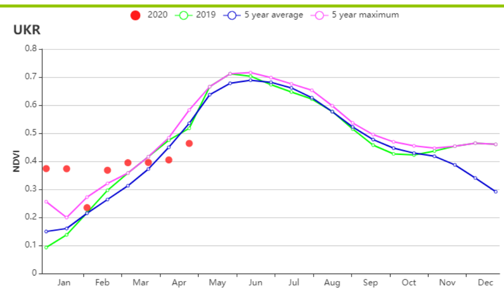
The **Eastern Carpathian hills** experienced similar agroclimatic and agronomic condition as the above mentioned AEZs, with lower rainfall (-20%) but higher radiation (+12%) and temperature (+1.34℃). The area had fair VCIx (0.74) and relatively better CALF (88%), a value nevertheless 8% below average. The biomass production potential is down 7% and the NDVI development curve was above average until March and then dropped to below average. Crop production prospects are somewhat less favourable than in the two previous AEZs.

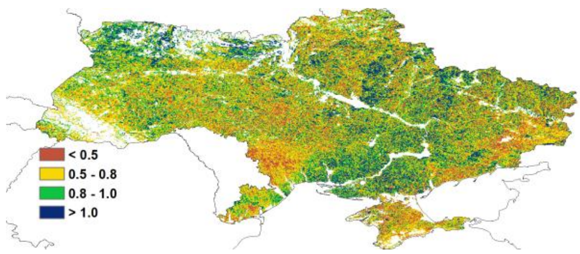
The **Southern wheat and maize area** was deficient in rainfall (-26%) with higher temperature of about 2.2℃ and radiation (+11.4%), which led to a 9% increase in potential biomass. Agronomic indices were average with both fair CALF (71%) and VCIx (0.76). The NDVI development curve dropped relatively less than in the other regions, but the crop condition in this area is still assessed as below average.

Figure 3.41 Ukraine's crop condition, January - April 2020

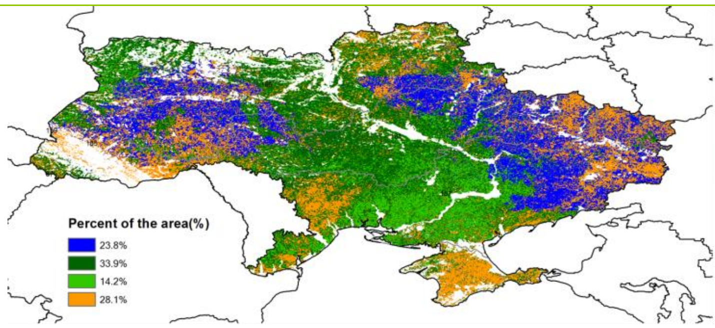


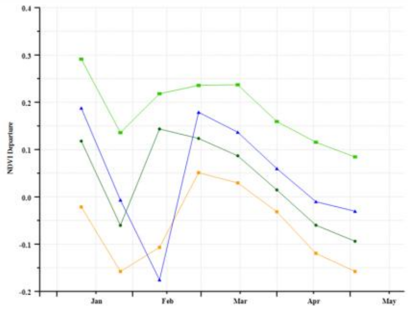
(a). Phenology of major crops



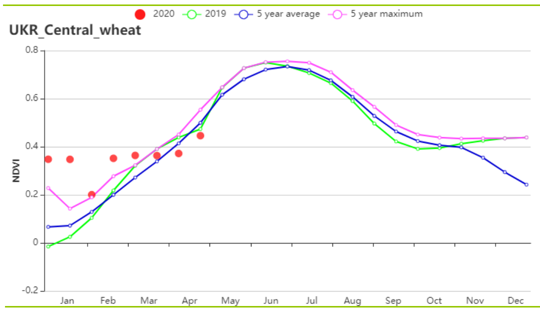


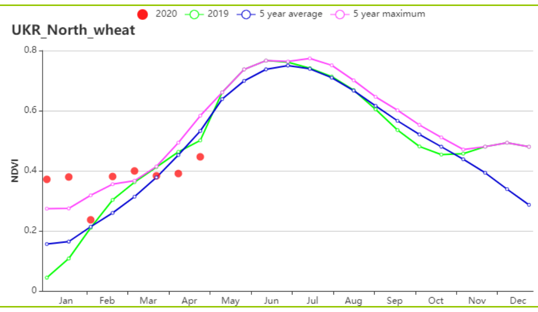
(b) Crop condition development graph based on NDVI (c) Maximum VCI



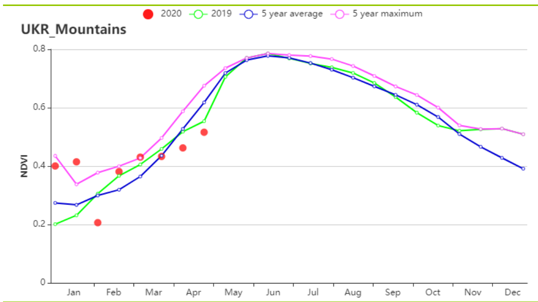


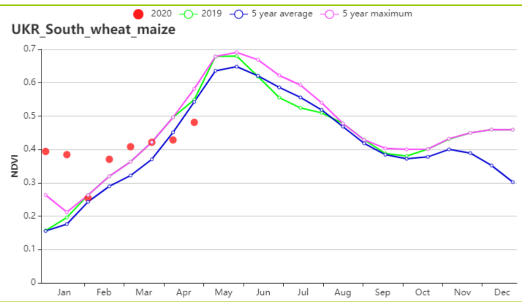
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



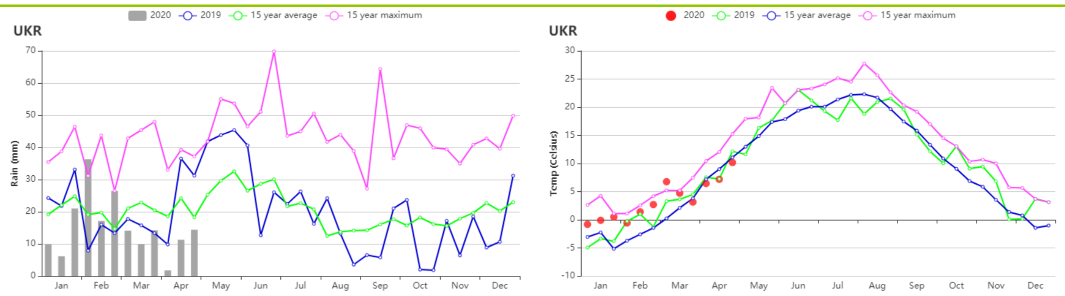


(e) Crop condition development graph based on NDVI (Central wheat area(left) Northern wheat area(right))





(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 3.71 Ukraine's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 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	173	-26	3.2	2.5	573	11	120	6
Eastern Carpathian hills	229	-21	2.6	1.3	614	12	113	-5
Northern wheat area	193	-25	3.1	2.4	525	10	109	5
Southern wheat and maize area	165	-27	4.1	2.2	636	11	141	9

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Central wheat area	64	-8	0.78
Eastern Carpathian hills	88	-8	0.74
Northern wheat area	71	-12	0.79
Southern wheat and maize area	71	-13	0.76

[USA] United States

Winter wheat is the main crop that is grown during this monitoring period between January and April. It is planted at all latitudes in the United States. Therefore, phonological stages can vary greatly between the north and the south. In the northern regions, wheat reached stem elongation and flowering stage in the south by the end of April. This month also marks the beginning of the sowing period for maize, soybean and rice. In general, the crop conditions are average. Wheat conditions were favorable. But the growth conditions for wheat in the northern part of the Southern Great Plains and Northwest Pacific should be closely watched during the next reporting period.

Compared with the average of the same period in the past 15 years, precipitation (+17%) and air temperature (+0.7 ℃) were higher for the United States. But photosynthetic effective radiation was significantly lower (-7%).

The Southern Great Plains, including Kansas, Oklahoma, Texas, and eastern part of Colorado, are the most important wheat producing states in this country. Far above average precipitation occurred in Kansas (+30%), Oklahoma (+51%) and Texas (+40%), while the photosynthetically active radiation was between 5 to 11% below the 15YA. Colorado was the only state that suffered from reduced precipitation (-3%). As mentioned in the section on North America of Chapter 2, drought occurred in western Kansas and Colorado. A cold snap in April had a negative impact on winter wheat growth in some areas. All in all, favorable growth conditions indicated by NDVI departure distribution and spatial pattern of NDVI departure clusters were observed for Texas and Oklahoma, while below average crop growth conditions were prevalent in western Kansas and Colorado.

The Pacific Northwest, including Washington, Oregon and Idaho, is another important winter wheat producing area of the United States. During this monitoring period, slightly-above average precipitation was observed in Washington (+2%) and Idaho (+1%), however the NDVI departure and NDVI anomaly clustering indicated that crop growth in this area is still below average which could be attributed to the ongoing drought.

Serious water deficit occurred in California and the precipitation was significantly lower than the average (-43%). However, the crop growth conditions appear to be normal, which can be attributed to the advanced irrigation infrastructure in California.

The spring wheat, soybean and rice planting period started in April. Some differences of the agro-climatic conditions were observed among the spring wheat and maize producing areas. Below-average precipitation occurred in the spring wheat production zones, such as Nebraska (-7%), North Dakota (-21%), and South Dakota (-11%) and Montana (-6%). The agro-climatic and crop growth conditions of spring wheat should be closely watched in next monitoring period. Above-average precipitation occurred in most states of the Corn Belt, including Illinois (+19%), Indiana (+6%), Michigan (+8%), Missouri (+28%), and Ohio (+11%), while in Iowa (-9%) and Minnesota (-5%) precipitation was below average. Conditions were favorable for the planting and growth of maize and soybeans. As the most important rice producing state, Arkansas received abundant precipitation during the monitoring period that replenished soil moisture for the sowing and growth of rice.

In short, the winter wheat growth conditions in Kansas and northwest regions were unfavorable while the other wheat producing regions experienced average or favorable conditions. Planting conditions for maize and soybean were favorable.

Regional analysis

The agro-climatic and crop growth conditions of the three major winter wheat producing areas and Corn Belt were as follows.

Southern Plains

The southern part of the Great Plains is the most important winter wheat producing area in the United States. During the monitoring period, winter wheat reached the heading or early grain filling stages.

Overall, Kansas, Oklahoma, and Texas received significantly above average precipitation, which is 30%, 51%, and 40% higher than the average, while precipitation in Colorado was below average by 3%. The abundant precipitation in Oklahoma and Texas effectively replenished the soil moisture and benefited winter wheat growth. Water stress and abnormal low temperatures occurred in April in Colorado and western Kansas that hindered winter wheat growth. In summary, conditions for winter wheat in Oklahoma and Texas were normal but unfavorable in western Kansas and Colorado. The conditions of the crops should be closely watched in next reporting period.

Northwest Pacific

The Pacific Northwest is an important winter wheat production area in the United States. The crop condition development graph based on NDVI shows that crop growth by the end of April was close to the 2019 conditions, but below the 5YA. In the last reporting period, this region suffered from a moderate precipitation deficit. Even though precipitation recovered to slightly below average (-3%) in the current period, a water deficit still persists.

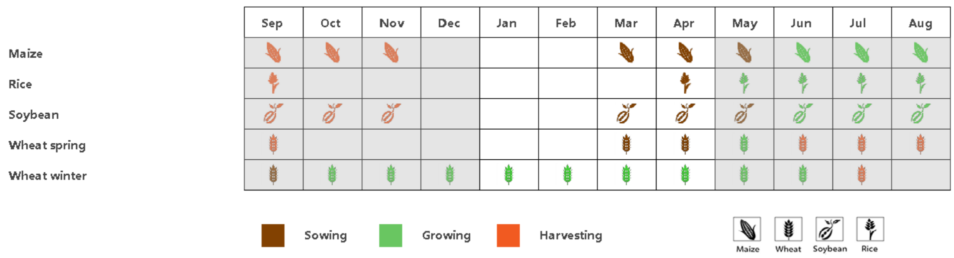
California

California experienced a serious precipitation deficit. As compared to the 15YA, precipitation (-43%) was below average and temperature above (+0.2℃). This monitoring period is the wet season of California. The drought led to a below average development of the NDVI curve, but due to wide-spread irrigation, crop conditions were slightly above the 5YA by the end of this monitoring period.

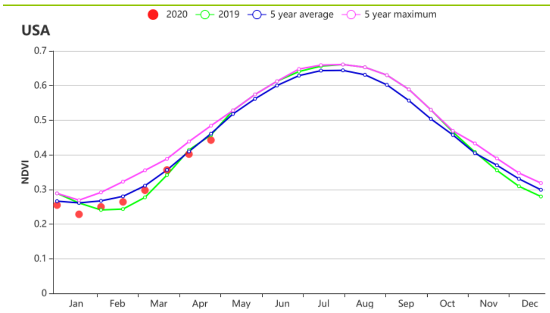
Corn Belt

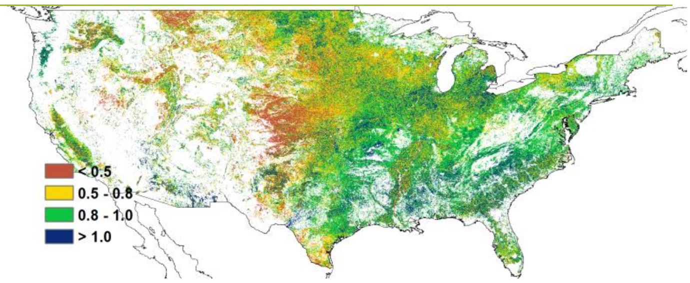
This region is the most important soybean and maize producing area in the United States. In April, planting of maize and soybeans started. In general, precipitation was above average by 6%, and temperature was above average by 0.6℃. Above-average precipitation was observed in most states of the Corn Belt, including Illinois (+19%), Indiana (+6%), Michigan (+8%), Missouri (+28%) and Ohio (+11%). The conditions were favorable for sowing and early establishment of the crops.

Figure 3.42 United States's crop condition, January-April 2019



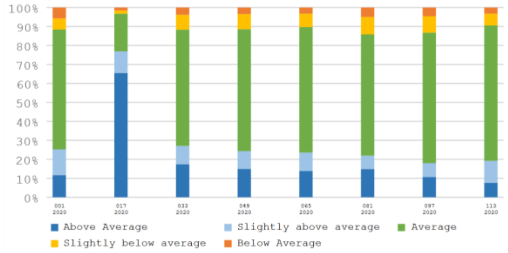
(a). Phenology of major crops

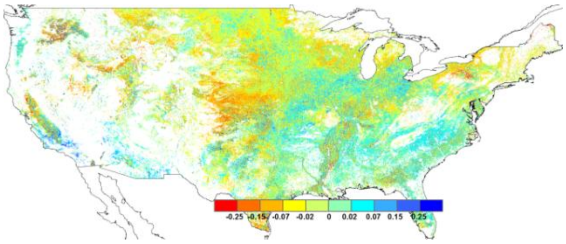




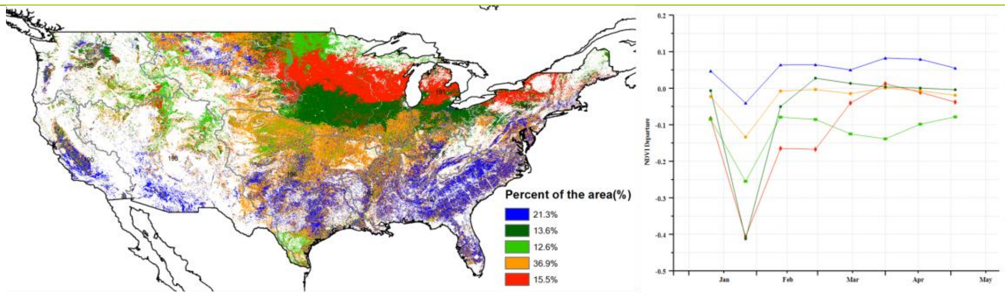
(b) Crop condition development graph based on NDVI_USA

(c) Maximum VCI

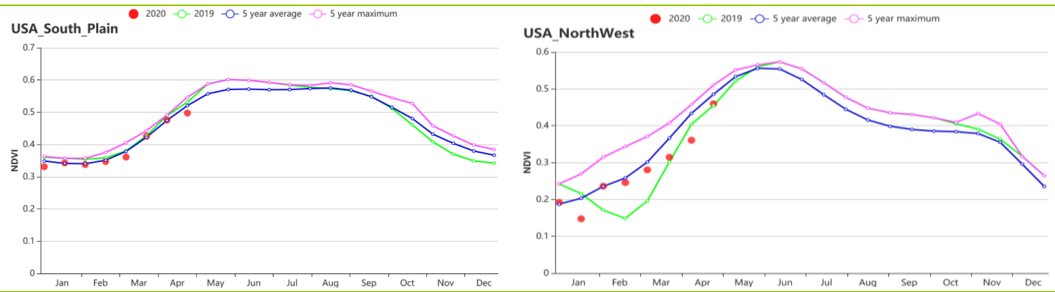




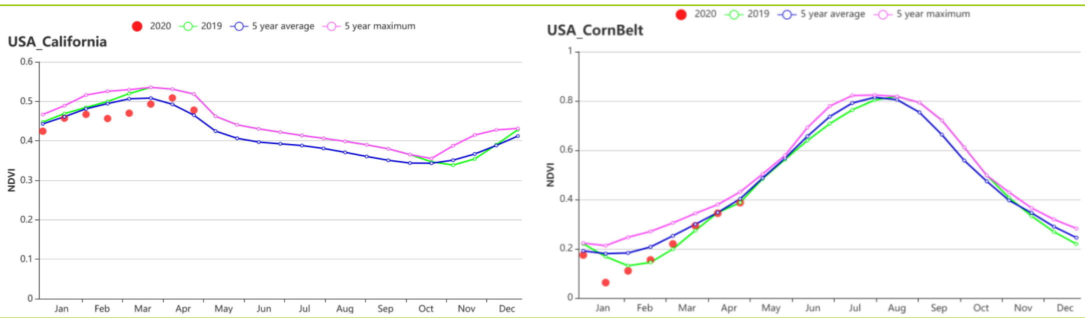
(d) NDVI departure in the late of April, 2020 (e)Maximum VCI



(f)Spatial distribution of NDVI profiles



(g) Crop condition development graph based on NDVI(South Plain(left) and Northwest(right))



(h) Crop condition development graph based on NDVI(California(left) and CornBelt(right))

Table 3.73 United States's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January-April 2019.

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 (%)
Blue Grass region	708	40	7.7	1.1	654	-13	175	-17
California	232	-43	8.9	0.2	896	1	234	5
Corn Belt	350	6	1	0.6	637	-7	119	-10
Lower Mississippi	687	32	12.4	1.1	721	-11	270	-10
North-eastern areas	470	12	2.7	1.4	618	-10	119	-16

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 (%)
Northwest	431	-3	1.5	0.3	670	2	129	2
Northern Plains	196	-9	-1.3	-0.1	757	1	509	-12
Southeast	573	35	13.8	1.7	816	-8	329	-2
Southwest	173	3	5.6	0.1	983	-3	229	11
Southern Plains	381	37	10.4	0.5	804	-9	268	-3

Table 3.74 United States's agronomic indicators by sub-national regions, current season's values and departure from 5YA, January-April 2019.

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Current (%)	Current
Blue Grass region	97	0	0.89
California	81	5	0.82
Corn Belt	36	0	0.82
Lower Mississippi	80	7	0.9
North-eastern areas	95	1	0.88
Northwest	50	-17	0.76
Northern Plains	95	11	0.96
Southeast	100	0	0.95
Southwest	16	-5	0.8
Southern Plains	64	-1	0.78

[UZB] Uzbekistan

Winter wheat is the most important crop that was grown in Uzbekistan during this monitoring period. The sowing of maize started in April.

Among the CropWatch agroclimatic indicators, TEMP was above the fifteen-year average (0.5°C), and RAIN was above average by 20%, while RADPAR had decreased by 3%. The combination of these factors resulted in favorable conditions for BIOMSS (+8%), as compared to the 15YA. As shown by the NDVI development graph, crop conditions were above the 5YA at the end of this monitoring period.

Spatial NDVI clusters and profiles show that 62% of the agricultural areas were in above average conditions from February to late April in most parts of Tashkent, Sirdaryo, Northen Samarkand, Namangan, Andijon, Ferghana, and Southern Karakalpakstan. The remaining 38% of the area were in below average conditions during the whole reporting period. Out of this, 14% were located in the south-western (Kashkadarya and Surkhandarya) in the Eastern hilly cereals zones. The other 24% were mostly located in Karakalpakstan and the northern Aral Sea cotton zone. All in all, crop conditions were favorable for Uzbekistan.

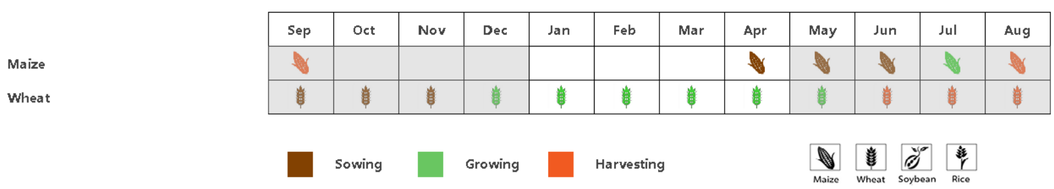
Regional analysis

In the Eastern hilly cereals zone, NDVI was above the five-year average during April. RAIN and TEMP were above average (21% and 0.5°C), and RADPAR was below average (-4%). The combination of the factors resulted in high BIOMSS (+5% compared to the 15YA). The maximum VCI index was 0.89, and the cropped arable land fraction increased by 45%. The crop condition was favorable during the monitoring period in this zone, and a bumper crop is expected.

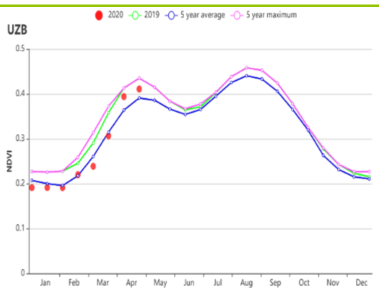
The Aral Sea cotton zone was close to the maximum condition compared with the five-year average between January and February. However, the NDVI value was below 0.2 from January to April, which indicates the absence of crops in this zone where cotton is the primary commodity. Among the CropWatch agroclimatic indicators, temperature and radiation were above average during the monitoring period (TEMP +1.1°C and RADPAR +2%), but precipitation was significantly below (RAIN -22%). However, the BIOMSS index was 21% above the fifteen-year average. The maximum VCI index was 0.80.

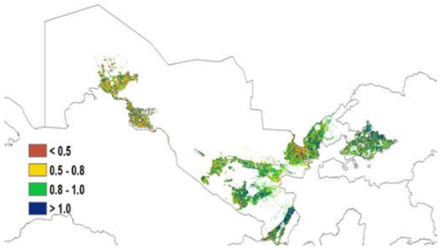
In the Central region, crop conditions were roughly on average. RAIN was below the fifteen-year average (-6%), whereas temperature was slightly warmer (TEMP 1.1°C) and RADPAR was average. Nevertheless, BIOMSS had increased by 9% from the fifteen-year average, and the cropped arable land fraction increased as well (CALF +317%). In this region, the maximum VCI was 0.80.

Figure 3.43 Uzbekistan's crop condition, January - April 2020

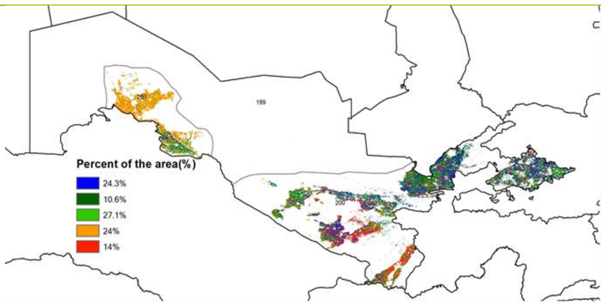


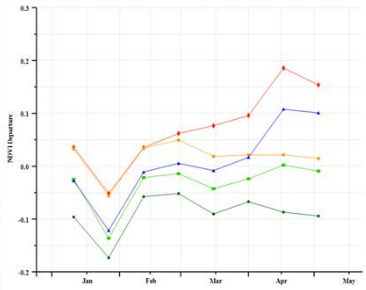
(a). Phenology of major crops



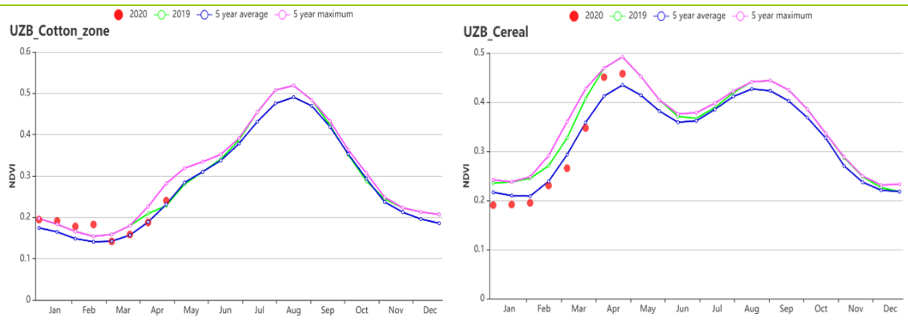


(b) Crop condition development graph based on NDVI (c) Maximum VCI

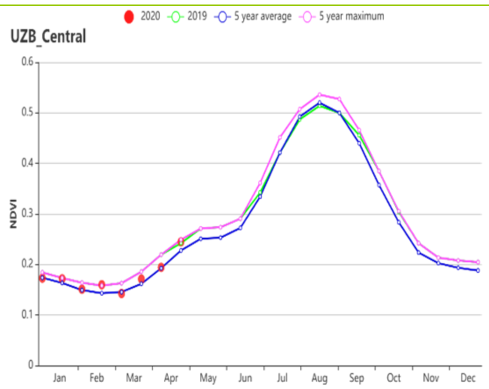




(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



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



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

Table 3.75 Uzbekistan's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 2020

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	51	-22	6.7	1.1	830	2	239	21

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Eastern hilly cereals zone	315	21	6.8	0.5	813	-4	245	5
Central region with sparse crops	116	-6	7.9	1.1	825	0	245	9

Table 3.76 Uzbekistan's agronomic indicators by sub-national regions, current season's values and departure from 5YA, January - April 2020

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Aral Sea cotton zone	1	79	0.80
Eastern hilly cereals zone	72	45	0.89
Central region with sparse crops	6	317	0.80

[VNM] Vietnam

Vietnam is the world's second largest exporter of rice. The monitoring period covers the sowing and growth of spring and winter rice in both the north and south of the country, with differences due to altitude. Most of the rice cultivation regions are distributed over the northern Red River delta and the Mekong Delta in the south. Crop condition development graph based on NDVI were significantly below average, and only the beginning of March and the end of April have just reached the average level. The spatial NDVI patterns compared to the five-year average indicated that 35.6% regions was slightly above average, with below average values in the other region. CropWatch indicators showed that RADPAR (+1%), CALF (96%), temperature(+0.4°C), but total rainfall (274mm) was below average by 7% and VICx was only 0.89, which led to BIOMSS decreased about 8%. Overall crop condition in the country is unsatisfactory.

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).

In the **Central Highlands,** both TEMP and RADPAR were above average (0.3°C and 8%, respectively), while RAIN was only 84mm(-68%). Crop condition development graph based on NDVI were consistently below average. Although cropped arable land fraction was 0.97, scarce rainfall caused BIOMSS decreased 8% compared to average and VCIx was only 0.77. Through the above analysis, crop condition was bad this region.

The situation in the **Mekong River Delta** was conditioned by low precipitation (RAIN -48%) and average temperature (TEMP +0.6°C) and sunshine (RADPAR +3%). BIOMSS was below average slightly (-1%). But VCIx (0.83) and CALF (84%) described not good condition. The crop condition development graph based on NDVI showed that crop condition was below 5 years average consistently. Output is likely to below the average.

Favorable climatic conditions dominated the **North Central Coast** over the reporting period. Rainfall was 3% above average. Temperature(+0.3°C) and RADPAR (+2%) were increased, and BIOMSS was below average by 5%. CALF(+1%) and high VCIx(0.97) value confirmed the favorable condition in this region.

North East recorded 448 mm of rainfall over four months (RAIN +47%). Temperature(+0.5°C) and CALF(0.99) was average. The significant decline in BIOMSS was18% compared to the 5 years average, which caused by the lack of light(RADPAR -12%). All of this showed unsatisfactory crop condition.

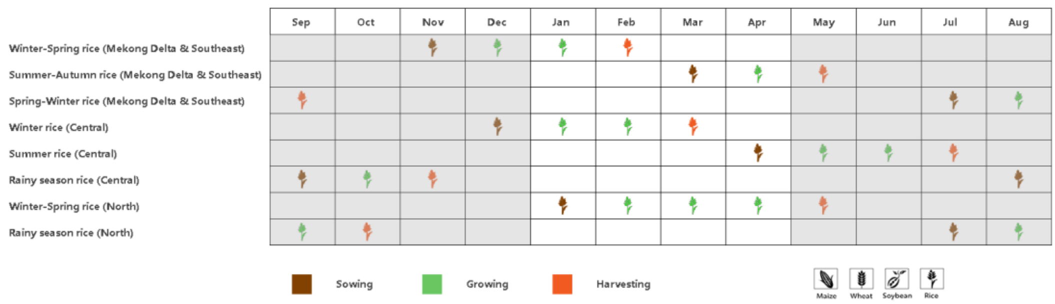
North West recorded high RAIN (+46%),and temperature (+0.5°C). VCIx (0.9) and CALF(1.0) were high. With the decrease of 3% in RADPAR, the biomass also decreased by 6% . The NDVI profile also confirmed the conditions of crop was below average from January to March and maximum occurred in May.

In the **Red River Delta**, rainfall was 38% above the average and the temperature was up by 0.3°C. The VCIx(0.94) and CALF(+4%) were above average slightly. Both RADPAR and BIOMSS were all declined sharply(-16% and -18% , respectively). This region is known for the wide cultivation of rice. The crop condition development graph of NDVI fluctuated greatly, especially at the beginning of February and the end of March were below average obviously.

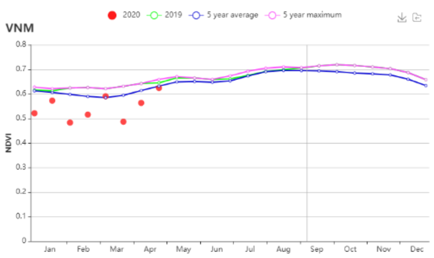
In the **South Central Coast**, the average rainfall was 52% below average and TEMP was not changed. RADPAR was above average (+10%).Despite the high reduction in rainfall, BIOMSS was below average(-6%) and the crop condition was below the average from February to April. Overall, VCIx(0.93) and CALF(+1%) indicated moderate conditions in this region.

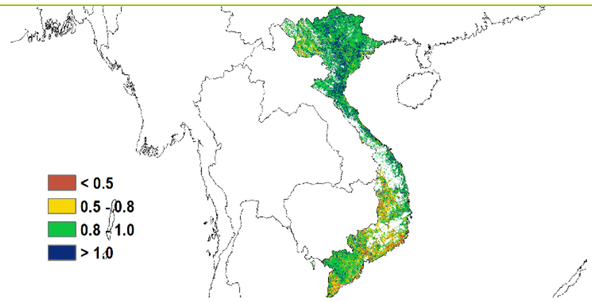
In the **South East of Vietnam**, crop condition was below average from January to April. The agro-climatic condition showed that rainfall (-47%), TEMP (+0.5°C), RADPAR(+6%) ,VCIx (0.74), and CALF(-1%) compared to be the average. Due to the decrease of rainfall and dry weather, BIOMSS decreased by 12%,which indicated unsatisfactory crop conditions.

Figure 3.44 Vietnam's crop condition, January -April 2020



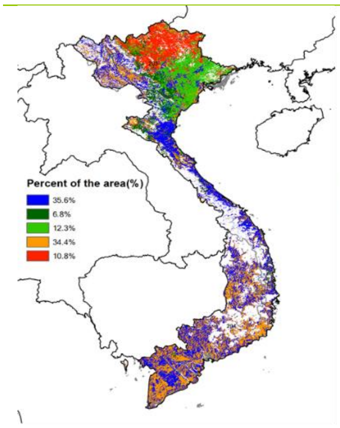
(a). Phenology of major crops

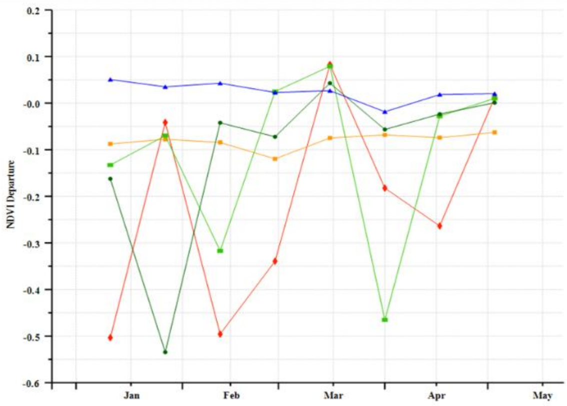




(b) Crop condition development graph based on NDVI

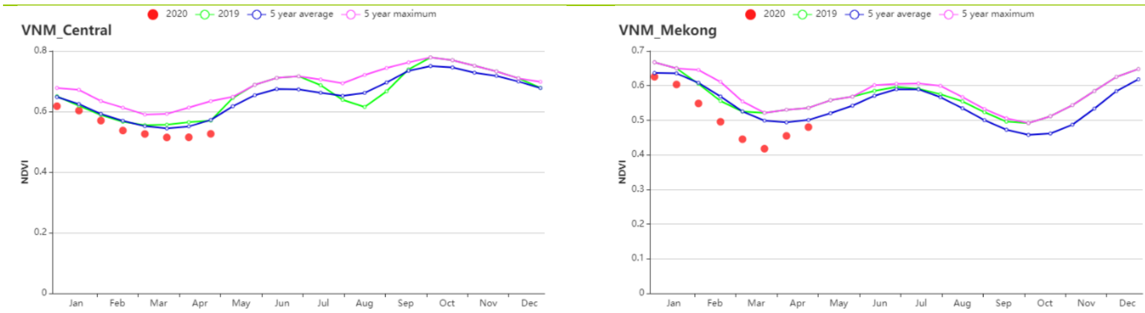
(c) Maximum VCI



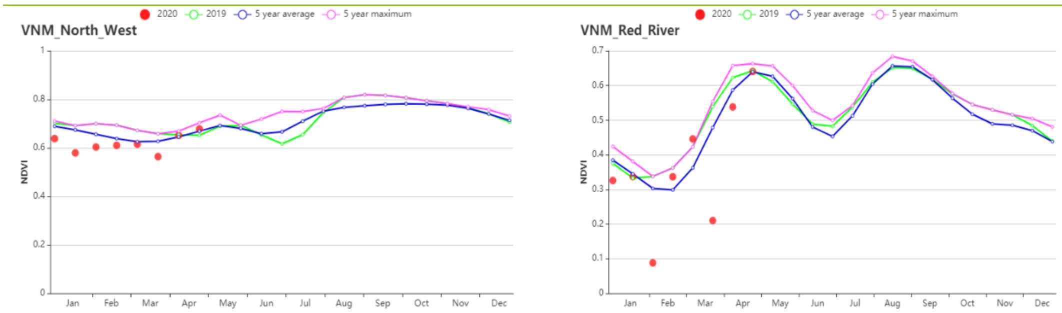


(d) Spatial NDVI patterns compared to 5YA

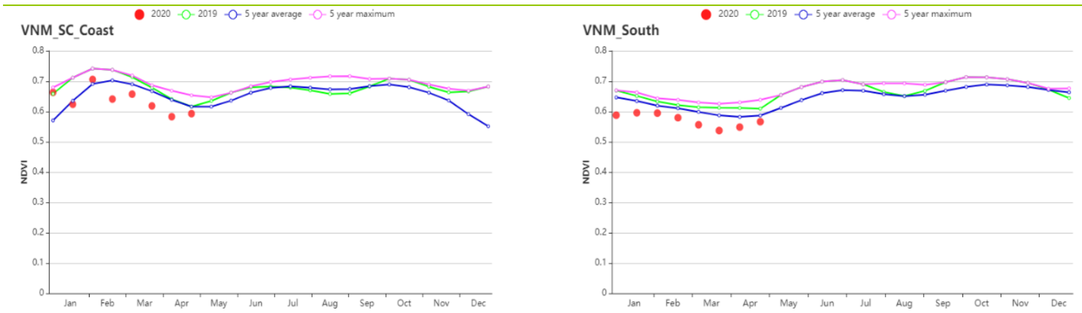
(e) NDVI profiles



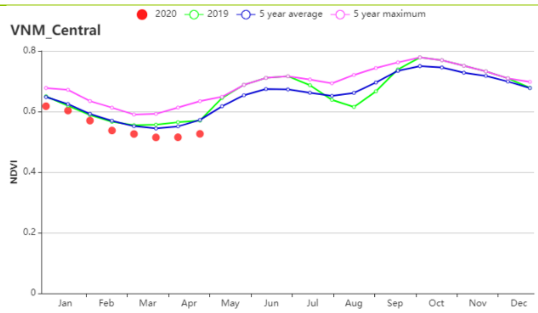
(f) Crop condition development graph based on NDVI Central Highlands Vietnam (left), and Mekong River Delta (right).



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



(h) Crop condition development graph based on NDVI South Central Coast Vietnam (left), and South East Vietnam (right).



(i) Crop condition development graph based on NDVI North Central Coast Vietnam

Table 3.77 Vietnam's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA,January-April 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 (%)

Central Highlands	84	-68	22.6	0.3	1209	8	585	-8
Mekong River Delta	158	-48	28.1	0.6	1224	3	736	-1
North Central Coast	351	3	19.8	0.3	897	2	482	-5
North East	448	47	17.3	0.5	636	-12	296	-18
North West	341	46	17.8	0.5	926	-3	445	-6
Red River Delta	397	38	19.6	0.3	548	-16	306	-18
South Central Coast	203	-52	20.6	0	1127	10	583	-6
South East	129	-47	26.7	0.5	1248	6	577	-12

Table 3.78 Vietnam's agronomic indicators by sub-national regions, current season's values and departure from 5YA, January -April 2020

Region	**Cropped arable land fraction**		**Maximum VCI**
	Current	**Departure from 5YA (%)**	**Current**
Central Highlands	98	1	0.77
Mekong River Delta	84	-2	0.83
North Central Coast	99	1	0.97
North East	99	0	0.96
North West	100	0	0.9
Red River Delta	96	2	0.95
South Central Coast	98	1	0.93
South East	91	-1	0.74

[ZAF] South Africa

This report covers the main growing period of the summer crops, including soybeans, sorghum, sunflower and groundnuts. Soybean harvesting period started in April and maize harvest will start later in the beginning of May.

In some regions of the country, the delay of the onset of summer rains forced farmers to sow their crops outside of the ideal window. Starting from January, the situation improved, since above-average rain was recorded. Subsequently, rain dropped to below-average levels again. Nevertheless, the situation was quite favorable for the maize-belt region of South Africa, extending to the Eastern Cape and up to the KwaZulu-Natal states. The northern regions of Kwazulu Natal, Limpopo and Free State remained under soil moisture stress. Overall, the conditions for South Africa were mixed.

At the national level, rainfall was 4% below average. The recorded temperature was 19.3°C (-0.2°C). Biomass slightly increased to 668 gDM/m2 (+1%). 90% of the cropped area was cultivated, which was an 8% expansion over the 5YA. Based on the NDVI graph, crop conditions were above average during the whole month of February, but later in March, conditions declined to the average until April. Conditions were below average during the whole period in cropped areas of the Eastern and Western Cape provinces, where VCIx was less than 0.5 . The countrywide maximum VCI was good (0.89), mainly in Kwazulu-Natal and northern coastal areas of Eastern Cape Province.

Regional analysis

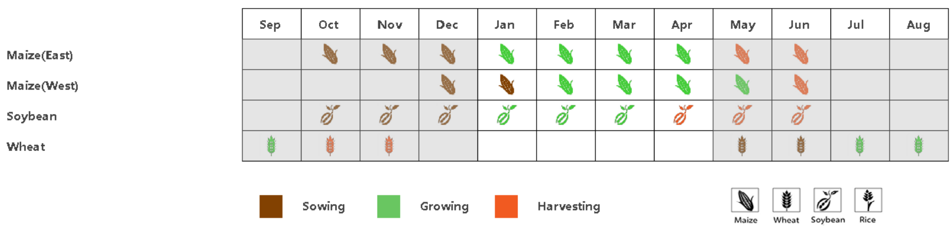
In South Africa, three agro −ecological zones (AEZs) that are important for crop production are considered: **the Mediterranean zone**, **Humid Cape Fold mountains zone** and **the Dry Highveld and Bushveld zone** which is known for maize and a pertinent zone for food supply.

The Mediterranean zone, the region with extensive cultivation of winter wheat, received rainfall of 86 mm (15 % below the average), and the temperatures remained constant at 19.4 ℃. The RADPAR was 1295 MJ/m2 (-1%) and BIOMSS 638 gDM/m2 (-4%). Cropped area covered 97 % of cultivated land (+ 2% of departure). Crop conditions remained above average during the whole growing period from January up to April in the east and west of the zone and the maximum VCI also increased to 0.65.

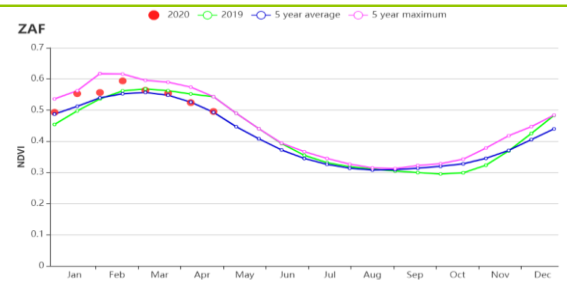
In **the Humid Cape Fold Mountains**, the average rainfall was 311 mm (-11%) and temperature was 19.8℃ (+0.1℃). RADPAR was 1149MJ/m2 (+2%) and the biomass was 616 (-3%). Even though there was a reduction in rainfall (-11%), the cropped arable land fraction increased to 97% (+1.5 %) and the vegetation condition was good with a maximum VCI of 0.92.

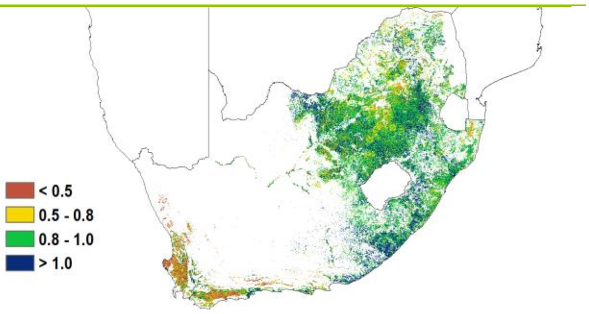
In **Dry, Highveld and Bushveld maize areas**, rainfall (-2%) and temperature (-0.3℃) were below average. The observed RADPAR was 1275 MJ/m2 (+2%) which consequently increased the BIOMSS by 2% above average. Almost 99% of cultivated land was cropped; the NDVI-based graph for crop conditions indicated above-average conditions and the maximum VCI was higher (0.92).

Figure 3.45 South Africa's crop condition, January - April 2020

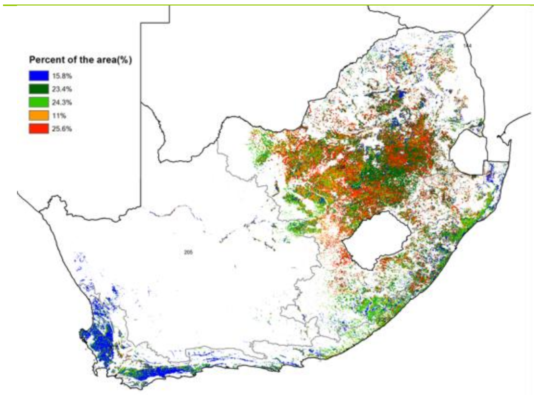


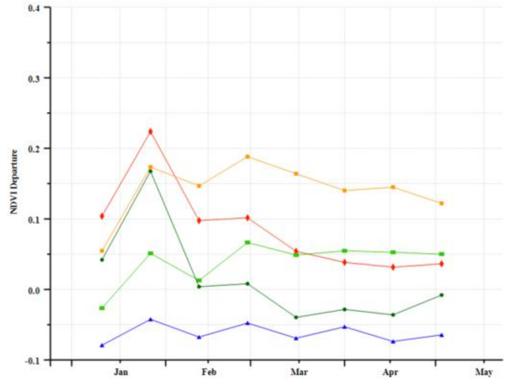
(a). Phenology of major crops



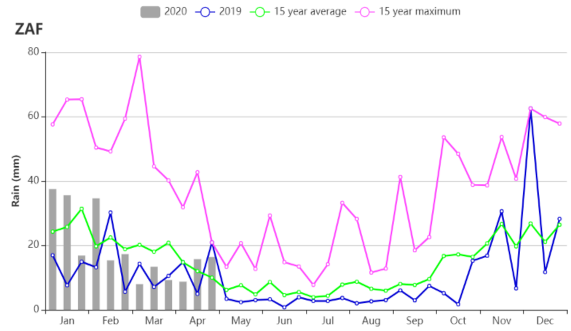


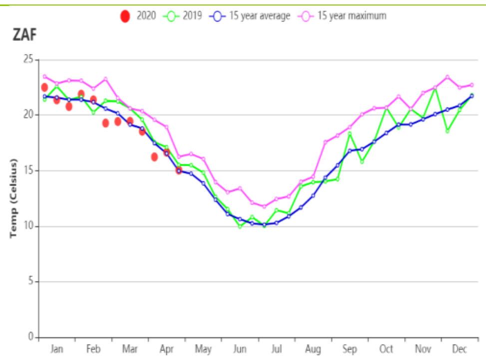
(b) Crop condition development graph based on NDVI (c) Maximum VCI



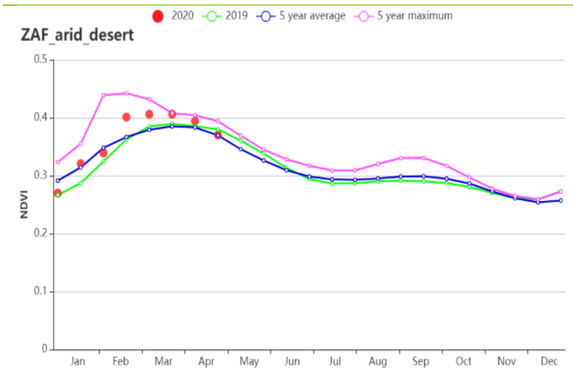


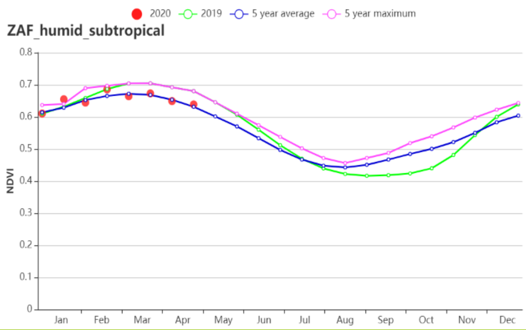
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



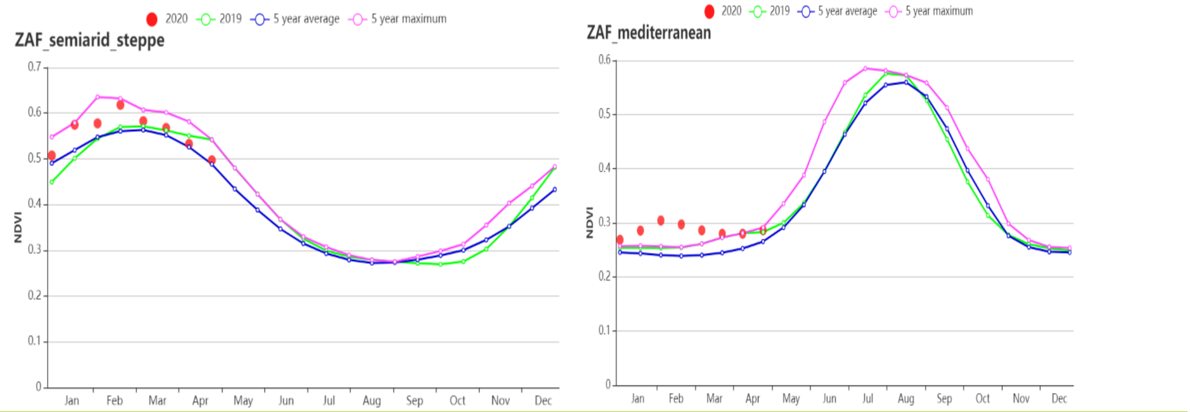


(f) Rainfall profiles (g) Temperature profiles





(h)Crop condition development graph based on NDVI Arid desert (left) and Humid sub-tropical (right)



(i)Crop condition development graph based on NDVI semiarid steppe (left) and Mediterranean (right)

Table 3.79 South Africa's agro-climatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 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	311	-11	19.8	0.1	1149	2	616	-3
Mediterranean Zone	86	-15	19.4	0.0	1295	-1	638	-4
Dry Highveld and Bushveld	235	-2	19.2	-0.3	1275	2	676	2

Table 3.80 South Africa's agronomic indicators by sub-national regions, current season's values and departure from 5YA, January - April 2020

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Humid Cape Fold Mountains	97	2	0.93
Mediterranean Zone	24	22	0.65
Dry Highveld and Bushveld	99	9	0.92

[ZMB] Zambia

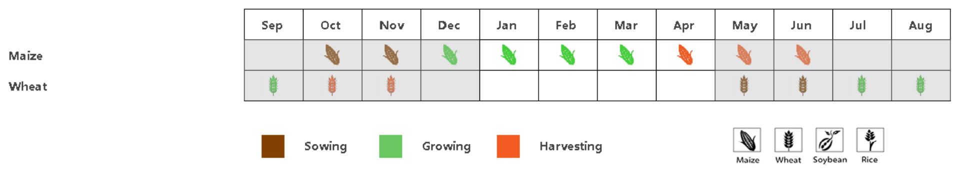
This report covers the primary growing season, including harvest, for rainfed crops in Zambia. The dominant cereal crops are maize, sorghum and millet. This growing season was severely affected by rainfall deficits during crop establishment. After that, rainfall reached average levels. Harvest of the main cereal crops started in April. Maize production is forecasted to be above average; however, shortfalls are expected for maize production in southern and western parts of the country.

The CropWatch indicators at the national scale show a slight increase (+1%) in rainfall received, reduction in potential radiation (-3%) and biomass production (-13%). Accordingly, NDVI was also below average in January and February. However, it had recovered by the time of the peak of the season, when it reached close to 5-year average levels. Area under cultivation was 100% (CALF=100%). Average VCIx was 0.93. It ranged from 0.8 to 1.0, with some exceptions in parts of central and southern Zambia experiencing maximum VCI between 0.5 and 0.8. These regions also experienced some rainfall deficits.

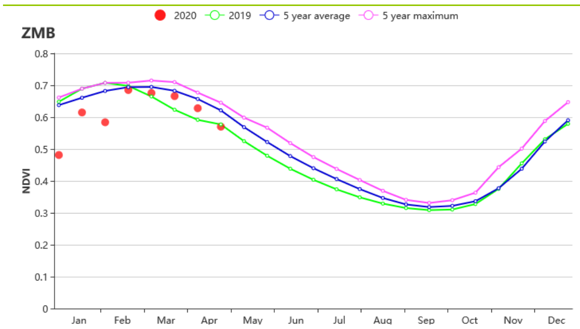
Regional analysis

The analysis at the level of agro-ecological regions showed a reduction in rainfall received in the Luangwa - Zambezi Rift Valley (-6%), and Central - Eastern and Southern Plain (-5%), with the latter being important for cereal grain production in Zambia. The Western Semi-Arid zone received above-normal rainfall (+18%), and the Northern High Rainfall Zone also received above-average rainfall (+6%). However, for all these regions reduced potential biomass production were estimated, which could be due to the delayed onset of rainfall and reduction in radiation. Despite these deviations, the Cropped Arable Land Fraction (CALF) remained at 100% (no change). The negative departures in biomass and NDVI indicate a slightly reduced potential agricultural productivity in some regions of the country.

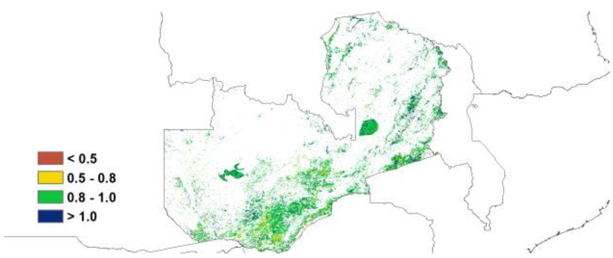
Figure 3.46 Zambia's crop condition, January - April 2020



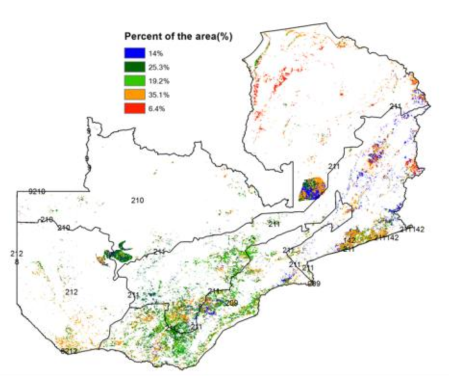
a). Phenology of major crops



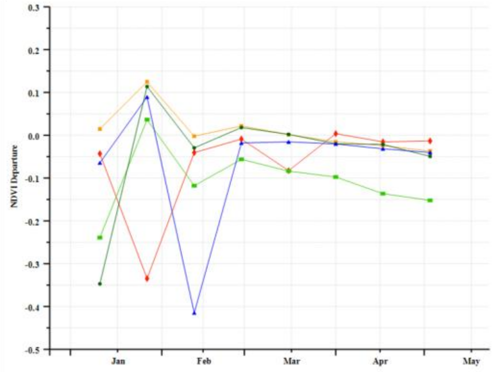
(b) Crop condition development graph based on NDVI



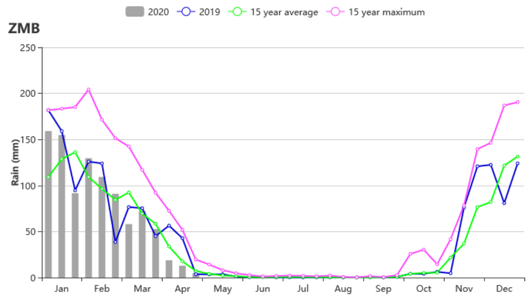
(c) Maximum VCI



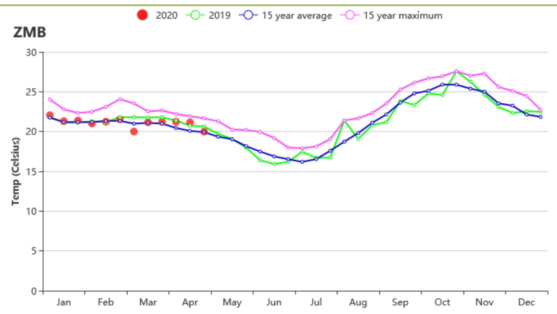
(d) Spatial NDVI patterns compared to 5YA



(e) NDVI profiles



(f) Rainfall profiles



(g) Temperature profiles

Table 3.81 Zambia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 2020

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Luangwa-Zambezi Rift Valley	746	-6	22.2	0.2	1213	-3	683	-13
Western Semi-arid zones	864	18	22.6	0	1209	-1	678	-8
Central-Eastern Plateau	873	-5	21.2	0.3	1161	-1	646	-12
Northen High Rainfall Zone	1159	6	20	0.1	1061	-5	557	-18

Table 3.82 Zambia's agronomic indicators by sub-national regions, current season's values and departure from 5YA, January - April 2020

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Luangwa-Zambezi Rift Valley	100	0	0.91
Western Semi-arid zones	100	0	0.92
Central-Eastern Plateau	100	0	0.93
Northen High Rainfall Zone	100	0	0.95

Chapter 4. China

This chapter starts with a brief overview of the agro-climatic and agronomic conditions in China over the reporting period (section 4.1). Next it presents an updated estimate of national winter crop production (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). Section 4.4 describes trade prospects (import/export) of major crops. Additional information on the agroclimatic indicators for agriculturally important Chinese provinces are listed in table A.11 in Annex A.

4.1 Overview

During the current monitoring period, winter wheat and rapeseed were still at the growing stage while spring crops including spring maize and early rice were at the sowing stage. Generally speaking, agro-climatic conditions were favorable and beneficial for crop growth. At the national scale rainfall and temperature increased by 20% and 0.8°C respectively, as compared to the 15 year average, whereas RADPAR declined by 4%. Consequently, BIOMSS was 7% below average and VCIx was quite fair, with a value of 0.85.

Spatially, 71% of the arable land experienced average precipitation throughout the reporting period. The remaining areas in the south-eastern region (13.2% of cropland), went through rainfall fluctuations over time. The most pronounced high rainfall anomalies (more than 75 mm above average) affected 18.5% of agricultural areas in late March mainly in the provinces along the Yangtze River. At the national scale, the temperatures had positive anomalies before early April, and then generally dropped to negative departures until the end of the monitoring period. In contrast to rainfall, temperature anomalies were much more varying over time especially in Southern China, accounting for 19.1% of the arable land, mainly including some parts of Guizhou, Guangxi, Guangdong, Hunan, Jiangxi, Fujian, and Jiangsu province, where the anomalies ranged between -2.7 and +5.7°C. These are rather dramatic variations. Fortunately, they occcured before the start of the growing season. Uncropped areas mainly occurred in the North-west, North-east regions and the provinces of Gansu, Ningxia, Shaanxi, Shanxi, and Hebei in Northern parts of China due to the low temperatures. The potential biomass (Figure 4.4) showed significant variability across regions. Negative anomalies dominated most of the country, mainly observed in the northern, southern and southwestern regions, while positive anomalies were mainly observed in the provinces of Guangdong, Fujian, and Jiangxi in the southeastern regions, as well as in some parts of Xinjiang, Shanxi, Henan, Yunnan, Shaanxi, and Inner Mongolia.

The cropping season is well underway in southern and central China. According to the spatial VCIx patterns (Figure 4.6), favorable crop condition (VCIx larger than 0.8) occurred widely all across China; values between 0.5 and 0.8 mainly appeared in the provinces of Gansu, Shaanxi, Shandong, Hebei, and Shanxi where cropland was not cultivated during the monitoring period according to the CALF map. When it comes to VHIn (Figure 4.7), high values (above 36) are widespread in China, indicating limited drought effects on most of winter crops.

As for the main producing regions at the sub-national level, rainfall was significantly above average, ranging from +6% to +51%. Temperature departures were all positive, ranging from +0.4°C to +1.8°C, with the highest positive departure in north-east China. RADPAR in all regions was below average. Consequently, BIOMSS decreased in almost all the regions compared to average except for Lower Yangzte region, with the anomalies ranging from -16% to -3%. CALF in major winter crops regions was generally close to average, ranging from 2% below average in Huanghuaihai to 1% above average in Southern China. As for VCIx, the values were quite fair for all the regions, ranging between 0.76 and 0.90.

Table 4.1 CropWatch agro-climatic and agronomic indicators for China, January to April 2020, departure from 5YA and 15YA

Region	Agroclimatic indicators				Agronomic indicators	
	Departure from 15YA (2005-2019)				Departure from 5YA (2015-2019)	Current period
	RAIN (%)	TEMP (°C)	RADPAR (%)	BIOMSS (%)	CALF (%)	Maximum VCI
Huanghuaihai	51	1.2	-4	-9	-2	0.83
Inner Mongolia	34	0.9	-2	-11	/	0.77
Loess region	6	0.8	-1	-13	-12	0.76
Lower Yangtze	18	1.0	-2	-3	0	0.88
Northeast China	10	1.8	-4	-3	/	0.91
Southern China	12	0.6	-1	0	1	0.89
Southwest China	36	0.4	-9	-16	0	0.90

Figure 4.1 China crop calendar

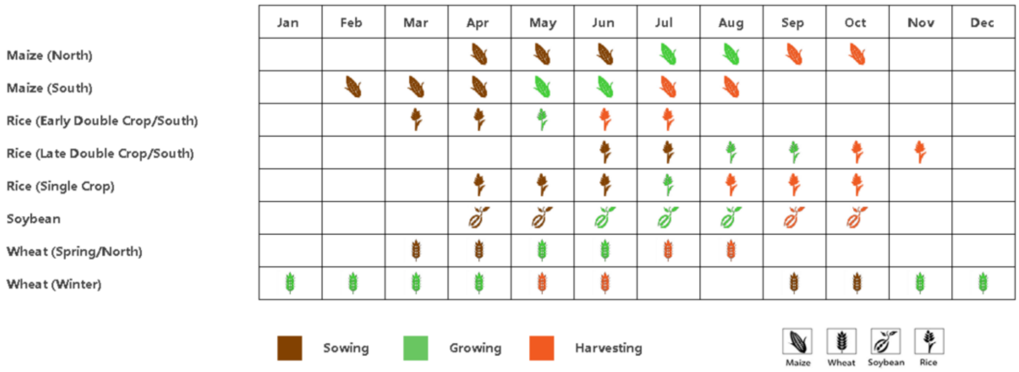


Figure 4.2 China spatial distribution of rainfall profiles, January - April 2020

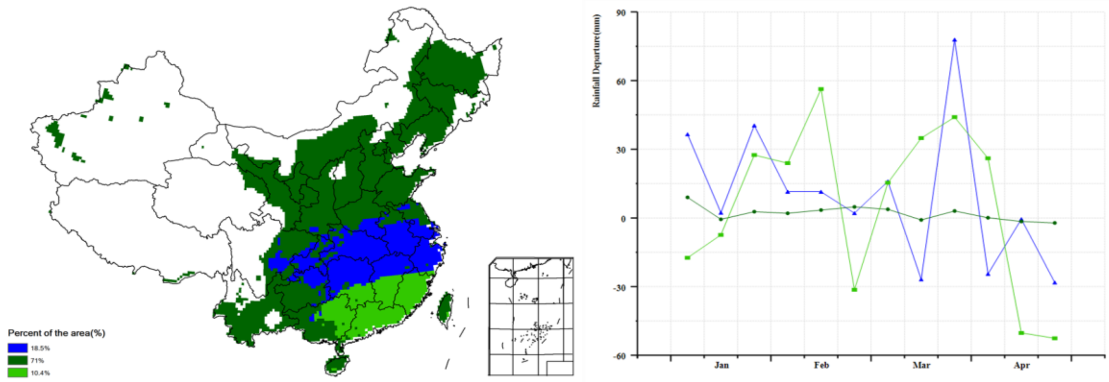


Figure 4.3 China spatial distribution of temperature profiles, January - April 2020

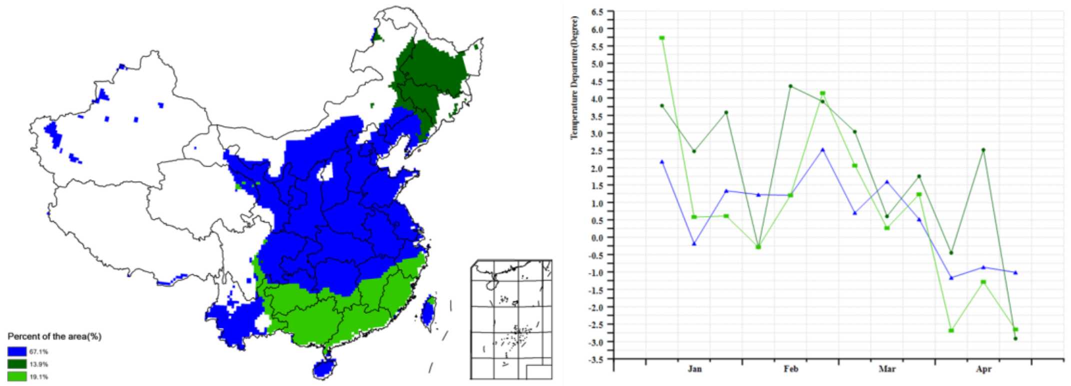


Figure 4.4 China cropped and uncropped arable land, by pixel, January - April 2020

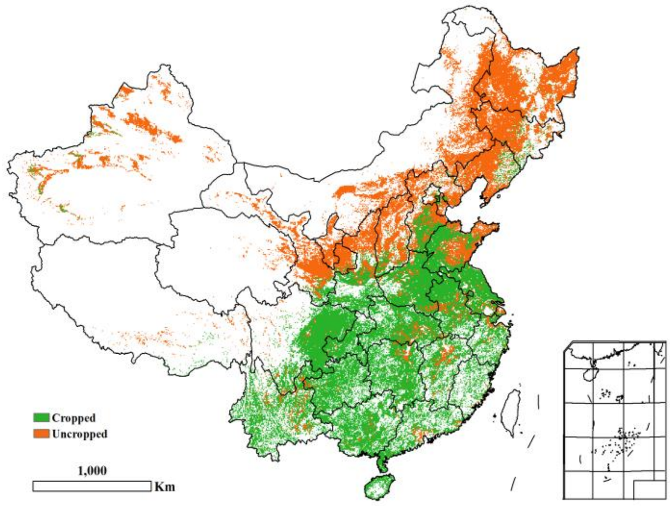


Figure 4.5 China maximum Vegetation Condition Index (VCIx), by pixel, January - April 2020

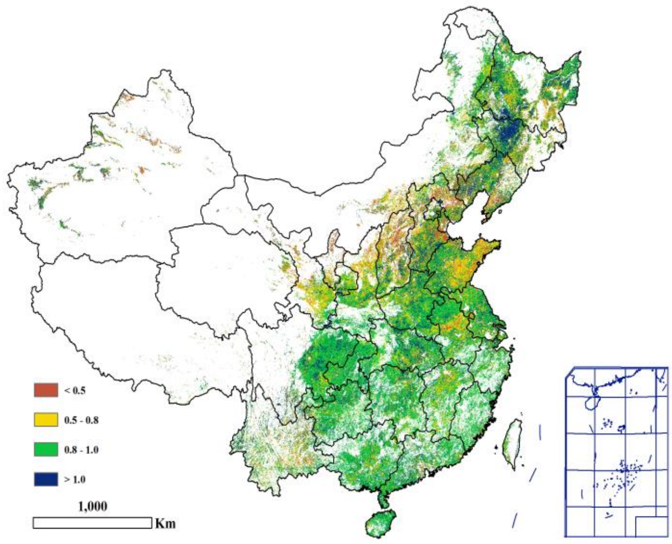


Figure 4.6 **China biomass departure map from 15YA, by pixel, January - April 2020**

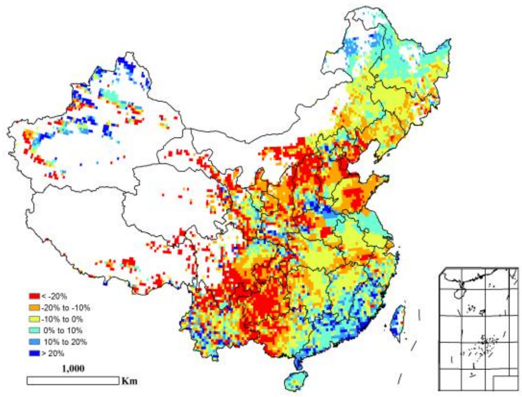
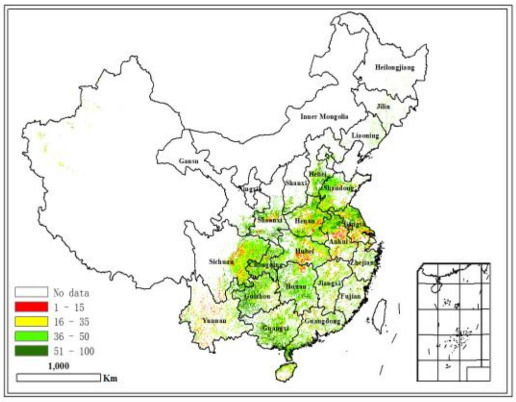


Figure 4.7 **China minimum Vegetation Health Index, by pixel, January - April 2020**



4.2 China crops prospects

(1) Winter crop production

Multi-source high resolution satellite images, agro-climatic and agronomic indicators as well as field surveys from winter crop producing provinces were integrated into the forecast of winter crop production.

The overall favorable weather conditions benefitted winter crops. The significantly above-average rainfall provided good soil moisture which was conductive for the development of winter crops. CropWatch puts the total output of winter crops at 132.33 million tons, up by 3% or 4.29 million tons from 2019 (Table 4.2).This is due to increased yield and expanded planted area at the national level.

Table 4.2 China, 2020 winter crop production (thousand tons) and percentage difference with 2019, by province

	2019	2020			
Provinces	Production (kton)	Area change (%)	Yield change (%)	Production change (%)	Production (kton)
Hebei	12297	−2	3	1	12417
Shanxi	2311	−1	3	2	2361
Jiangsu	10280	1	3	5	10747
Anhui	11852	2	−1	1	11923
Shandong	24916	3	0	3	25758
Henan	26952	5	0	4	28157
Hubei	5380	1	1	2	5492
Chongqing	2259	0	4	4	2345
Sichuan	5866	0	−3	−3	5683
Shaanxi	4001	1	1	3	4111
Gansu	3590	5	−2	3	3690
Sub total	109702	−	−	3	112684
Other provinces	18342	−	−	7	19650
National total*	128044	2	1	3	132334

* Production of Taiwan province is not included.

Rainy and cloudy weather dominated the dormancy to flowering stages of winter crops in most of the winter crop producing provinces. The significantly below-average radiation in Anhui and Sichuan resulted in lower yield prospects compared with the 2018-2019 season. Low rainfall in Gansu, where most crops are rain-fed, hampered the development of winter crops after the wintering period and resulted in a 2% drop in yield compared with last year. Winter crop yields in all other provinces are forecasted to be above or remain at same level as 2019. As for the planted area, decreases were observed in Hebei and Shanxi, down by 2% and 1% from 2019, respectively. The reduction of winter crops planted area might be a consequence of the water-saving and sustainable groundwater management policy. Henan, as the No. 1 winter crop producing province, planted 5% more winter crops compared with last year. It is also noteworthy that winter crops in Hubei recovered from unfavorable conditions in March (see impacts of COVID-19 section) thanks to the end of the lockdown.

The total winter wheat production in 2020 is estimated to reach 122.24 million tons, an increase of 4.44 million tons or 4% from 2019. The national winter wheat area is 23,898 thousand hectares, an increase of 3% over the same period of last year. The average winter wheat yield nationally is 5115 kg/ha, up by 1% compared to 2019 (Table 4.3).

The two main winter wheat producing provinces of Henan and Shandong further expanded the winter wheat planted area by 5% and 3%, respectively. Although drought occurred in Gansu, the planted area of winter wheat still increased by 5% because of favorable rainfall during the sowing period last year. The increased planted area compensated for the impacts of drought and lower yield, resulting in a 3% increase of winter wheat production in Gansu. Since winter wheat is the dominating crop in all winter crop producing provinces, the inter-annual yield variations of winter wheat are very similar to those of winter crops in table 4.2. Yield dropped by 1%, 3% and 2% in Anhui, Sichuan, and Gansu. Increased yield in Hebei and Shanxi compensated for the reduced planted area and resulted in 1% and 2% increase of winter wheat production. The largest inter-annual production changes in percentage are observed in Jiangsu where both planted area and yield are above 2019.

Overall, CropWatch gives a good prospect for winter crop production in 2020.

Table 4.3 China, 2020 winter wheat area, yield, and production and percentage difference with 2019, by province

	Area (kha)			**Yield (kg/ha)**			**Production (kton)**		
Provinces	**2019**	**2020**	Changes (%)	**2019**	**2020**	Changes (%)	**2019**	**2020**	Changes (%)
Hebei	2000	1965	−2	5997	6163	3	11994	12111	1
Shanxi	520	517	−1	4301	4423	3	2238	2285	2
Jiangsu	1955	1978	1	5142	5314	3	10053	10510	5
Anhui	2389	2430	2	4752	4698	−1	11350	11414	1
Shandong	4154	4281	3	5946	5963	0	24701	25528	3
Henan	5138	5373	5	5225	5219	0	26846	28038	4
Hubei	979	984	1	3951	4007	1	3868	3945	2
Chongqing	345	343	0	3234	3372	4	1115	1157	4
Sichuan	1295	1289	0	3874	3766	−3	5016	4854	−3
Shaanxi	1059	1072	1	3702	3759	2	3920	4029	3
Gansu	430	452	5	4176	4073	−2	1794	1843	3
Sub total	20263	20684	2	5078	5111	1	102896	105714	3
National total*	23315	23898	3	5053	5115	1	117801	122240	4

* Production of Taiwan province is not included.

(2) Early rice planted area

Using the multi-source satellite remote sensing data of ESA Sentinel 1 and Sentinel 2 from February 1 to April 16, 2020, combined with the crowd-sourcing of in-situ data, early rice planted area in eight major production provinces of China were estimated. In short, the significant changes of ground surface before and during land preparation and transplanting were utilized to extract early rice cultivation area. The results show that COVID-19 had limited impacts on early rice cultivation at the national level. It is expected that the area of early rice in the eight main early rice producing provinces in 2020 will increase by 2.2% compared with 2019.

In 2020, the total early rice area is estimated at 5101.4 thousand hectares, an increase of 109.7 thousand hectares or 2.2% up from 2019 (Table 4.4). As the largest early rice producing province, Hunan province planted 1543.6 thousand hectares of early rice, an increase of 27.6 thousand hectares compared with 2019 (+1.8%); The largest inter-annual increase of early rice area in percentage was observed in Guangxi with a 7.6% increase over 2019. The cultivated early rice area in Guangxi is estimated at 942 thousand hectares, an increase of 66.6 thousand hectares from 2019. The planted areas of early rice in Fujian, Zhejiang, Anhui and Guangdong increased by 5.5%, 0.7%, 4.0% and 4.1%, respectively.

Hubei and Jiangxi provinces are the only two provinces for which we observed a decreased early rice planted area compared with 2019. In Jiangxi Province it has decreased by 1.3%; while for Hubei Province, affected by the outbreak of the COVID-19 and the complete lockdown, early rice area was ignificantly reduced by 10.6% or 18.2 thousand hectares compared to 2019.

Table 4.4 China Early rice planted area for each major rice producing province in 2019 and 2020

Province	Cultivated area (kha)		Inter-annual changes	
	2019	2020	Changes (kha)	Changes in percentage
Fujian	151.0	159.3	8.3	5.5
Zhejiang	112.7	113.5	0.8	0.7
Jiangxi	1182.7	1166.8	-15.9	-1.3
Guangxi	875.4	942.0	66.6	7.6
Hunan	1516.0	1543.6	27.6	1.8
Anhui	172.1	179.0	6.9	4.0
Hubei	171.6	153.4	-18.2	-10.6
Guangdong	810.2	843.8	33.6	4.1
Sub-total	4991.7	5101.4	109.7	2.2

(3) Limited impacts of COVID-19 on winter crops

In general, growth conditions for winter wheat at the national level were better than during the same period of last year at the time of the end of the lockdown in Hubei province. The favorable crop conditions coincide with the increased yield of winter crops as described in the previous section.

Over the major winter wheat-producing areas, 36% of the cultivated area was above the 2019 crop conditions, mostly distributed in the Provinces of Hebei, northwest Shandong, central and northeast Jiangsu, and Shaanxi. Only 2% of the cultivated area showed inferior conditions compared to 2019, scattered in the different provinces.

At the provincial level, winter crops in Hebei, Shaanxi, Shanxi, Shandong, Jiangsu, Henan and Anhui provinces performed well, with 75%, 62%, 54%, 43%, 35%, 23% and 21% of cultivated area above 2019â€™s conditions, respectively. Less than 3% of the area under cultivation showed crop conditions below 2019 for all provinces except for Hubei. It is noteworthy that crop conditions were lower than in 2019 in the Jingzhou and Puyang municipal region in Hubei Province, accounting for 8% of the province's winter crop cultivation area. Overall, the outbreak of COVID-19 in China had limited impact on the production of winter crops.

Figure 4.8 **Crop growth condition in the major winter wheat-producing areas (March 1st to 10th)**

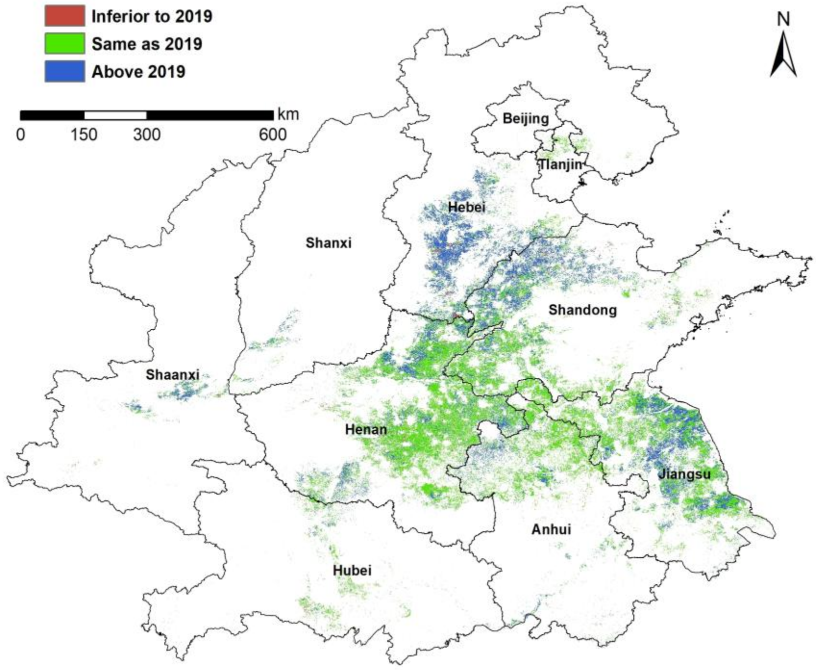
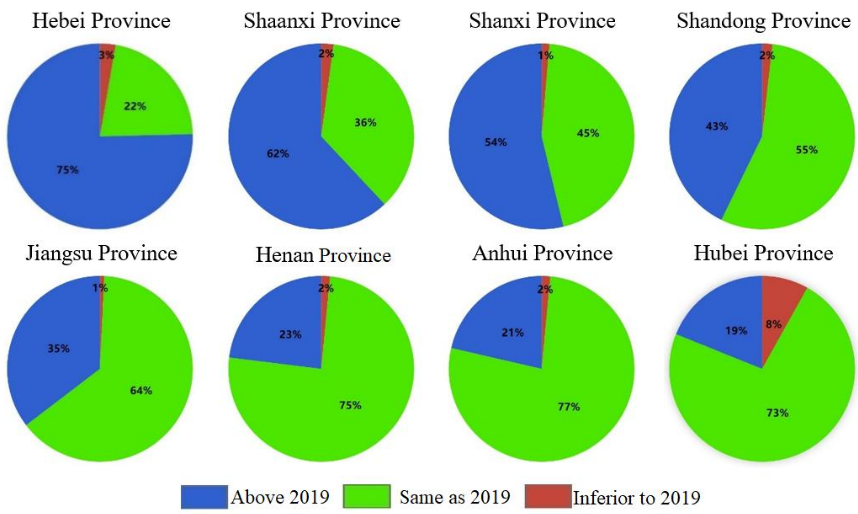


Figure 4.9 **Statistical proportion of winter crops condition compared to 2019 for each province in March**



4.3 Regional analysis

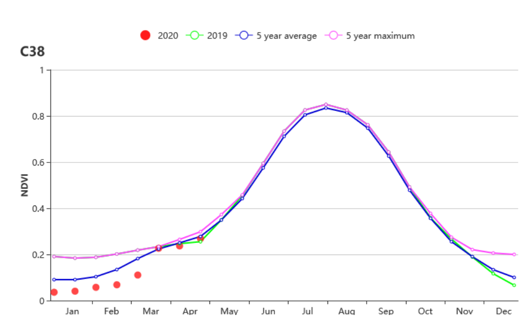
Figures 4.10 through 4.16 present crop condition information for each of China's seven agricultural regions. The provided information is as follows: (a) Phenology of major crops; (b) Crop condition development graph based on NDVI, comparing the current season up to October 2019 to the previous season, to the five-year average (5YA), and to the five-year maximum; (c) Spatial NDVI patterns for January - April 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 January - April 2020. Additional information about agro-climatic indicators and BIOMSS for China is provided in Annex A.

Northeast region

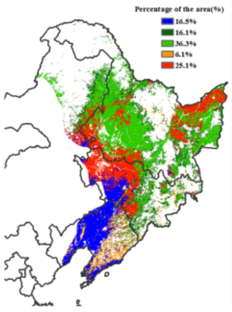
Due to the cold winter weather, no crops were grown in the northeast of China during this monitoring season (January to April 2020). Accordingly, the NDVI growth curve showed low values. CropWatch Agroclimatic Indicators (CWAIs) have shown that the precipitation and temperature greatly deviated from the average level. The overall precipitation increased by 10%, and the precipitation was above average level in mid-February, late February, mid-March and mid-April. The photosynthetically active radiation decreased by 4%, and temperature increased by about 1.8°C. The temperatures were close to average levels in mid-March, late March and early April. Altogether, the potential biomass was 3% below the fifteen-year average level.

Overall, higher precipitation and warmer temperatures are beneficial to spring sowing. A short period of cold weather in late April in the northern part (Heilongjiang Province) of northeast China may have caused a slight delay of sowing. CropWatch will continue to monitor the Northeast in the coming months.

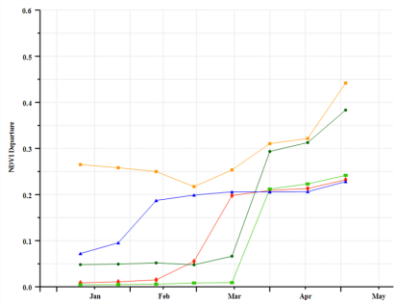
Figure 4.10 Crop condition China Northeast region, January - April 2020



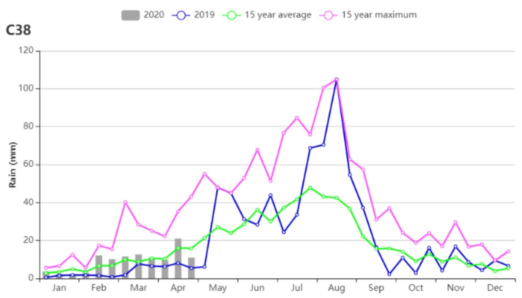
(a) Crop condition development graph based on NDVI



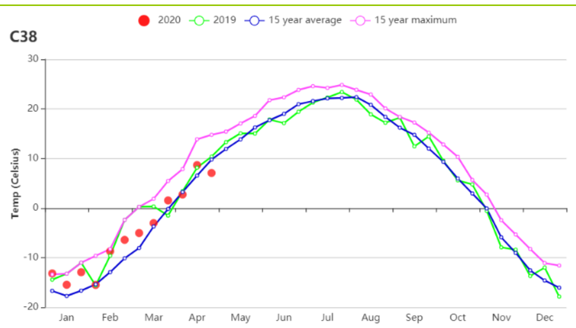
(b) Spatial NDVI patterns compared to 5YA



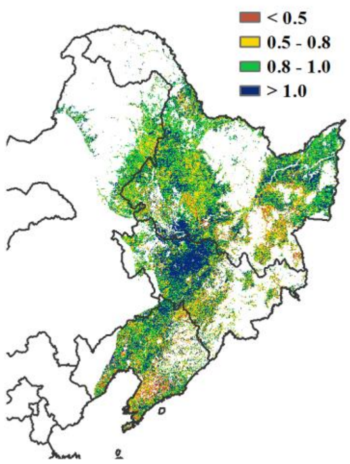
(c) NDVI profiles



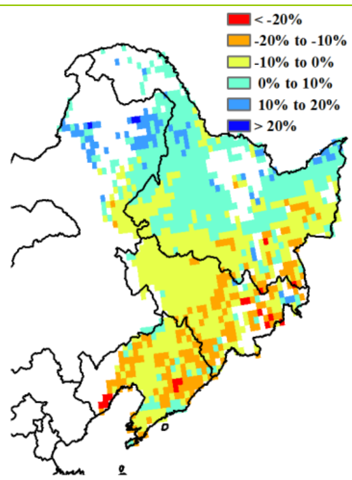
(d)Time series rainfall profile



(e)Time series temperature profile



(f) Maximum VCI

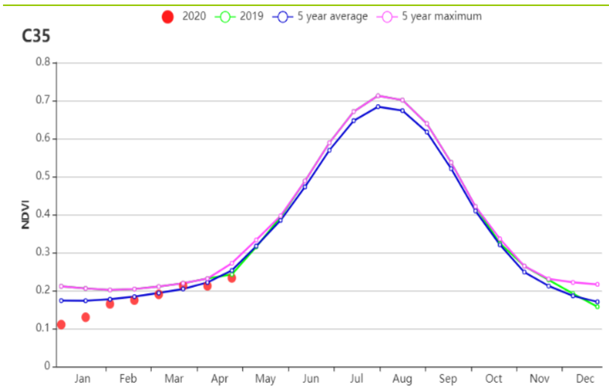


(g) Potential biomass departure from 15YA

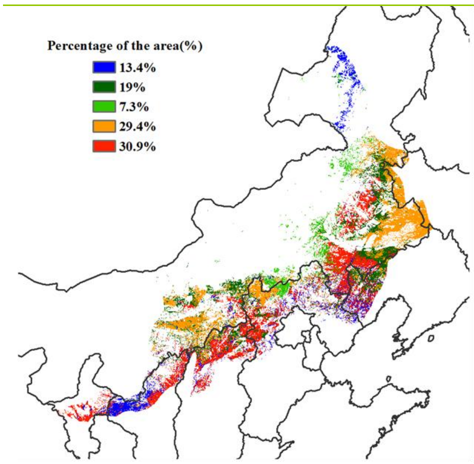
Inner Mongolia

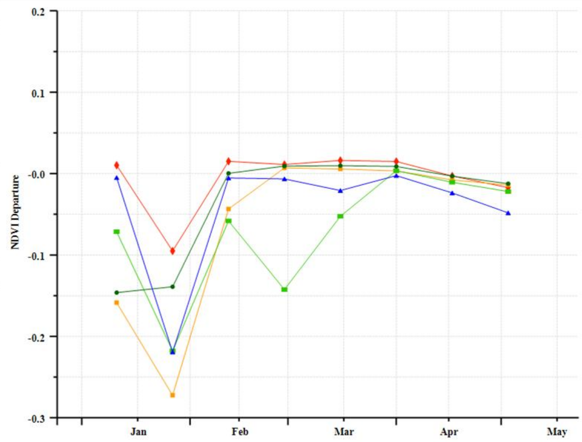
At the end of this monitoring period in late April, most crops had not yet been planted in Inner Mongolia due to the low temperatures in the winter and early spring. Sowing activities gradually started from late April, along with increasing temperatures. Agro-climatic indicators in the first four months of this year demonstrated that rain and temperature indicators were above average (RAIN +34%, TEMP +0.9°C), while the radiation (RADPAR) decreased by about 2%. Significant above-average rainfall provides sufficient soil moisture which will benefit the germination of crops and green-up of grazing lands alike. Meanwhile, the abundant rainfall also hampered the sowing of spring crops as reflected by the 45% lower CALF because of late sowing. Current prospects for the region are mixed, weather conditions in the following months are very critical.

Figure 4.11 **Crop condition Inner Mongolia region, January - April 2020**

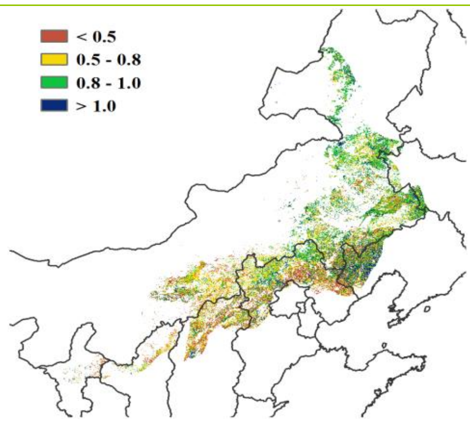


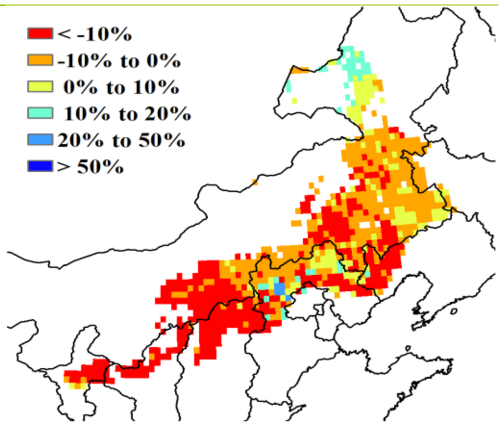
(a) Crop condition development graph based on NDVI





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





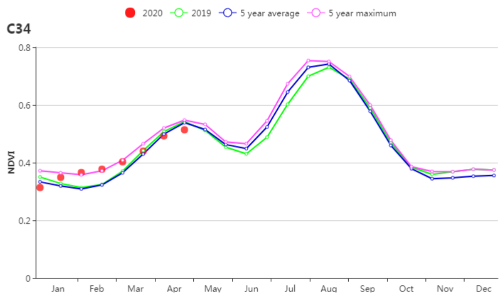
(c) Maximum VCI (d) Potential biomass departure from 15YA

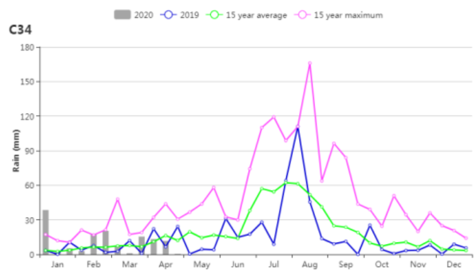
Huanghuaihai

The Huanghuaihai region is located in the North China Plain, where winter wheat - summer maize double cropping is the major cropping practice. The monitoring period of this report is from January to April, during which the winter wheat progressed from winter dormancy to the flowering stage. Harvest will be completed in mid-June. The NDVI-based crop growth profile shows that the growth of winter wheat was generally above average until March, and slightly lower than the average in April. The maximum vegetation condition index (VCIx) was 0.83 indicating that the crops were in average conditions. As assessed by CropWatch indicators, the agro-climatic and agronomic conditions were generally favorable. Compared to average, the precipitation (RAIN) increased greatly by 51% and the temperature (TEMP) rose slightly (+1.2℃), while the radiation (RADPAR) showed a reduction of 4%. The low radiation potentially lowered the biomass by 9% compared with 15YA but the significant above average rainfall might benefit crops if further weather are dominated by sunny condition. The cropped arable land fraction (CALF) was 2% lower than the past 5-year average.

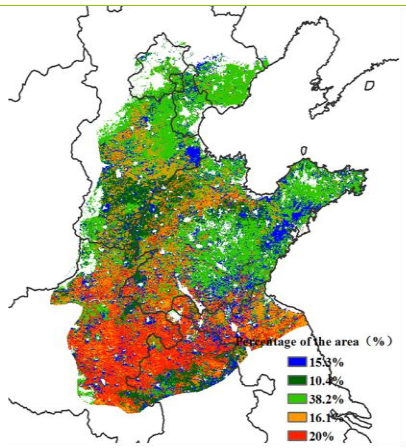
The whole region displayed NDVI values that were below but close to average as shown by the NDVI clusters and profiles. Northern Jiangsu showed above-average crop conditions, accounting for 16.1% of the total cultivated area, while about 38.2% of the cultivated land located in south-eastern Hebei, Tianjin and southeastern Liaoning had poor crop growth condition in mid and late January. Then the crops recovered to average levels over the regions mentioned above. The crop growth in the remaining areas of Huanghuaihai was somewhat lower than the average level, including parts of eastern Liaoning and eastern Hebei. The potential biomass departure map shows that biomass in the northern part of the region was significantly lower than the average level and higher in the south, which is consistent with the actual growth situation reflected by the NDVI anomaly cluster map.

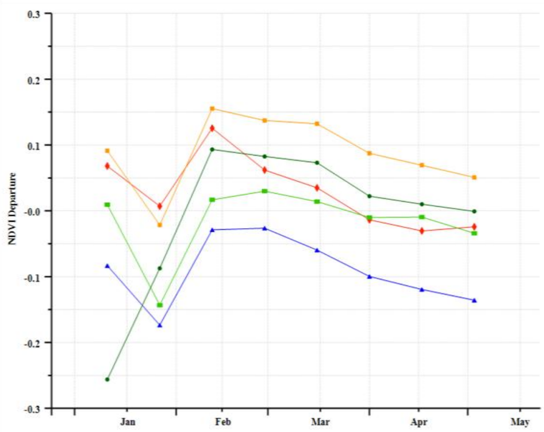
Figure 4.12 Crop condition Huanghuaihai region, January - April 2020



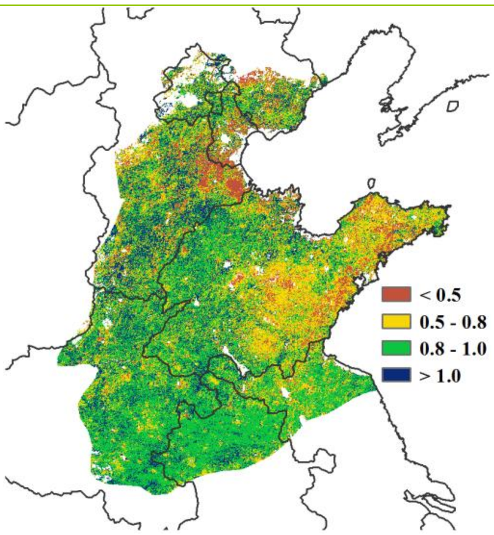


(a) Crop condition development graph based on NDVI (b) Rainfall profiles

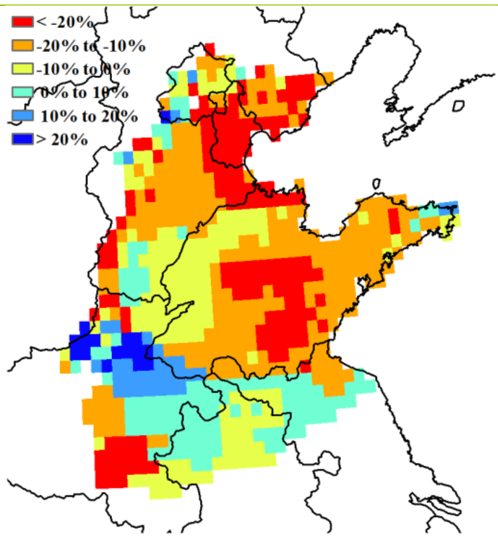




(b) Spatial NDVI patterns compared to 5YA (c) NDVI profiles



(d) Maximum VCI

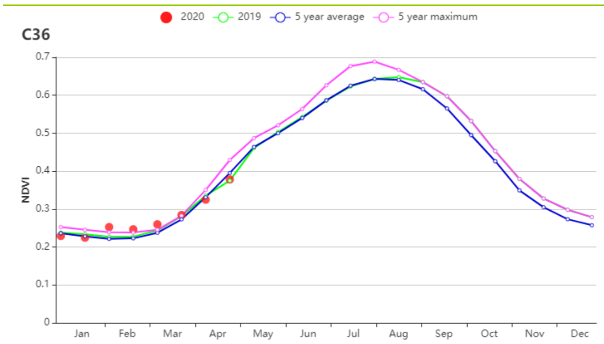


(e) Biomass departure from 15YA

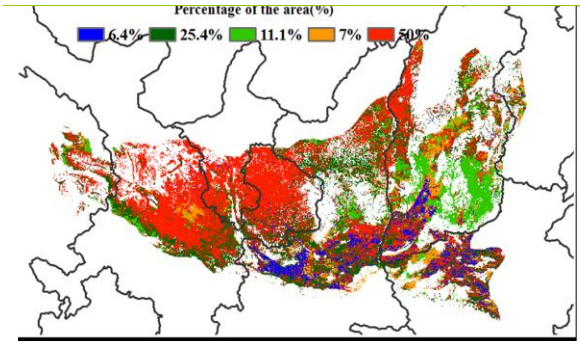
Loess region

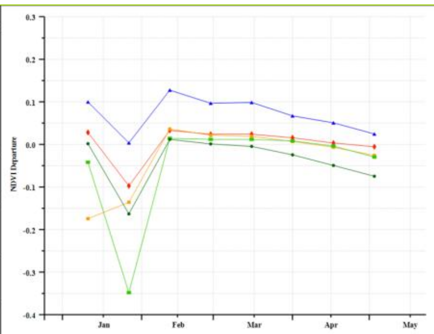
During this reporting period, the main crops grown in the Loess region were winter wheat, spring wheat and spring maize. Winter wheat was sown during late September to mid-October and will be harvested in mid-June. Planting of spring wheat and maize took place from late March to April. According to the regional NDVI development graph, crop conditions were close to the 5YA. They were generally superior to last year's and the 5-year average from February to March and close to average in April. During the monitoring period, precipitation (RAIN +6%) was above average, and so was the temperature (TEMP +0.8°C). Radiation (RADPAR -1%) was below average, which may slightly affect photosynthesis. NDVI clusters and profiles show that crop conditions were close to average in the west and north of the Loess region, while the crop conditions were below average and underwent some fluctuation from late January to early February in central and southern Shanxi. The potential biomass indicator was below average (BIOMASS -13%) for most of the Loess region. The maximumVCIx in some area was lower than 0.5, especially in the north and west. The fraction of cropped arable land was below the 5-year average (CALF -12%). Overall, the current indicators show slightly unfavorable crop prospects in the region. At the end of the monitoring period, wheat harvest was still more than a month away and average yields may result, depending on the weather conditions in May and early June.

Figure 4.13 Crop condition China Loess region, January - April 2020



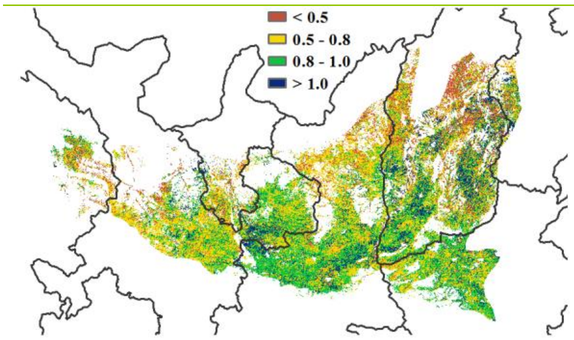
(a) Crop condition development graph based on NDVI

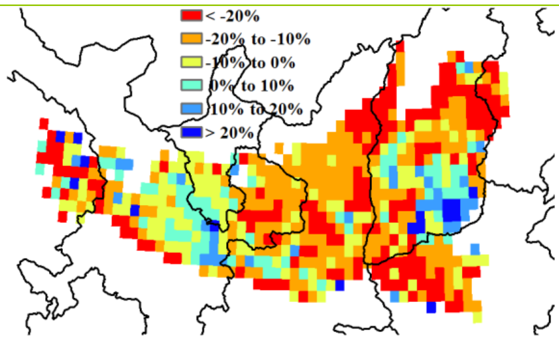




(b) Spatial NDVI patterns compared to 5YA

(c) NDVI profiles





(d) Maximum VCI

(e) Biomass departure from 15YA

Lower Yangtze region

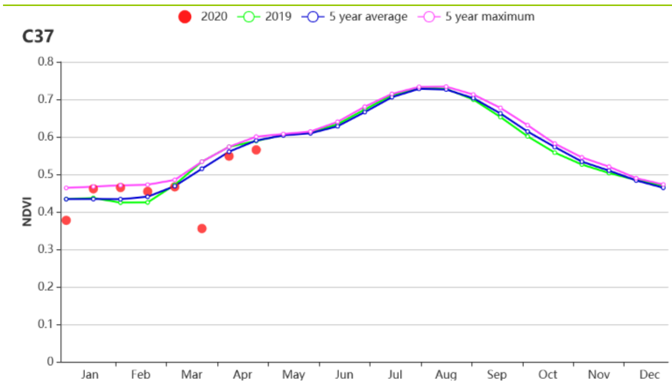
During this monitoring period, only winter crops such as wheat and rapeseed were in the field, essentially in the north of the region, including parts of Hubei, Henan, Anhui and Jiangsu provinces. There were no crops growing in the field in Fujian, the southern Jiangxi and Hunan provinces. The overall crop condition is estimated to be slightly unfavorable.

According to the CropWatch agro-climatic indicators, the Lower Yangtze region experienced a warmer and wetter season compared to the 15YA with temperatures at 1.0℃ above average and accumulated precipitation at 17% above average. The photosynthetically active radiation, however, was slightly below average (RADPAR, -2.1%). The combined environmental factors led to a 3% decrease in potential biomass compared to the 15YA. The potential biomass departure map showed the spatial variation of the weather impact on crops. Most areas in this region had negative anomalies up to 10% below average due to lower radiation.

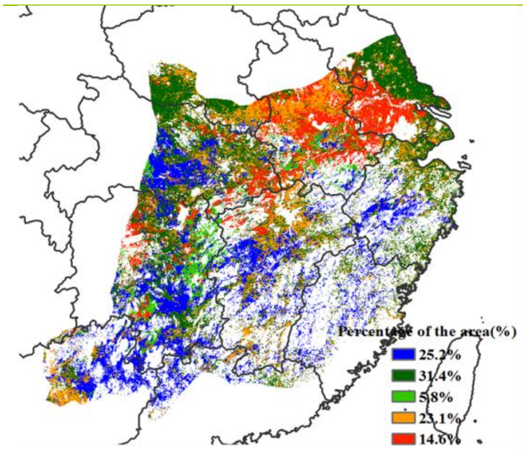
As shown in the NDVI development graph, crop conditions were slightly below the 5-year average. Only 31.4% of the area, mostly distributed in the northwest and northeast of this region including Jiangsu, Hubei and Henan provinces, showed slightly better crop conditions than the 5YA. NDVI in the remaining areas presented below-average levels.

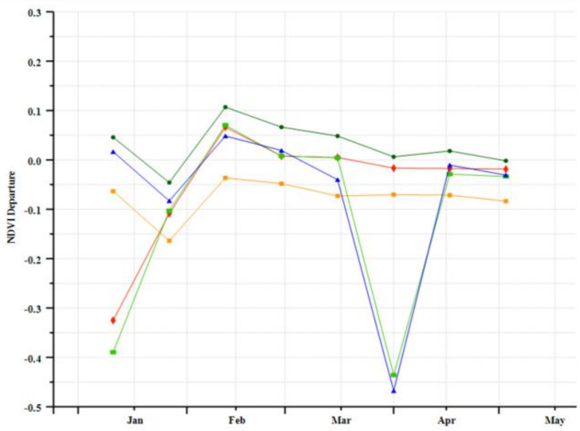
The crop conditions in the Lower Yangtze region are currently assessed as close to but below average. Meanwhile, the significantly above-average rainfall will provide favorable soil moisture for the crop development and yield formation in the following months.

Figure 4.14 Crop condition Lower Yangtze region, January 2020 - April 2020



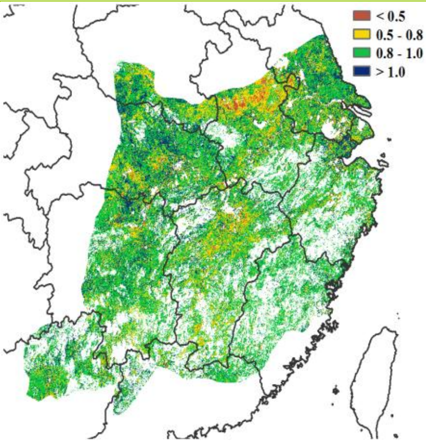
(a) Crop condition development graph based on NDVI



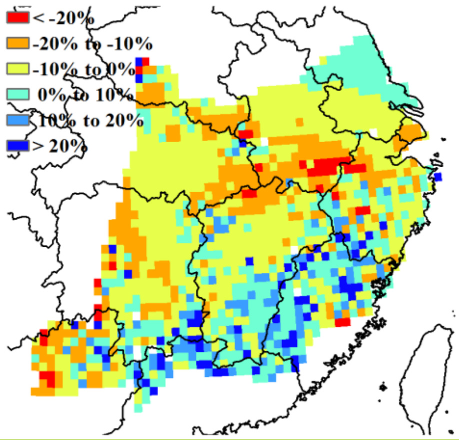


(b) Spatial NDVI patterns compared to 5YA

(c) NDVI profiles



(d) Maximum VCI



(e) Biomass departure from 15YA

Southwest China

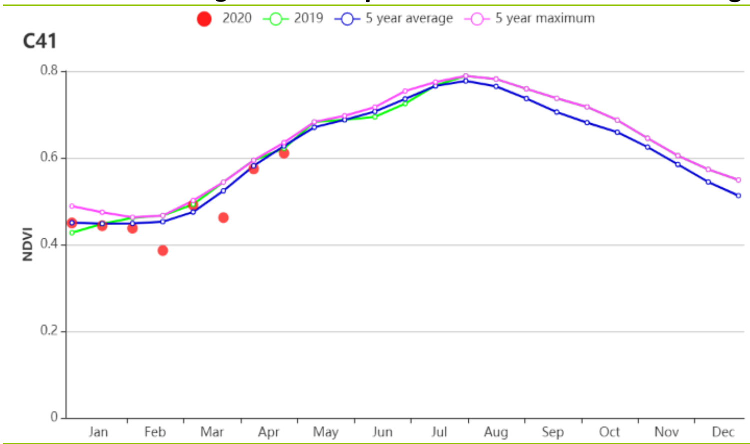
This reporting period covers the dormancy to flowering stage of winter wheat. According to the regional NDVI profile, crop conditions were slightly below the 5-year average but recovered to average levels in April.

On average, rainfall was above the fifteen-year average (Rain +36%), whereas radiation was below average (RADPAR -9%). Temperature was close to average as well (TEMP + 0.4°C). The resulting BIOMSS was 9% below average mainly due to less radiation. The cropped arable land fraction remained at the same average level as in the previous five years.

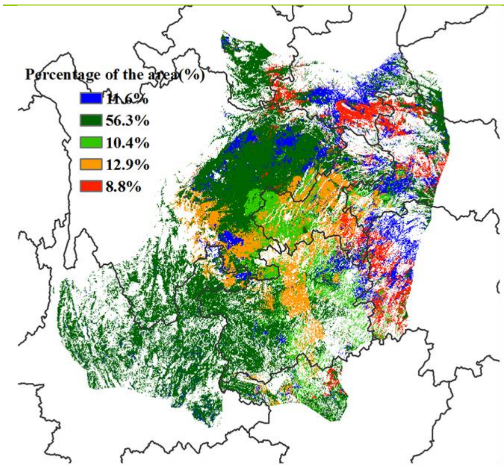
According to the NDVI departure clustering map and the profiles, values were close to average from late January to mid-April, except in Chongqing and neighboring areas in eastern Guizhou, which recorded very low NDVI due to low RADPAR (-15% and -16%, respectively). Average NDVI throughout the monitoring period was observed in eastern Sichuan and eastern Yunnan, where radiation was below average and precipitation above average (See Annex A.11). The maximum VCI reached 0.90, indicating that peak conditions were comparable to the previous five years.

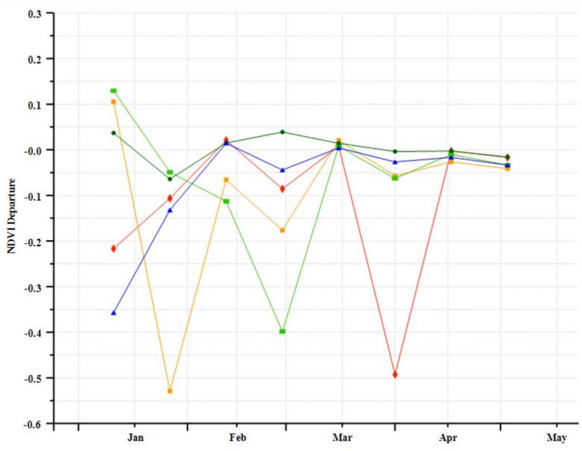
The mixture of positive and negative departures of indicators shows overall slightly below-average crop conditions. Meanwhile, the sufficient rainfall might benefit the grain-filling of the winter crops if radiation is at normal levels in May.

Figure 4.15 Crop condition Southwest China region, January - April 2020

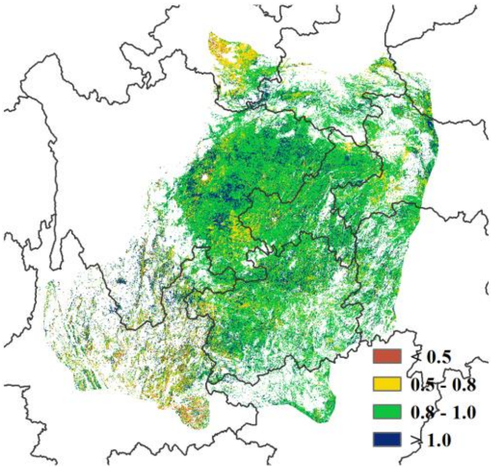


(a) Crop condition development graph based on NDVI

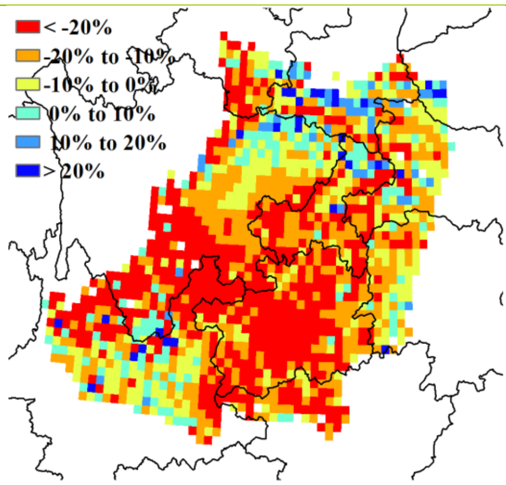




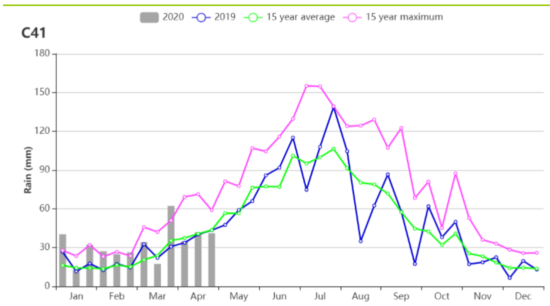
(b) Spatial NDVI patterns compared to 5YA (c) NDVI profiles



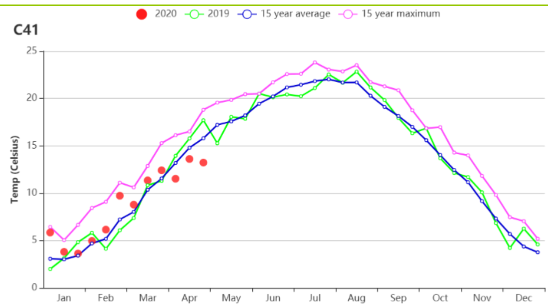
(d) Maximum VCI



(e) Biomass departure from 15YA



(f) Time series rainfall pofile



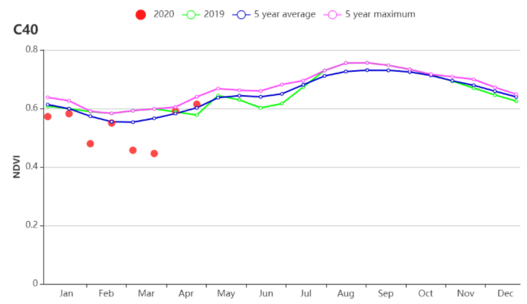
(g) Time series temperature profile

Southern region

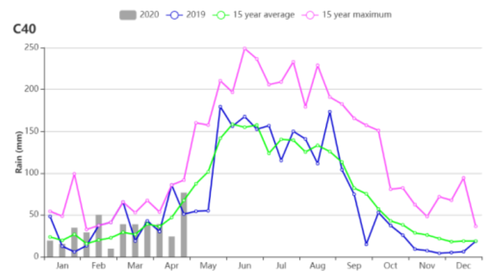
During this monitoring period, winter wheat was approaching maturity and transplanting of early rice was almost concluded except for some areas in Yunnan. According to the crop condition development graph based on NDVI, crop conditions were generally below the 5-year average, while they gradually improved after mid-March. Rainfall was above average (RAIN +12%) and radiation and temperature were close to average (RADPAR -1%, and TEMP +0.6℃).

The average VCIx of the Southern China region during the monitoring period was 0.89, and almost all regions presented above 0.80 VCIx. The cropped arable land fraction was near average (CALF +1%), and the biomass was close to average as well. Guangdong, Fujian and some scattered areas in Yunnan experienced a significant increase of BIOMSS. Guangxi was just the opposite. As shown by NDVI clusters and profiles, 32.1% of the region displayed above-average values. 12.8% of cropland, mostly located in Guangxi, showed negative departures during late January to late March and was near average in April. During April, most areas in Southern China were slightly above average, while only 29.7% of the region was below average. Yunnan had experienced a severe drought starting in March, which caused serious crop losses. The drought intensity was greater than usual and will most likely continue until the beginning of the rainy season in early summer. A closer monitoring for this region will be needed in the coming months.

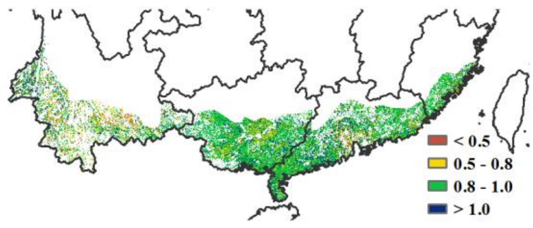
Figure 4.16 Crop condition China Northeast region, January - April 2020



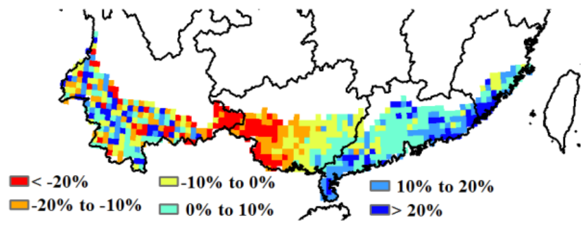
(a) Crop condition development graph based on NDVI



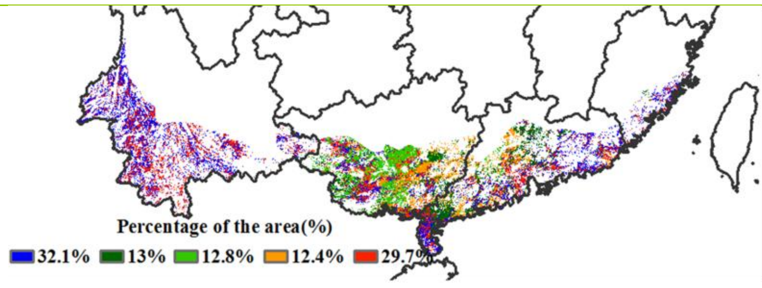
(b) Time series rainfall profile



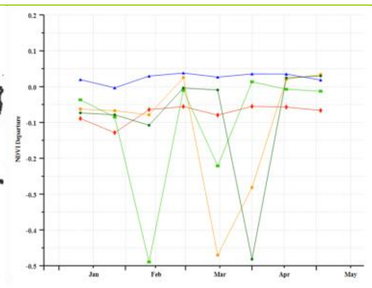
(c) Maximum VCI



(d) Potential biomass departure from 15YA



(e) Spatial NDVI patterns compared to 5YA



(f) NDVI profiles

4.4 Major crops trade prospects

This section analyzes the import and export situation of maize, rice, wheat, and soybean in the first quarters of 2020 in China.

In the first quarter, China imported 563.1 ktons of rice, down by 4.0% compared to the same period last year. The main sources of rice imports were Myanmar, Vietnam, Pakistan, Thailand and Cambodia, accounting for 25.6%, 24.4%, 17.4%, 14.3% and 14.4%, respectively, with an import value of US$293 million. Rice exports totaled 521.5 ktons, an increase of 8.8% over the previous year, mainly to Egypt, the republic of Korea, Papua New Guinea, Japan and sierra leone, accounting for 16.7%, 8.4%, 7.3%, 7.1% and 6.3% of total exports, respectively, with a value of US$214 million.

In the first quarter, China imported 1.27 million tons of wheat and wheat products, an increase of 22.6% over same period in the previous year. The main sources of imports were Australia, France, Canada and Lithuania, accounting for 36.7%, 27.5%, 11.5% and 10.3% of the total imports, respectively, with an import value of US$362 million. The export volume of wheat and its products was 55.9 ktons, mainly to the DPRK and Hong Kong, accounting for 71.7% and 26.1% of the total export volume respectively, with a value of US$21 million.

In the first quarter, China imported 1.25 million tons of corn, an increase of 27.4% over the previous year. The main sources of imports were Ukraine, Bulgaria and Russia, accounting for 88.6%, 9.0% and 2.2% of the total imports, respectively, with an import value of US$266 million. Corn exports were 1.2 ktons, mainly to north Korea (100%), with an export value of US$317.3 thousand.

In the first quarter, China imported 17.79 million tons of soybeans, an increase of 6.2% over the previous year. The main sources of imports were the United States, Brazil and Argentina, accounting for 43.9%, 40.7% and 12.0% of the total imports, respectively, with an import value of US$7.193 billion. Soybean exports were 27.4 ktons, down 18.2% from the previous year.

Trade prospects for major cereals and oil crop in China for 2020

Based on remote sensing-based production prediction in major agricultural producing countries in 2020 and the Major Agricultural Shocks and Policy Simulation Model, which is derived from the standard GTAP (Global Trade Analysis Project), it is predicted that the import of major grain crop varieties will increase slightly in 2020. The details are as follows:

Rice imports will decrease by 3.7% and exports by 8.6% in 2020.Affected by COVID-19 and "desert locust", the international rice market price will remain high, affecting Chinese rice import quantity. It is estimated that Chinese rice import will decrease marginally in 2020.

Chinese wheat import will increase by 10.2% and export by 2.6% in 2020. The global wheat supply is relatively abundant and the international price is low and fluctuating. Driven by the domestic and foreign price differences, it is estimated that the wheat import will keep increasing in 2020. However, affected by the epidemic, the international wheat price volatility risk is greater.

Chinese maize import will increase by 20.5% in 2020, and its export will be basically flat. At present, affected by the epidemic, the global demand for feeding maize is weakening, the overall supply and demand situation is easing with price going down. Domestic and foreign maize price difference is being at greater amptitude, Chinese maize import is expected to continue to increase in 2020.

Chinese soybean import will increase by 1.0% and export by 3.5% in 2020. As the differences between domestic and international soybean price is getting greater, soybean imports are expected to continue to grow. As the United States and China have reached an agreement on a Phase One trade deal, it is estimated that Chinese soybean import will remain high in 2020. However, the outbreak of the epidemic also brings uncertainties.

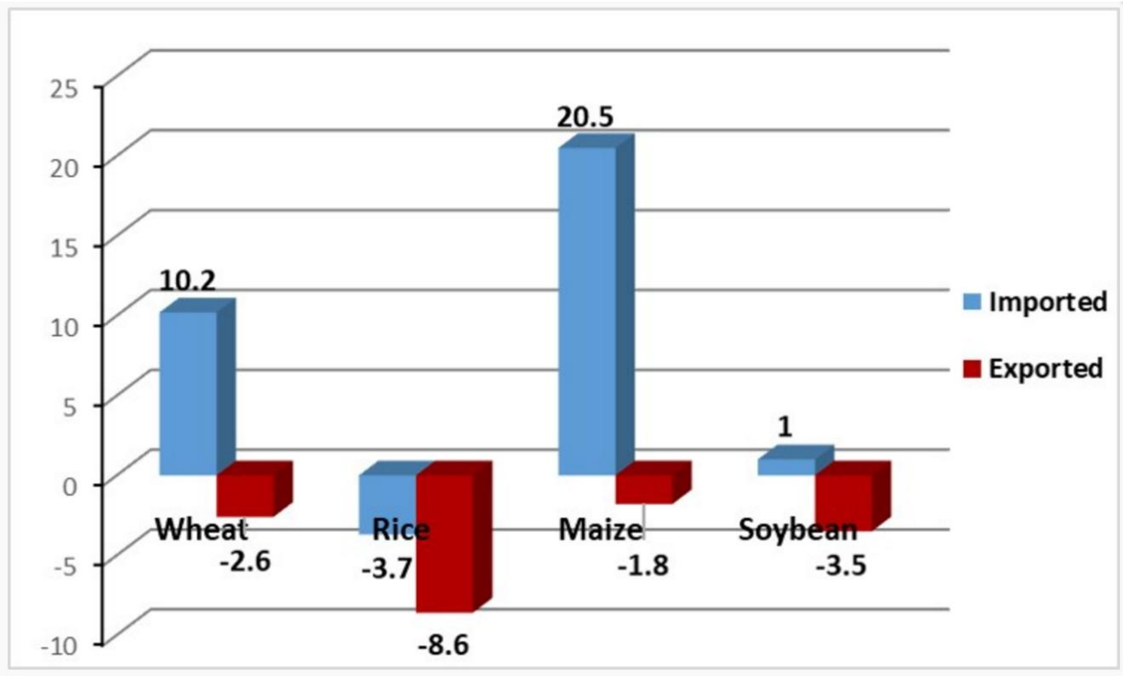


Figure 4.17 Rate of change of imports and exports for rice, wheat, maize, and soybean in China in 2020 compared to those for 2019(%)

Chapter 5. Focus and perspectives

Building on the CropWatch analyses presented in chapters 1 through 4, this chapter presents first early outlook of crop production for 2020 (section 5.1), as well as sections on recent disaster events (section 5.2), Drought impacts on rice production in lower Mekong river (5.3) and an update on El Niño (5.4).

5.1 CropWatch food production estimates

Table 5.1 presents this year's second estimate by the CropWatch team of global maize, rice, wheat and soybean production in 2020. The production is forecasted based on remote sensing data from the start of growing season up to the end of April 2020. Winter crops in the Northern Hemisphere are still growing and summer crops are in very early stages, or yet to be planted in May. The harvest of last year's summer season/monsoon season has been completed while winter crops were mostly in their vegetative growth period. CropWatch will further update and review the production in the August and November 2020 CropWatch bulletins when more in-season satellite data become available.

The current bulletin only focuses on the crops grown or harvested between January and April as listed in table 5.1 below. The production values for each country are all remote sensing-based estimates/predictions while global production is projected by combining remote sensing model estimates and production trends. The percentage of modelled global production varies according to crops: 21% for maize, 36% for rice, 77% for wheat (most of it being northern hemisphere winter wheat) and 46% for soybeans. The crop conditions for 42 countries at national and agro-ecological zone level are provided in detail in chapter 3 while a whole chapter is devoted to China (Chapter 4). The 42 + 1 countries are referred to conventionally as the "Key Targeting Countries". "Others" include the 142 countries from Albania, Algeria, Armenia [...] to Venezuela, Yemen and Zimbabwe.

CropWatch predicts the global production of the major commodities at 1057 million tonnes of maize, and 755 million tonnes for rice, both of which are the same as 2019. Wheat and soybean productions are projected at 737 million tonnes, and 329 million tonnes, up by 3% and 1% from 2019, respectively. The outlook for each country is described below.

Maize:

In this bulletin, maize production was projected for only 13 countries in the Southern Hemisphere or Equatorial areas out of the 43. Maize in other countries was either harvested by the end of 2019 or is just planted, or to be planted in the coming months. The total production of the 13 maize producing countries is projected at 218 million tonnes, 2% above 2019. Among the 13 countries, Brazil and Argentina are the top 2 maize producers with a 2% drop and 2% increase from 2019, respectively. The largest production increase in percentage was observed for South Africa whose maize production increased by 27% to 14,759 thousand tonnes. The significant increase of maize production is attributed to both expanded maize planted area and the increased yield thanks to the conducive rainfall in the main producing regions. Other big producers such as Indonesia and Mexico also present marginal increase of production by 2% and

1%. Maize production dropped in Mozambique, Myanmar, Vietnam and Zambia mainly due to the water stress during the growing season. The largest production drop was observed in Myanmar by 12% from 2019.

Rice:

Rice production was projected using remote sensing data for twelve countries as listed in table 5.1. Two thirds of the countries are located in South and Southeast Asia. Two countries in Africa (Angola and Mozambique), and two countries in South America (Argentina and Brazil) are also included. Among those 12 countries, Indonesia (same as 2019), Bangladesh (6% below 2019), Vietnam (3% below) and Thailand (6% above) are the top producers but with different inter-annual changes in production. Since rainfall in rice producing countries is relatively high, there is relatively less water stress in those countries and the production changes in percentage compared with 2019 are in general marginal to moderate, ranging from -5% in Bangladesh and Cambodia to +6% in Thailand. Still, most countries with reduced rice production are those that were affected by drought conditions, such as Brazil, Cambodia, Myanmar, and Vietnam.

Wheat:

Since most winter wheat in the Northern Hemisphere was sown around September to October of last year and the weather was generally favorable during winter to spring, the outbreak of COVID-19 has limited impacts on wheat production. According to the latest prediction, the total production of the 22 key wheat producing countries is at 569.4 million tonnes, which is 3% up from 2019. Greater differences are observed among countries in terms of inter-annual production change compared with the other three crops, ranging from 22% lower than 2019 in Ukraine and 23% up from 2019 in Mexico. It is also noteworthy that the top wheat producers (China, India, Russia) all present an increased wheat production, by 4%, 14% and 6% respectively, which contribute to a 20.54 million tonnes of production increase. Wheat production in USA, another important wheat producer, is projected at the same level as 2019. However, if the lockdown continues to the harvest season of winter crops, it might hamper harvest practices. Meanwhile, for several countries in Europe and Asia forecasted outputs are lower as compared to 2019, including Afghanistan, Belarus, France, Germany, Iran, Kyrgyzstan, Romania, Ukraine, United Kingdom, and Uzbekistan mainly due to the reduced planted area.

Soybean:

Considering the crop calendar, this CropWatch May Bulletin only focuses on the two major soybean producing countries in the Southern Hemisphere, Brazil and Argentina. The soybean productions for Brazil and Argentina are estimated at 99.85 million tonnes and 52.59 million tonnes, which are 1% below and 2% above 2019, respectively. The decrease in soybean production is mainly due to the dry spell in central-southern Brazil which resulted in lower yield compared with 2019. The combined soybean production of these two countries contributes to almost half of global soybean production and remains at the same level as 2019 which is a benefit for the global soybean market.

Early warning:

Based on the CropWatch early warning indicators, CropWatch also tracked the sowing progress for some countries at high latitude in the Northern Hemisphere such as spring crops in Canada and Kazakhstan, as well as summer crops in USA. By early May, sowing in Canada is 14% in advance from 2019 and it is 8% in advance in Kazakhstan. Maize sowing progress in USA is at same pace with 2019, while rice sowing is 7% in advance and soybean sowing progress is 1% delayed compared with the same period last year. According to our analyses, the lockdown did not result in a significant delay of sowing for spring crops and summer crops in the Northern Hemisphere. CropWatch will keep an eye on the impacts from COVID-19 in the following months and next bulletin.

Table 5.1: 2020 cereal and soybean production estimates in thousands tonnes. All the national production values in the table are remote sensing model-based estimates while the global production is projected by adding up the model-based production and trend-based model for all other countries. 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					5482	-17%		
Angola	2865	3%	46	2%				
Argentina	54054	2%	1938	5%			52587	2%
Bangladesh	2453	4%	45690	-5%				
Belarus					2613	-11%		
Brazil	84098	-2%	11228	-4%			99849	-1%
Cambodia			9544	-5%				
China					128472	4%		
Egypt					12712	8%		
France					35206	-1%		
Germany					26776	-4%		
Hungary					5247	7%		
India					102873	14%		
Indonesia	16776	3%	64154	0%				
Iran					15767	-2%		
Italy					7868	2%		
Kenya	3134	15%						
Kyrgyzstan					522	-12%		
Mexico	22345	1%			5167	23%		
Morocco					6303	-5%		
Mozambique	2071	-1%	384	0%				
Myanmar	1630	-12%	26474	-4%				
Pakistan					29121	10%		
Philippines	6986	0%	21000	3%				
Poland					10329	2%		
Romania					7575	-2%		

	Maize		Rice		Wheat		Soybean	
	2020	**Δ%**	**2020**	**Δ%**	**2020**	**Δ%**	**2020**	**Δ%**
Russia					56312	6%		
South Africa	14750	27%						
Sri Lanka			2420	1%				
Thailand			41831	6%				
Turkey					18553	0%		
Ukraine					16327	-22%		
United Kingdom					13246	-2%		
USA					54832	0%		
Uzbekistan					8099	-1%		
Vietnam	5067	-2%	44678	-3%				
Zambia	1847	-1%						
Sub-total	**218077**	**2%**	**269388**	**-1%**	**569403**	**3%**	**152436**	**0%**
Global	**1057321**	**0%**	**755420**	**0%**	**736553**	**3%**	**327882**	**1%**

5.2 Disaster events

Introduction

In late 2019, humanity was severely hit by a highly contagious and rapidly spreading type of coronavirus named COVID-19, leading to a massive health crisis. Hence, a period of fewer than three months was enough time for the new virus to spread all over the world. A pandemic was announced by WHO on March 11, 2020. Under the current pandemic conditions, governments were forced to take unprecedented actions of border closures, quarantines, and restricting people's movement. Up to mid-May, about 4.67M persons were infected by the virus around the world, and 1.71M persons had recovered, while 312,645 persons have lost their lives (Figure 5.1).

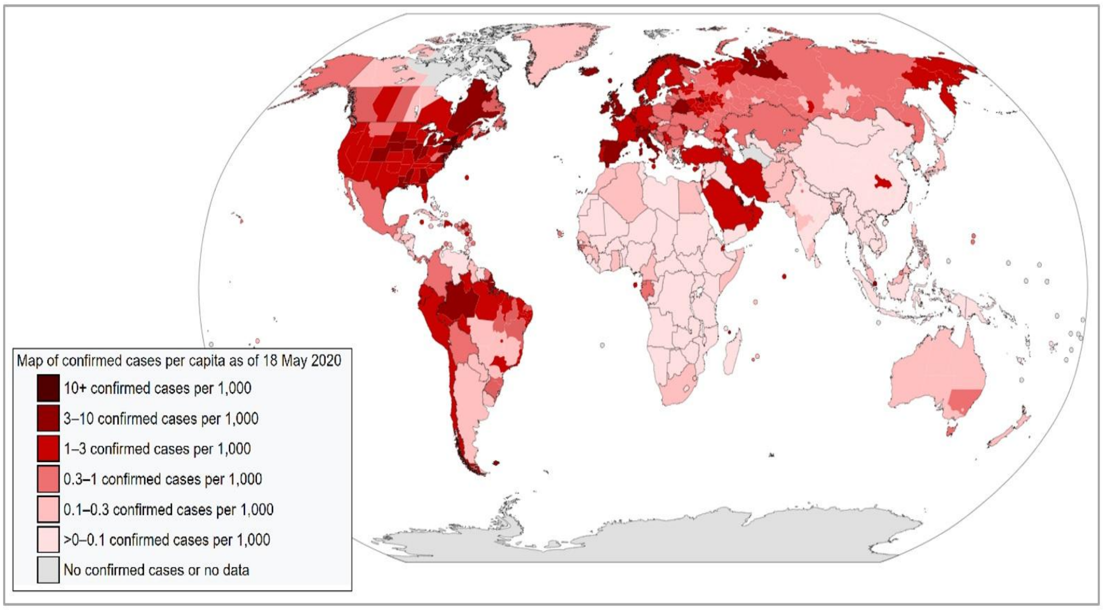


Figure 5.1 Crop growth condition in the major winter wheat-producing areas during the period from March 1st to 10th,2020 (left), and the statistical proportion of winter crops condition compared to 2019 for each province (right)

Currently, scientists around the world are racing to find a vaccine for this new virus, and several specialized international organizations such as WHO, FAO and World Bank are attempting to assess the damage of COVID-19 on public health, economy, and food security. In this context, many scenarios for how COVID-19 could impact human life were introduced. All agree that the bill for this crisis will depend on the length of the duration of the lockdown until a vaccine has been developed. The most affected countries will be the poorest ones, where the public health systems are very weak to cope with the current situation. Vulnerable groups, including small-scale farmers, migrant and informal workers, will be extremely affected. They are in an urgent need for intervention and assistance to mitigate the negative impacts of COVID-19.

The first quarter (January to April) of 2020 was warmer than average particularly over Russia, Europe, Central Asia, and southern America. The same period can be characterized as being drier-than-average, particularly over Europe, South-East Asia, and the southern part of North America. After intensive wildfires at the end of 2019, Australia received some rainfall by the start of 2020. It helped fight wildfires and even caused some floods in the northern part. Also, the West Indian Ocean area, Madagascar and eastern Africa experienced positive rainfall anomalies and flooding over the land areas.

COVID-19 impacts on food and agriculture

The current and prospective impacts of COVID-19 on food and agriculture sectors are primarily assessed by FAO. As of now, according to FAO analysis, the food market has been stable so far since the food demand was reduced due to the crisis and in the meantime, the food supply has been adequate. Global cereal stocks are at comfortable levels and the outlook for wheat and other major staple crops for 2020 is positive. The shortage of fruits and vegetable production was not noticeable due to the low demand during the lockdowns. As of early May, the world market prices of some major food staples, such as maize, wheat, and palm oil, have declined. The only staple food that has seen rising prices is rice, and that was linked to the export restrictions of a key exporter, i.e., Vietnam.

A particular concern raised by FAO is to have a long duration of lockdowns waiting for vaccines. As demand for food will decrease over the next months, prices should go down in 2020, and this will harm farmers and the agricultural sector. Countries that depend on primary commodity exports (food, raw materials, fuels) will be affected by the significant reduction of demand from import countries. The restrictions of movement in the medium and long run are expected to impede farmers from accomplishing their farming process (e.g. fertilizing and harvesting) which finally must affect agricultural production, such as what happened in Sierra Leone (2014-2016) during the Ebola Virus Disease outbreak.

In the same context, the CropWatch analyses based on Big Earth Data (Landsat-8, Sentinel-2, and survey data) revealed favorable crop conditions over the major winter wheat-producing areas of China, mostly distributed in the Provinces of Hebei, northwest Shandong, central and northeast Jiangsu, and Shaanxi (Figure 4.8 and Figure 4.94). The conditions over Hebei were the most favorable (75% of the cultivated area was above 2019's crop conditions), except over Jingzhou and Puyang municipal region, accounting for 8% of the province's winter crop cultivation area. Overall, the outbreak of COVID-19 in China has limited impacts on the production of winter crops.

Furthermore, remote sensing observations revealed that the land preparation for early rice sowing and transplanting started earlier than last year in the Province of Guangdong, one of the major early rice-producing areas in China.

Food security of vulnerable communities already grappling with hunger or other crises (e.g. the Desert Locust outbreak in the Horn of Africa, insecurity in Yemen, or the Sahel) is also another important concern raised by FAO since these current crises are overlapping with the pandemic's impacts. In the absence of timely and effective policies, millions more are likely to join the ranks of the hungry as a result of the COVID-19-triggered recession which will be a setback to global Zero Hunger efforts. Vulnerable groups including small-scale farmers, migrant, and informal workers will be hard hit by lockdowns since accessing markets to sell their products or buy essential inputs will be challenging.

To reduce the negative impacts of COVID-19 on agriculture and food production, FAO is urging all countries to keep international trade open and take measures that protect their food supply chain. Seeds and planting materials must continue to flow to smallholders; animal feed to livestock breeders; and aquaculture inputs to fish farmers. Also, countries should focus on the needs of the most vulnerable communities and groups, and scale up social protection programmes including cash transfers.

Desert locust

Vast regions in Africa, the Middle East and Asia are now under the threat of Desert locust. The threat started when large swarms were on the move, traveling over the Red Sea to Ethiopia and Somalia. Aided by uncommonly heavy rains that buffeted East Africa from October to December 2019, the insects spread south to Kenya, Uganda, and Tanzania. During the last four months (January to April 2020) and up-to-now, the locusts were migrating to other areas in Africa, the Middle East and southwest Asia (Figure 5.2). Isolated locust swarms in Algeria, Morocco, and northern Mali were reported with very limited breeding possibilities due to the low rainfall in those regions during April. However, the possibility was higher at limited agriculture irrigated perimeters in the Adrar valley (Algeria) and the Draa Valley (Morocco). The situation is more serious over Kenya, Ethiopia, Iran, Pakistan, and Saudi Arabia. All these countries have received light to moderate rains in April, while heavy rains fell over Yemen, Ethiopia, and Kenya. The moderate or heavy rains could be helpful to new-generation swarms such as what is currently happening in Kenya and Ethiopia intensively, with fewer numbers over other countries (Figure 5.3). As reported by FAO, the total area treated in April was more than 302,000 ha compared to 182,000 ha in March.

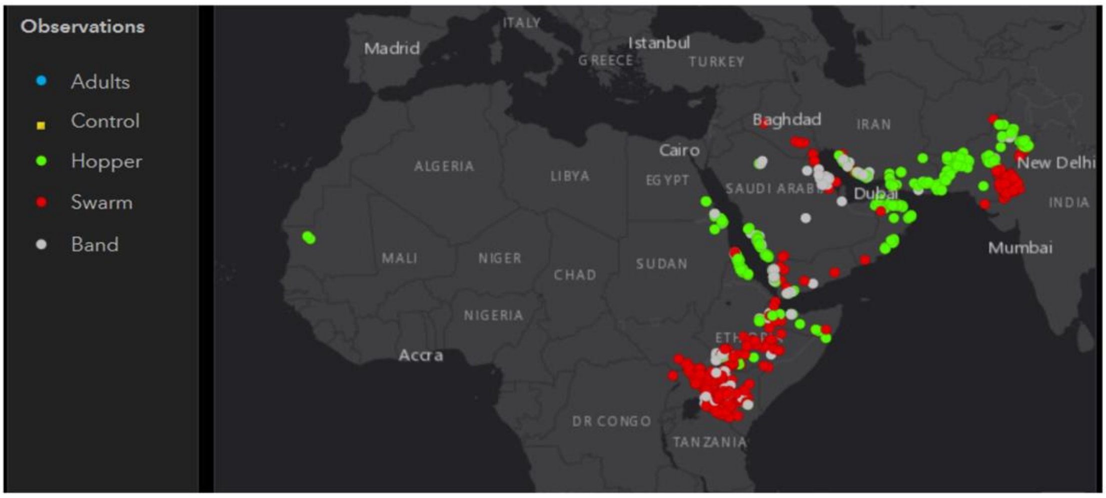


Figure 5.2 Desert Locust Data Explorer for January – May 2020 issued by FAO/ESRI locust Hub. Source of image: https://locust-hub-hqfao.hub.arcgis.com/.

Another aspect of concern is the overlapping between COVID-19 and Locusts threat over some regions. Over East Africa in particular, the pandemic is disrupting the supply chains for pesticides and other equipment necessary to control the spread of locusts. Also, border closures and delays posed by quarantine measures are imposing restrictions on the movement of personnel and equipment to aid in the locust response. The aid teams and control officers themselves are under the risk of getting infected by the virus or even to spread the virus to remote rural locations where locust control operations take place. These issues need to be considered by governments and funding organizations to financing responses and taking the measures to protect teams and the communities they engage with are required.

Drought

In the lower Mekong River Basin, rice is cultivated in two different seasons. The main season is the rainy season from May through December. The second is the dry season from December through July. The production in the dry season is irrigated and thus depends on an ample supply of water. The current reporting period is corresponding to the second season when extensive dryness continued throughout the lower Mekong River Basin. According to the Ministry of Agriculture in Thailand, the extremely dry weather particularly over the North region resulted in near-historic low water levels in the top two reservoirs, Bhumibol and Sirikit. These reservoirs are essential for the dryland cultivated rice crop –predominantly irrigated – as the reservoirs provide approximately 80% of the irrigation water supply to rice areas in the lower North and Central Plains regions (refer to the section 4 in this chapter for details of the impact of drought on the crop yield).

The drought was the main driver for delaying the planting progress of soybeans (from Dec. 2019 to early January 2020) in Northeast Brazilian states in addition to the Rio Grande do Sul this year. The Northeast recovered due to favorable rains in January, but Rio Grande do Sul experienced another drought in late February which reduced production by 30% below the 5-year average, according to USDA. However, Brazil is expected to overtake the United States as the world's leading soybean producer despite weather-related production losses in the Rio Grande do Sul. Also, USDA estimates Argentina soybean production for 2019/20 to be 6% down from last year due to dry conditions in the last half of February and into March (Figure 5.3). In Australia, a large decline in Cotton production (72% from last year) occurred due to the reduction of cotton cultivated area by 84% compared with last year. This was due to below-normal precipitation during the first half of the growing season and a subsequent lack of soil moisture for dryland sowing operations.

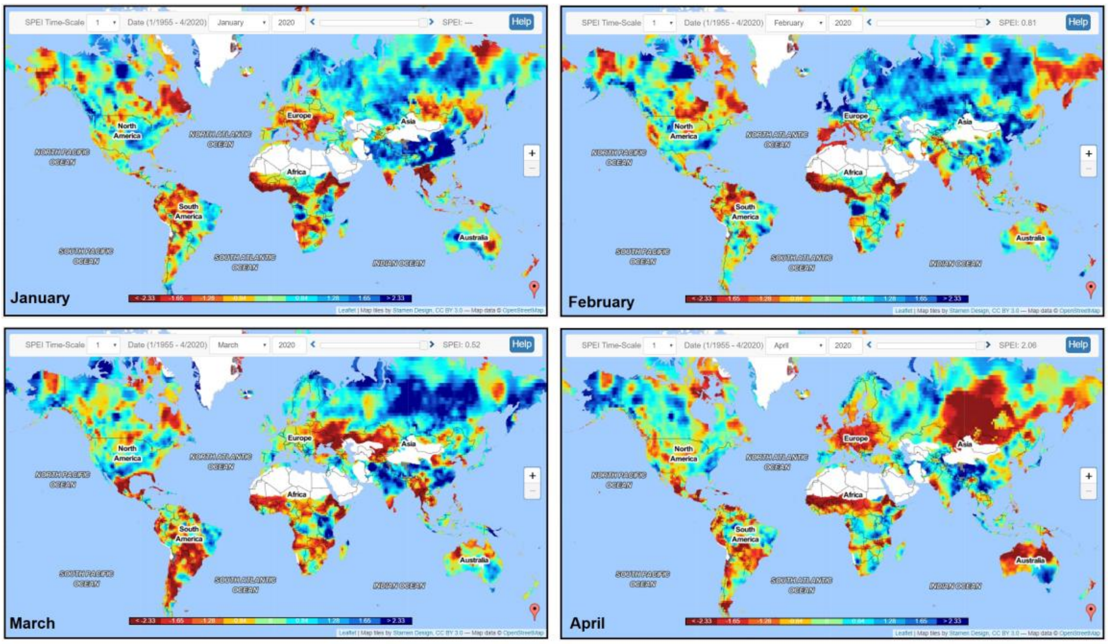


Figure 5.3 The Standardised Precipitation-Evapotranspiration Index (SPEI) estimated globally for the months; January to April of 2020, https://spei.csic.es/map/maps.html#months=1#month=3#year=2020.

Many African regions have received a significantly below-average cumulative rainfall during the period from January to March 2020. In south-western Morocco, close to harvest, vegetation conditions are worse than in the drought-affected 2019 season. Hence, the High Commission for Planning of Morocco forecasts a 4.3% drop in the agricultural value-added economic growth because of the drop in cereal production this year. In southern African countries, particularly in Zimbabwe, Zambia, Botswana, Namibia, and South Africa, in addition to the western parts of Madagascar, 45 million people are food insecure as the region enters the peak of the lean season (January-March 2020), as reported by WFP on Jan. 14th, 2020. The most affected country by drought was Zimbabwe where 4.1 million people are facing acute food insecurity.

Floods

Since the beginning of the season in February/March, significantly above-average rains affected west, central and south-east Kenya, parts of Ethiopia and parts of Uganda. Since mid-April heavy rains triggered floods, mudslides, flash floods, and river overflows in parts of East Africa, particularly in south Ethiopia, north Tanzania and most of Somalia States (Figure 5.4). These heavy rains led to casualties, displacement of people, and destruction of infrastructure and loss of standing crops. According to government officials, 214 people have lost their lives in floods and 185,600 have been displaced in Kenya, Uganda, Somalia, and Ethiopia.

In general, East African countries are confronted with multiple crises. The exceptional rainfall conditions created favorable conditions for desert locust development, adding pressure to the multiple crises caused by COVID-19 containment measures, pests, and previous drought seasons. Above-average rainfall is expected to continue across most parts of the region according to forecasts for May, with average to above-average rains concentrating in northeastern Tanzania, Kenya, eastern Ethiopia, and Somalia.

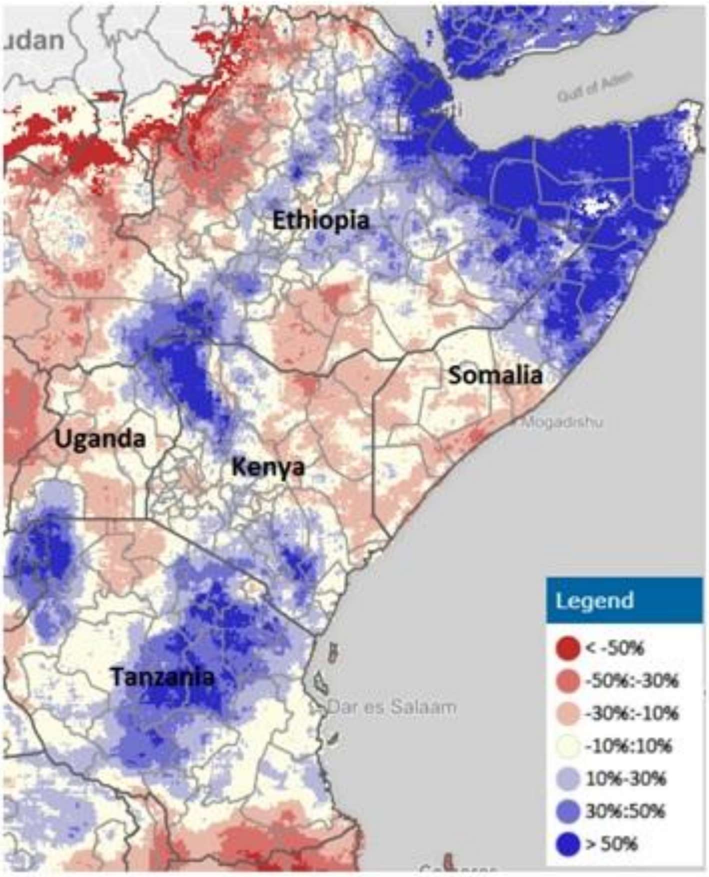


Figure 5.4 90-day rainfall anomaly map showing above-average rainfall received between February to April 2020 in Ethiopia, Somalia, Kenya and Tanzania (Source: CHIRPS, data mapped by JRC).

Another affected region by floods is in the north of Argentina which was hit by earlier floods immediately after peak flowering of soybeans which are expected to affect crop production. In Southern Africa, localised production shortfalls are expected in areas affected by floods in Zimbabwe, southern Zambia, and southern Mozambique.

Fires

Many fire alerts were recorded by global forest fires watch over Central Africa (Central African Republic, South Sudan, DRC Congo, and Nigeria) from January to April 30 of the current year, in addition to south and southeastern Asia (Myanmar, India, and China), Russia, and Australia (Figure 5.5). Over these regions and during the period (January to April) the temperature was warmer than average and precipitation was drier than average, except in January when Australia received some rainfall by the start of 2020 to help fight wildfires.

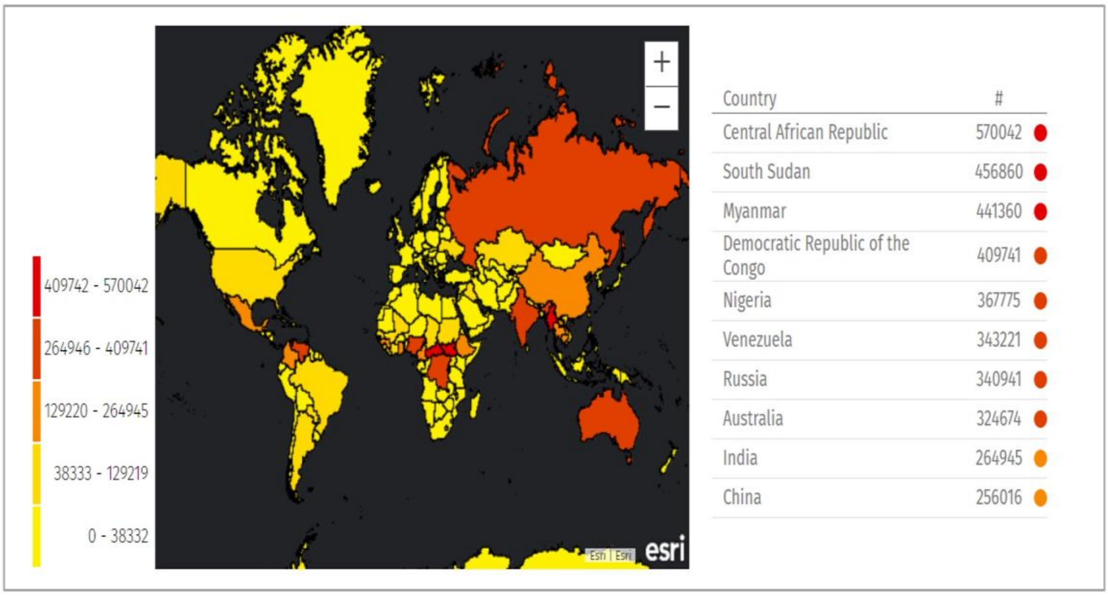


Figure 5.5 Number of fires alerts by countries (Jan.2020–April 30, 2020) Source: https://fires.globalforestwatch.org/

5.3 Drought and impacts on rice production in the lower Mekong river

CropWatch and DroughtWatch team had monitored the crop conditions affected by drought in the Mekong River Basin (including Cambodia, Laos, Myanmar, Thailand, Vietnam, and the Yunnan Province of China) from February to April of 2020. The results indicated that the five countries of the Mekong River Basin and the Yunnan Province of China had severe deficits of precipitation from February to April 2020, and a meteorological drought occurred in varying degrees (Figure 5.6). The precipitation deficits mainly occurred in the lower Mekong region in February, in Cambodia in March, and along the borders of Myanmar, Thailand and Laos in April.

Since it is the dry season of the Mekong and Lancang Jiang Rivers in February and March and it is not a main season for crop planting, the severe meteorological drought had not produced a significant impact on agriculture (Figure 5.7). Table 5.2 showed the drought situations since February in terms of the proportion of drought-affected area to crop planting area. Laos was hit the hardest: its average proportion reached 38.3% with a peak value of 58.5% in early March. Laos is followed by Cambodia (27.7%), Myanmar and Thailand (18.3% and 17.1%, respectively). The drought impact on Vietnam and the Yunnan Province of China was relatively low, about 13.1% and 11.0% respectively (Table 5.2).

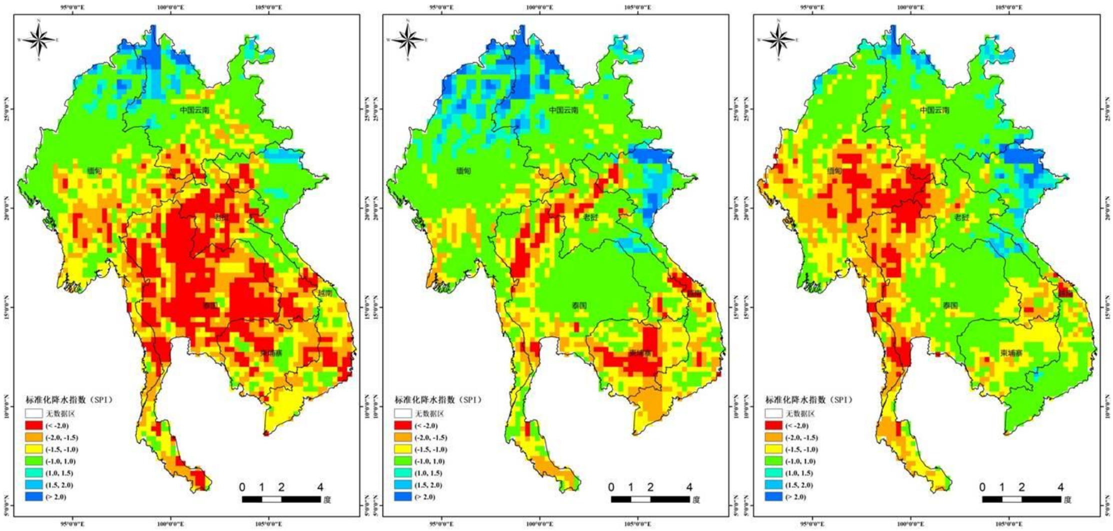


Figure 5.6 Distribution and changes of Standardized Precipitation Index (SPI-3) in the Mekong River Basin in early February, early March and early April 2020

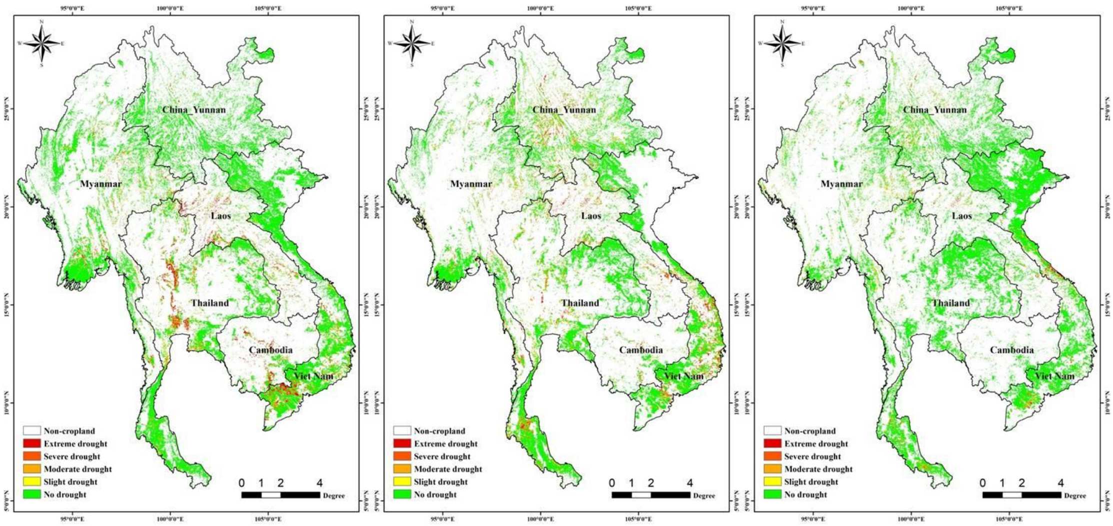


Figure 5.7 Spatial distribution and changes of drought in the Mekong River Basin in mid-February, mid-March and mid-April 2020

Table 5.2 Dekadal crop drought proportion from February to April 2020

February-April	The proportion of drought-affected area to crop planting area (%)					
	Cambodia	**Laos**	**Myanmar**	**Thailand**	**Vietnam**	**Yunnan of China**
First dekad of February	25.9	36.6	15.3	14.9	8.30	4.7
Second dekad of February	36.4	46.2	13.9	20.7	13.5	3.0
Third dekad of February	32.6	42.8	7.70	10.4	8.60	2.2
First dekad of March	26.6	58.5	17.1	25.3	13.8	11.2
Second dekad of March	28.0	42.9	20.2	18.0	18.9	23.5

Third dekad of March	28.2	35.5	27.5	18.3	8.0	21.8
First dekad of April	37.3	28.1	26.1	22.9	26.5	11.7
Second dekad of April	6.60	15.9	19.0	6.20	7.4	10.2
Average	**27.7**	**38.3**	**18.3**	**17.1**	**13.1**	**11.0**

There were differences in the temporal and spatial distribution of drought impact in the countries. The drought occurred mainly in the north of Laos and in the central and western regions of Cambodia (February). The southern and central and eastern regions in Myanmar were heavily affected by drought (February-March). The central and western Thailand (February) and the southern region (March) were relatively hard hit. The Mekong Delta and central Vietnam (February-March) and central and southern Yunnan Province of China (March) also suffered a rather serious drought. By mid-April, the drought situation in the Mekong River Basin had eased as a whole. However, the trend of drought still warrants continuous monitoring, and special attention should be paid to the drought impact as the main crop growing season starts.

The total rice production in Cambodia, Thailand and Vietnam harvested during September 2019 to April 2020 or to be harvested is estimated to be up by 320 thousand tons. The production of rainy season rice harvested before February 2020 increased 17% compared to the same period of last year. The rice supply of the three countries decreased only by 1%, with a limited impact on their rice exports.

The growth condition of rainy season rice in Cambodia, Thailand and Vietnam in 2019-2020 was generally above the previous five years average (5YA) except for the scattered areas of Kampong Cham and Siem Reap Provinces in Cambodia where rice condition was below the 5YA. In contrast, the rice development during dry season was overall inferior to the average level, among which the growth of rice in western and northwest Thailand, Eastern, northern and southwest Cambodia, the southern and southwest coastal areas of Vietnam were significantly below the 5YA (Figure5.8).

Among the three countries, rice in Vietnam outperformed that of Thailand and Cambodia, with about 85% of rainy season rice in an above-average condition. It is also noteworthy that 16% of the rainy season rice achieved the best condition over the last five years. Meanwhile, about two-thirds of dry season rice presented above-average condition. As for Cambodia, rice growth condition during rainy season was in general favorable, and about 75% of the rainy season rice was in an above-average situation. However, the dry season rice suffered from drought stress with only 29% of the rice area reaching the average level. Similarly, an above-average rice growth condition was also observed during rainy season in Thailand, accounting for 78% of rainy season rice area. However, rice development in dry season was hampered by severe drought with more than half of rice in a below-average condition(Figure 5.9).

Artificial intelligence algorithms were applied to estimate the cultivated area of dry and rainy season rice from October 2019 to April 2020 in Cambodia, Thailand and Vietnam. The total rice area was estimated at 12,225 thousand hectares, up by 6% compared with the same period last year. The cultivated area of rainy season rice in Cambodia, Thailand and Vietnam increased by 5%, 24% and 8%, respectively. However, the rice area in dry season in the three countries decreased by 23%, 4% and 9% respectively as affected by the severe drought. Remote sensing-based model revealed that the yield of rainy season rice in Cambodia and Thailand increased by 5% and 3% respectively while it remained at same level as the previous season in Vietnam. The rainy season rice production in the three countries increased by 10%, 28% and 8% respectively compared to the same period last year. Their total production of rainy season rice since mid-October 2019 reached 27.22 million tons, with a year-on-year increase of 4.05 million tons (or +17%).

Dry season rice was severely affected by drought although most rice are irrigated. The dry season rice yield in Cambodia, Thailand and Vietnam dropped by 8%, 12% and 1% year-on-year (YoY), respectively, and the production fell by 30%, 15% and 10% respectively. In total the dry season rice production of the three countries was only 19.99 million tons, a decrease of 3.73 million tons or 16%, compared with the same period last year (Table 5.3).

Consequently, the total output of rice harvested or to be harvested in rainy season and dry season from October 2019 to April 2020 was estimated at 47.21 million tons, an increase of 1% or 0.32 million tons. As for each country, Vietnam was less affected by the drought. From mid-October 2019, the total output of rice harvested or to be harvested in Vietnam was 14.84 million tons, a slight decrease of 3% from the same period of last year. Cambodia was the most affected country, with the total output of rice of 9.55 million tons, a decrease of 5% from the same period of last year. A large increase in rice production during the rainy season (major rice) in Thailand more than compensated the loss of dry season rice caused by the drought. Rice production of Thailand increased by 1.24 million tons. Considering the overall stable rice production during the past three years in Cambodia, Thailand and Vietnam, the drought-induced loss of dry season rice over the period monitored had limited impacts on the rice market and the total rice supply of the three countries only dropped by 1% year on year.

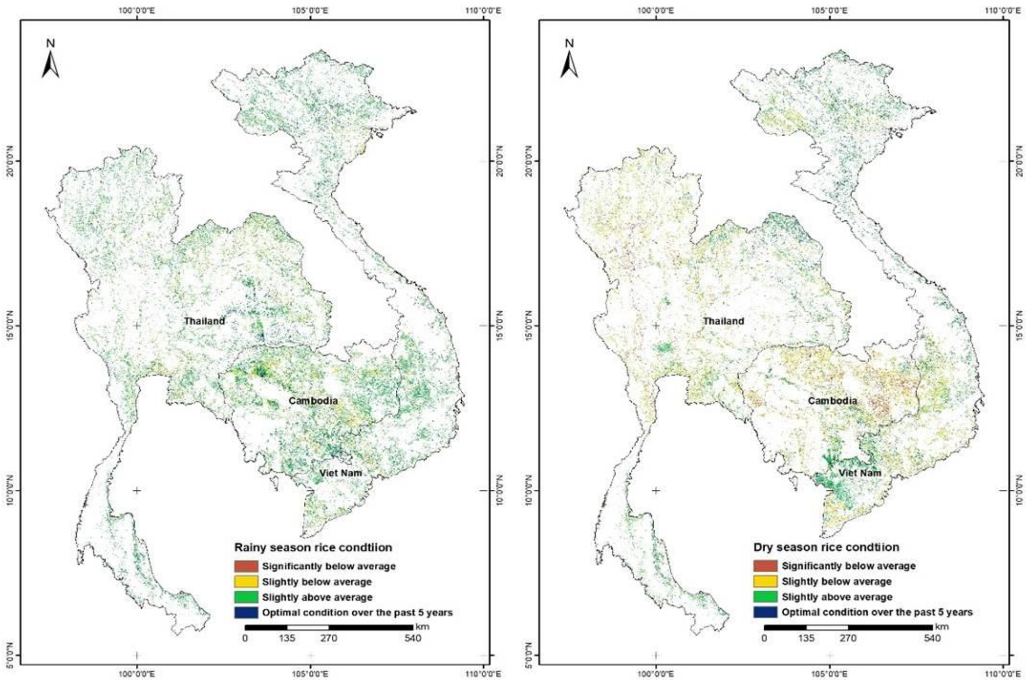


Figure 5.8 Rice growth condition in Cambodia, Thailand and Vietnam during the rainy season (left) and dry season (right) in 2019-2020

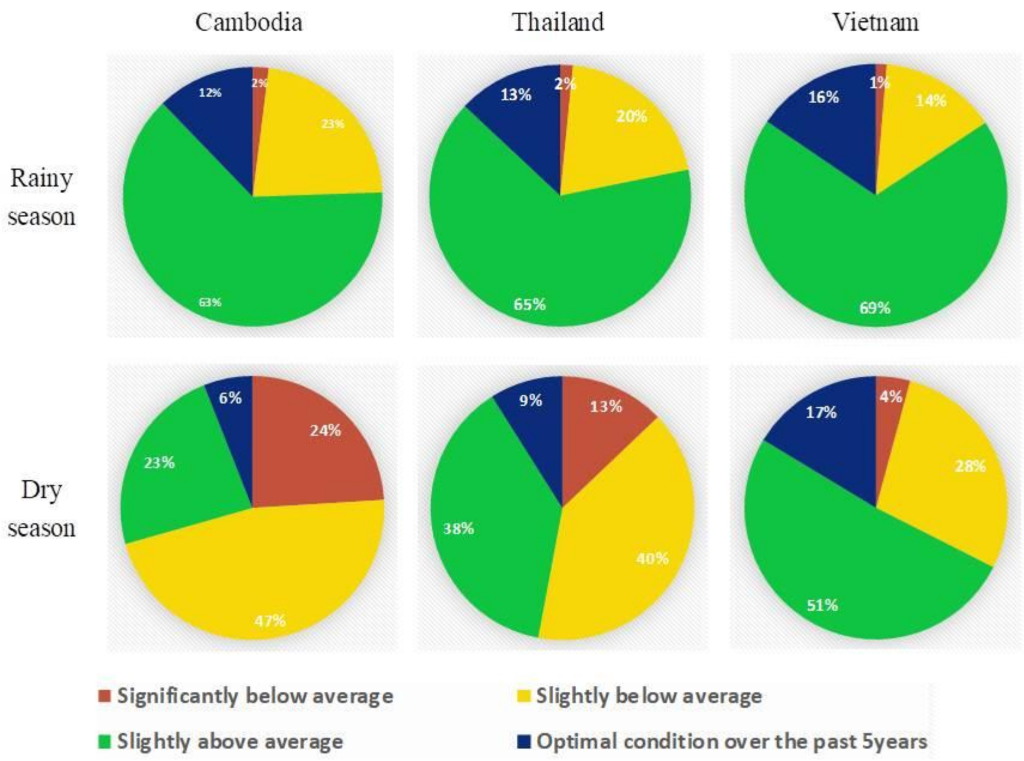


Figure 5.9 Statistical analysis of different categories of rice growth condition during rainy and dry seasons in Cambodia, Thailand and Vietnam in 2019-2020

Table 5.3 Rainy and dry season rice production in Cambodia, Thailand and Vietnam

Rice type	Country	Area		Yield		Production	
		2019-2020 (thousand hectares)	Departure YoY (%)	2019-2020 (Kg / ha)	Departure YoY （%）	2019-2020 （million tons）	Departure YoY (%)
Rainy season rice	Cambodia	1,834	5	3744	5	6.87	10
	Thailand	4,821	24	2807	3	13.53	28
	Vietnam	1,179	8	5786	0	6.82	8
	Subtotal	7,834	16	-	-	27.22	17
Dry season rice	Cambodia	602	-23	4448	-8	2.68	-30
	Thailand	2,513	-4	3696	-12	9.29	-15
	Vietnam	1,276	-9	6289	-1	8.02	-10
	Subtotal	4,391	-9	-	-	19.99	-16
Total		12,225	6	-	-	47.21	1

Note: the rainy season rice in this report represents the rice whose sowing concentrated from early August to October 2019, and whose harvest concentrated from mid-October 2019 to early February 2020. Each country uses different terminology to name the rainy season rice. For example, it is named as major rice in Thailand, median rice and late rice in Cambodia, and winter-spring rice in southern Vietnam. The dry season rice in the report is a general term for the rice whose sowing period was from late November 2019 to early January 2020, and harvest period was from late March 2020 to late April 2020.

5.4 Update on El Niño

Neutral El Nino condition prevails across the Pacific Ocean continuously. Figure 5.10 illustrates the behavior of the standard Southern Oscillation Index (SOI) of the Australian Bureau of Meteorology (BOM) from April 2019 to April 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 decreased from 1.3 in January to -5.2 in March, then increased to -0.5 in April, 2020, indicating a neutral El Nino situation.

The sea surface temperature anomalies in April 2020 for NINO3, NINO3.4, and NINO4 regions were +0.3°C, +0.5°C, and +0.9°C, respectively, somewhat warmer than the 1961-1990 average according to BOM (see Figure 5.10 and Figure 5.11). Both BOM and NOAA conjecture that the warmer condition indicates a neutral El Niño (www.climate.gov/enso). CropWatch will keep monitoring the situation (Figure 5.12).

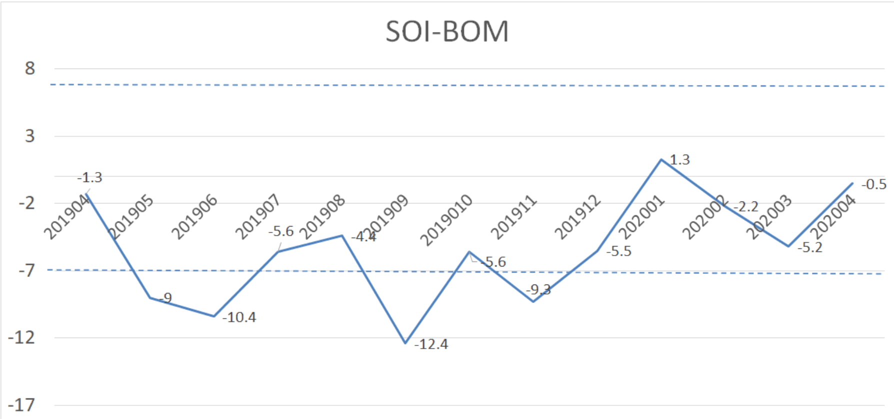


Figure 5.10 Monthly SOI-BOM time series from April 2019 to April 2020 (Source: http://www.bom.gov.au/climate/current/soi2.shtml)

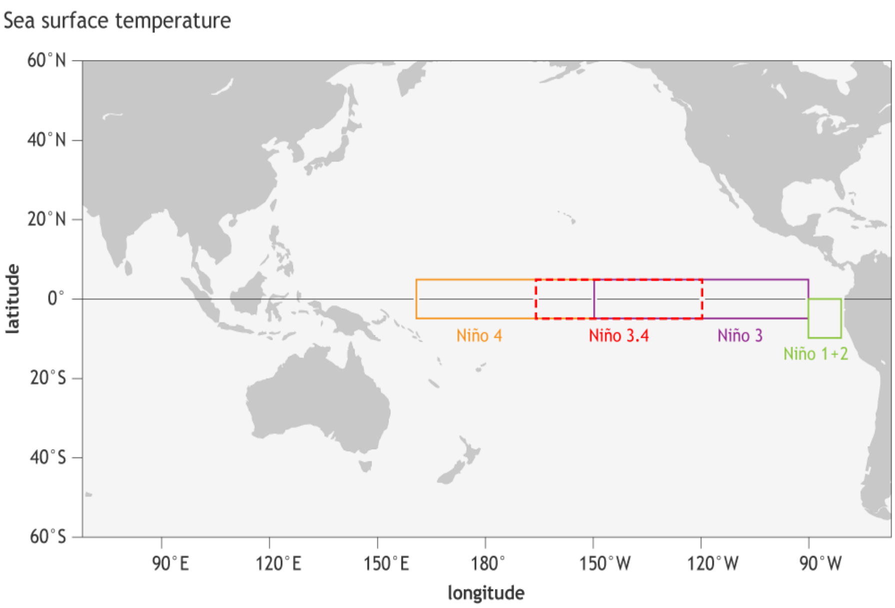


Figure 5.11 Map of NINO Region (Source: https://www.climate.gov/sites/default/files/Fig3_ENSOindices_SST_large.png)

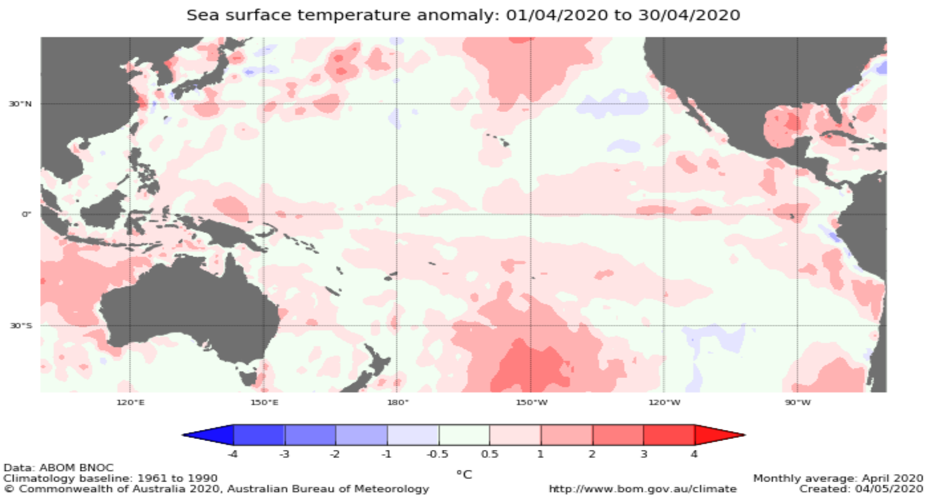


Figure 5.12 April 2020 sea surface temperature departure from the 1961-1990 average (Source: http://www.bom.gov.au/climate/enso/wrap-up/archive/20200512.ssta_pacific_monthly.png?popup)

Annex A. Agroclimatic indicators

Table A.1 Jan 2020 - Apr 2020 agroclimatic indicators by global Mapping and Reporting Unit (MRU)

65 Global MRUs		RAIN Current (mm)	RAIN 15YA dep. (%)	TEMP Current (°C)	TEMP 15YA dep. (°C)	RADPAR Current(MJ/m²)	RADPAR 15YA dep. (%)	BIOMSS Current (gDM/m²)	BIOMSS 15YA dep. (%)
C01	Equatorial central Africa	737	-5	23.5	-0.1	1184	-1	643	-8
C02	East African highlands	478	93	19.7	-0.4	1274	-5	511	2
C03	Gulf of Guinea	124	-15	27.4	0.0	1330	2	452	-14
C04	Horn of Africa	816	87	21.2	-0.5	1182	-8	617	-6
C05	Madagascar (main)	1095	-6	22.4	0.1	1166	-1	711	-6
C06	Southwest Madagascar	291	-48	25.7	0.7	1295	5	790	0
C07	North Africa-Mediterranean	176	-17	11.2	0.5	959	0	284	-9
C08	Sahel	22	9	27.3	-0.3	1363	-1	164	-2
C09	Southern Africa	601	3	22.0	0.0	1226	1	706	-4
C10	Western Cape (South Africa)	114	-6	19.1	0.0	1251	-1	624	-4
C11	British Columbia to Colorado	372	1	-2.4	0.0	700	-1	108	-4
C12	Northern Great Plains	244	7	0.6	0.1	716	-3	135	-1
C13	Corn Belt	474	14	1.3	1.0	602	-9	107	-15
C14	Cotton Belt to Mexican Nordeste	511	35	12.8	1.3	790	-10	312	-4
C15	Sub-boreal America	234	9	-7.4	0.4	507	-5	57	-12
C16	West Coast (North America)	408	-21	7.3	0.1	776	2	206	5
C17	Sierra Madre	108	30	17.1	0.5	1249	-3	366	8
C18	SW U.S. and N. Mexican highlands	133	3	9.5	0.2	1023	-4	272	15
C19	Northern South and Central America	291	-31	24.1	0.8	1196	3	569	-8
C20	Caribbean	121	-42	24.2	0.8	1149	0	690	-5
C21	Central-northern Andes	789	-20	15.6	0.3	1077	3	414	-8
C22	Nordeste (Brazil)	724	79	25.3	-0.2	1216	-3	780	-7
C23	Central eastern Brazil	964	3	23.5	0.0	1181	0	735	-7
C24	Amazon	1156	-11	24.6	0.4	1092	3	706	-1
C25	Central-north Argentina	587	17	23.3	-0.1	1170	2	694	-3
C26	Pampas	334	-31	22.3	0.0	1227	4	684	-2
C27	Western Patagonia	206	-23	14.0	0.4	1220	2	323	-11
C28	Semi-arid Southern Cone	206	11	18.8	0.4	1288	-1	508	-5
C29	Caucasus	360	7	3.0	0.0	781	-2	166	-9
C30	Pamir area	489	20	2.7	-0.4	856	-5	190	-9

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 15YA dep. (%)
C31	Western Asia	252	32	7.4	0.5	863	-4	254	2
C32	Gansu-Xinjiang (China)	99	1	-1.3	1.1	891	0	160	-4
C33	Hainan (China)	231	-17	22.0	0.7	992	6	605	8
C34	Huanghuaihai (China)	135	51	6.9	1.2	885	-4	205	-9
C35	Inner Mongolia (China)	69	34	-4.0	0.9	891	-2	126	-11
C36	Loess region (China)	90	6	2.7	0.8	973	-1	178	-13
C37	Lower Yangtze (China)	584	18	11.1	1.0	696	-2	234	-3
C38	Northeast China	109	10	-5.0	1.8	759	-4	111	-3
C39	Qinghai-Tibet (China)	427	18	-0.8	-1.4	1002	-5	140	-22
C40	Southern China	418	12	15.6	0.6	818	-1	345	0
C41	Southwest China	395	36	8.8	0.4	730	-9	211	-16
C42	Taiwan (China)	151	-53	19.9	0.7	1080	13	524	20
C43	East Asia	295	2	-0.7	1.5	767	-1	121	-6
C44	Southern Himalayas	233	42	17.7	-1.0	1074	-5	420	12
C45	Southern Asia	73	-18	25.2	-0.4	1239	-4	522	24
C46	Southern Japan and Korea	523	7	7.5	1.4	811	1	203	-2
C47	Southern Mongolia	35	-47	-9.7	2.9	840	2	99	11
C48	Punjab to Gujarat	125	116	21.6	-1.1	1151	-4	388	42
C49	Maritime Southeast Asia	1276	-3	24.6	0.5	1149	5	759	4
C50	Mainland Southeast Asia	143	-40	25.1	0.4	1228	4	523	-10
C51	Eastern Siberia	187	-13	-7.1	3.3	562	0	72	13
C52	Eastern Central Asia	93	7	-10.0	2.9	703	-1	83	11
C53	Northern Australia	871	-15	26.4	0.7	1309	6	867	5
C54	Queensland to Victoria	308	44	20.6	-0.5	1151	-4	613	-4
C55	Nullarbor to Darling	73	-32	21.1	0.1	1238	0	691	6
C56	New Zealand	176	-43	14.4	-0.1	1069	7	417	4
C57	Boreal Eurasia	390	30	-1.6	3.1	390	0	62	10
C58	Ukraine to Ural mountains	277	8	1.1	3.3	426	-4	80	-5
C59	Mediterranean Europe and Turkey	323	-11	7.4	0.3	774	-2	207	-6
C60	W. Europe (non Mediterranean)	305	-8	5.5	1.4	608	8	140	4
C61	Boreal America	268	-14	-9.0	-1.2	415	-6	45	-7
C62	Ural to Altai mountains	244	35	-2.4	4.6	506	-9	91	8
C63	Australian desert	109	1	21.7	-0.9	1272	-1	665	1
C64	Sahara to Afghan deserts	105	37	16.5	-0.3	1129	-2	381	12
C65	Sub-arctic America	67	-19	-23.1	-0.4	318	-1	14	-8

Table A.2 Jan 2020 - Apr 2020 agroclimatic indicators by country

Country code	Country name	RAIN Current (mm)	RAIN 15YA Departure (%)	TEMP Current (°C)	TEMP 15YA Departure(°C)	RADPAR Current (MJ/m^2)	RADPAR 15YA Departure (%)	BIOMSS Current (gDM/m^2)	BIOMSS 15YA Departure (%)
ARG	Argentina	405	6	22.0	-0.1	1201	2	649	-3
AUS	Australia	304	17	21.3	-0.3	1176	-2	639	-1
BGD	Bangladesh	164	22	22.3	-1.1	1167	-2	531	9
BRA	Brazil	998	-2	23.7	0.1	1164	1	731	-5
KHM	Cambodia	173	-46	27.5	0.8	1222	5	653	-4
CAN	Canada	315	4	-5.4	0.4	546	-3	65	-7
CHN	China	347	20	7.1	0.8	791	-4	194	-7
EGY	Egypt	112	136	14.8	-0.7	963	-6	302	13
ETH	Ethiopia	264	54	20.5	-0.2	1308	-4	482	8
FRA	France	358	-2	7.4	1.9	623	3	162	7
DEU	Germany	311	4	5.1	1.8	566	10	129	8
IND	India	110	27	22.6	-0.8	1181	-5	463	29
IDN	Indonesia	1422	1	24.7	0.4	1149	5	768	4
IRN	Iran	312	47	7.1	-0.5	942	-5	281	0
KAZ	Kazakhstan	218	27	-1.2	3.9	613	-6	117	10
MEX	Mexico	125	4	19.7	0.8	1200	-3	422	5
MMR	Myanmar	136	7	21.1	-0.2	1257	1	316	-26
NGA	Nigeria	90	-31	26.9	-0.2	1355	2	296	-20
PAK	Pakistan	426	43	11.5	-1.5	983	-5	339	11
PHL	Philippines	339	-46	24.9	0.3	1216	6	790	3
POL	Poland	231	-11	4.1	2.0	530	11	116	10
ROU	Romania	180	-34	4.2	1.2	707	11	147	-2
RUS	Russia	258	17	-1.7	3.9	454	-8	77	0
ZAF	South Africa	228	-4	19.4	-0.2	1264	1	668	1
THA	Thailand	164	-40	26.1	0.7	1214	4	610	-4
TUR	Turkey	389	5	3.8	-0.3	796	-2	178	-10
GBR	United Kingdom	430	13	6.0	0.8	460	9	110	11
UKR	Ukraine	183	-25	3.5	2.2	585	11	125	6
USA	United States	411	17	5.9	0.7	733	-7	186	-3
UZB	Uzbekistan	288	20	6.8	0.5	815	-3	244	8
VNM	Vietnam	274	-7	21.2	0.4	976	1	500	-8
AFG	Afghanistan	382	25	4.8	-0.4	912	-6	254	0
AGO	Angola	901	10	22.1	-0.1	1158	-1	654	-8
BLR	Belarus	220	-15	2.5	2.8	428	2	84	-1
HUN	Hungary	159	-34	5.1	0.7	696	11	146	-9
ITA	Italy	223	-43	7.0	0.6	783	8	198	-5
KEN	Kenya	899	120	20.4	-0.8	1245	-6	669	-2
LKA	Sri_Lanka	243	-58	26.0	0.7	1326	7	828	1
MAR	Morocco	167	-21	11.5	0.7	1017	0	266	-12
MNG	Mongolia	84	31	-10.0	2.5	786	-1	93	10
MOZ	Mozambique	724	-4	23.6	0.0	1220	2	768	-4
ZMB	Zambia	955	1	21.1	0.2	1140	-3	631	-13

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

Table A.3 Argentina, Jan 2020 - Apr 2020 agroclimatic indicators (by province)

	RAIN Current	RAIN 15YA	TEMP Current	TEMP 15YA Departure(°C)	RADPAR Current	RADPAR 15YA	BIOMSS Current	BIOMSS 15YA

	(mm)	Departure (%)	(°C)		(MJ/m^2)	Departure (%)	(gDM/m^2)	Departure (%)
Buenos Aires	317	34	20.5	-0.4	1217	0	657	2
Chaco	396	-20	24.6	-0.3	1182	4	706	-1
Cordoba	323	22	22.3	0.0	1212	-1	692	1
Corrientes	349	-32	24.3	0.2	1237	6	657	-11
Entre Rios	327	-13	22.9	-0.1	1233	4	646	-6
La Pampa	206	26	21.7	-0.3	1239	-1	704	4
Misiones	371	-44	22.7	-0.4	1292	9	738	-3
Santiago Del Estero	583	32	23.6	-0.6	1147	2	686	-3
San Luis	234	24	21.8	0.3	1238	-1	718	5
Salta	1118	31	20.2	-0.1	1064	-3	570	-13
Santa Fe	395	11	23.8	0.0	1199	2	655	-5
Tucuman	783	34	19.7	0.4	1102	-5	589	-13

Table A.4 Australia, Jan 2020 - Apr 2020 agroclimatic indicators (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 15YA Departure (%)
New South Wales	332	59	21.3	-0.6	1178	-5	626	-3
South Australia	141	29	19.3	-1.2	1140	-5	601	-3
Victoria	277	57	17.6	-1.1	1042	-9	536	-7
W. Australia	126	-28	22.0	0.2	1248	0	692	5

Table A.5 Brazil, Jan 2020 - Apr 2020 agroclimatic indicators (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 15YA Departure (%)
Ceara	964	60	25.5	-0.6	1250	1	836	0
Goias	1070	0	22.9	0.1	1197	-2	741	-8
Mato Grosso Do Sul	692	-20	24.6	0.0	1278	7	821	3
Mato Grosso	1159	-9	24.4	0.3	1153	4	757	0
Minas Gerais	1123	23	21.5	-0.2	1113	-7	651	-17
Parana	502	-41	21.1	-0.4	1257	9	695	-5
Rio Grande Do Sul	215	-61	22.2	0.4	1240	6	707	-2
Santa Catarina	435	-42	19.2	-0.5	1212	9	623	-5
Sao Paulo	898	-17	21.7	-0.6	1186	4	694	-6

Table A.6 Canada, Jan 2020 - Apr 2020 agroclimatic indicators (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 15YA Departure (%)
Alberta	182	-1	-6.1	-1.0	570	3	75	-5
Manitoba	220	17	-6.3	0.8	530	-9	62	-15
Saskatchewan	181	3	-6.0	0.1	566	-1	74	-3

Table A.7 India, Jan 2020 - Apr 2020 agroclimatic indicators (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 15YA Departure (%)
Andhra Pradesh	39	-20	26.6	-0.2	1243	-5	494	26
Assam	432	10	17.9	-0.8	995	-5	468	-7
Bihar	109	160	21.1	-1.8	1129	-6	475	19
Chhattisgarh	62	68	23.8	-0.6	1174	-7	522	42
Daman and Diu	0	-86	26.3	0.0	1374	0	174	44
Delhi	180	290	19.0	-1.7	1067	-7	481	29
Gujarat	4	24	25.7	-0.4	1313	-1	197	37
Goa	2	-87	26.9	0.2	1385	-1	342	41
Himachal Pradesh	441	39	8.5	-2.1	1002	-4	278	18
Haryana	195	227	18.6	-1.9	1054	-6	517	43
Jharkhand	119	241	21.5	-1.6	1133	-7	490	35
Kerala	198	-35	26.4	0.4	1307	0	723	1
Karnataka	32	-51	26.1	0.1	1286	-4	508	19
Meghalaya	297	0	18.6	-0.5	1064	-3	466	0
Maharashtra	15	-4	26.3	-0.4	1278	-5	408	43
Manipur	322	24	14.8	-0.9	1107	-5	398	-11
Madhya Pradesh	33	57	23.0	-1.0	1182	-6	449	49
Mizoram	185	-1	17.3	-1.4	1201	-2	439	-7
Nagaland	733	76	14.1	-0.8	983	-9	385	-16
Orissa	82	102	23.9	-0.7	1156	-7	573	42
Puducherry	62	-51	27.4	0.2	1386	1	735	15
Punjab	321	145	16.9	-2.4	999	-5	483	24
Rajasthan	33	98	22.2	-0.9	1158	-5	443	64
Sikkim	80	4	8.6	-1.5	1207	-4	251	16
Tamil Nadu	116	-49	26.0	0.1	1309	0	658	-1
Tripura	225	-13	21.1	-1.0	1143	-2	559	8
Uttarakhand	231	86	11.2	-2.5	1066	-6	315	10
Uttar Pradesh	103	139	20.5	-1.6	1108	-6	508	35
West Bengal	125	93	22.3	-1.5	1150	-5	521	21

Table A.8 Kazakhstan, Jan 2020 - Apr 2020 agroclimatic indicators (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 15YA Departure (%)
Akmolinskaya	229	65	-2.1	4.9	561	-8	102	16
Karagandinskaya	138	15	-2.8	3.9	660	-5	115	14
Kustanayskaya	231	46	-1.8	4.9	486	-14	85	0
Pavlodarskaya	181	59	-1.9	5.3	571	-4	109	21
Severo kazachstanskaya	241	58	-2.0	5.5	469	-10	84	13
Vostochno kazachstanskaya	178	-2	-3.1	3.2	713	0	123	23
Zapadno kazachstanskaya	194	-1	1.0	4.2	543	-6	107	2

Table A.9 Russia, Jan 2020 - Apr 2020 agroclimatic indicators (by oblast, kray and republic)

	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 15YA Departure (%)
Bashkortostan Rep.	340	43	-2.3	4.4	388	-16	61	-10
Chelyabinskaya Oblast	227	32	-2.7	4.5	437	-12	68	-5
Gorodovikovsk	151	-36	4.2	1.6	643	7	146	4
Krasnodarskiy Kray	212	-18	0.5	3.1	584	4	110	11
Kurganskaya Oblast	228	32	-2.4	5.0	383	-15	63	-3
Kirovskaya Oblast	412	48	-1.9	4.4	248	-29	37	-28
Kurskaya Oblast	250	-4	1.6	3.0	449	0	85	-5
Lipetskaya Oblast	270	6	1.0	3.5	417	-8	76	-10
Mordoviya Rep.	392	56	-0.3	4.0	330	-23	55	-24
Novosibirskaya Oblast	264	45	-3.1	5.8	393	-14	68	9
Nizhegorodskaya O.	364	39	-0.5	4.2	298	-24	48	-26
Orenburgskaya Oblast	290	30	-1.2	4.4	469	-13	81	-4
Omskaya Oblast	279	57	-2.5	6.0	370	-16	66	9
Permskaya Oblast	372	38	-2.6	4.7	267	-26	40	-20
Penzenskaya Oblast	365	43	-0.1	3.9	367	-18	63	-17
Rostovskaya Oblast	192	-23	3.2	2.2	610	7	131	5
Ryazanskaya Oblast	329	26	0.6	3.8	345	-18	60	-20
Stavropolskiy Kray	166	-37	3.7	1.2	681	9	150	2
Sverdlovskaya Oblast	253	20	-2.9	4.8	325	-17	50	-9
Samarskaya Oblast	322	34	-0.5	4.5	418	-12	73	-5
Saratovskaya Oblast	275	16	0.5	3.9	466	-9	87	-5
Tambovskaya Oblast	319	23	0.7	3.7	408	-12	74	-12
Tyumenskaya Oblast	284	50	-2.7	5.4	328	-18	55	-1
Tatarstan Rep.	346	39	-1.1	4.6	323	-20	53	-16
Ulyanovskaya Oblast	317	35	-0.5	4.3	374	-16	64	-12
Udmurtiya Rep.	397	47	-1.9	4.7	257	-29	39	-26
Volgogradskaya O.	211	-5	1.8	3.2	542	-2	107	-3
Voronezhskaya Oblast	247	-4	1.5	3.3	500	-2	95	-3

Table A.10 United States, Jan 2020 - Apr 2020 agroclimatic indicators (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 15YA Departure (%)

	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 15YA Departure (%)
Arkansas	713	41	10.1	0.8	675	-14	214	-18
California	229	-43	9.1	0.2	903	1	239	5
Idaho	367	1	-0.4	0.3	719	1	129	3
Indiana	500	6	4.2	0.8	605	-12	133	-18
Illinois	495	19	3.9	0.5	623	-12	137	-18
Iowa	281	-9	1.0	0.5	679	-3	132	-4
Kansas	270	30	6.3	0.2	821	-5	214	1
Michigan	383	8	-0.6	0.9	543	-12	85	-19
Minnesota	243	-5	-3.1	0.7	612	-3	91	-8
Missouri	493	28	5.9	0.4	690	-9	173	-14
Montana	223	-6	-1.8	-0.1	728	3	117	-1
Nebraska	192	-7	2.7	0.0	806	-1	171	3
North Dakota	150	-21	-3.1	0.3	667	0	103	1
Ohio	499	11	3.9	1.2	591	-12	125	-18
Oklahoma	420	51	9.8	0.4	795	-9	254	-4
Oregon	430	-13	3.8	0.2	682	4	145	4
South Dakota	191	-11	-0.4	-0.1	750	2	135	2
Texas	342	40	14.4	0.7	834	-11	340	-3
Washington	514	3	3.2	0.2	604	3	130	1
Wisconsin	316	3	-1.9	0.9	594	-7	89	-15

Table A.11 China, Jan 2020 - Apr 2020 agroclimatic indicators (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 15YA Departure (%)
Anhui	413	27	9.5	1.2	750	-8	238	-6
Chongqing	523	59	9.3	0.3	628	-15	189	-17
Fujian	578	-6	12.7	0.8	748	7	275	8
Gansu	113	-13	0.9	0.5	972	-1	162	-16
Guangdong	526	-5	16.7	1.0	740	7	349	11
Guangxi	589	35	14.9	0.8	572	-7	241	-11
Guizhou	483	26	9.7	0.5	540	-16	166	-23
Hebei	72	52	1.4	0.7	925	-1	157	-13
Heilongjiang	111	5	-6.4	2.2	722	-3	103	0
Henan	197	49	8.3	1.1	856	-6	233	-6
Hubei	462	43	9.0	0.8	729	-9	221	-9
Hunan	658	29	10.6	0.9	617	-5	203	-6
Jiangsu	275	21	9.2	1.5	823	-5	242	-2
Jiangxi	682	12	11.7	1.1	677	1	235	-1
Jilin	124	20	-4.3	1.6	774	-7	120	-7
Liaoning	85	10	-1.4	0.7	848	-4	140	-10
Inner Mongolia	72	30	-5.7	1.3	847	-2	116	-7
Ningxia	44	-32	1.0	0.5	1028	2	175	-11
Shaanxi	140	9	4.8	0.8	921	-2	192	-13
Shandong	121	54	6.8	1.2	902	-3	196	-14
Shanxi	75	20	1.5	0.8	954	-1	160	-16
Sichuan	356	28	6.9	0.1	803	-8	201	-20
Yunnan	323	54	11.3	-0.1	984	-5	314	-10
Zhejiang	539	4	10.0	1.1	731	-1	228	-3

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**.**

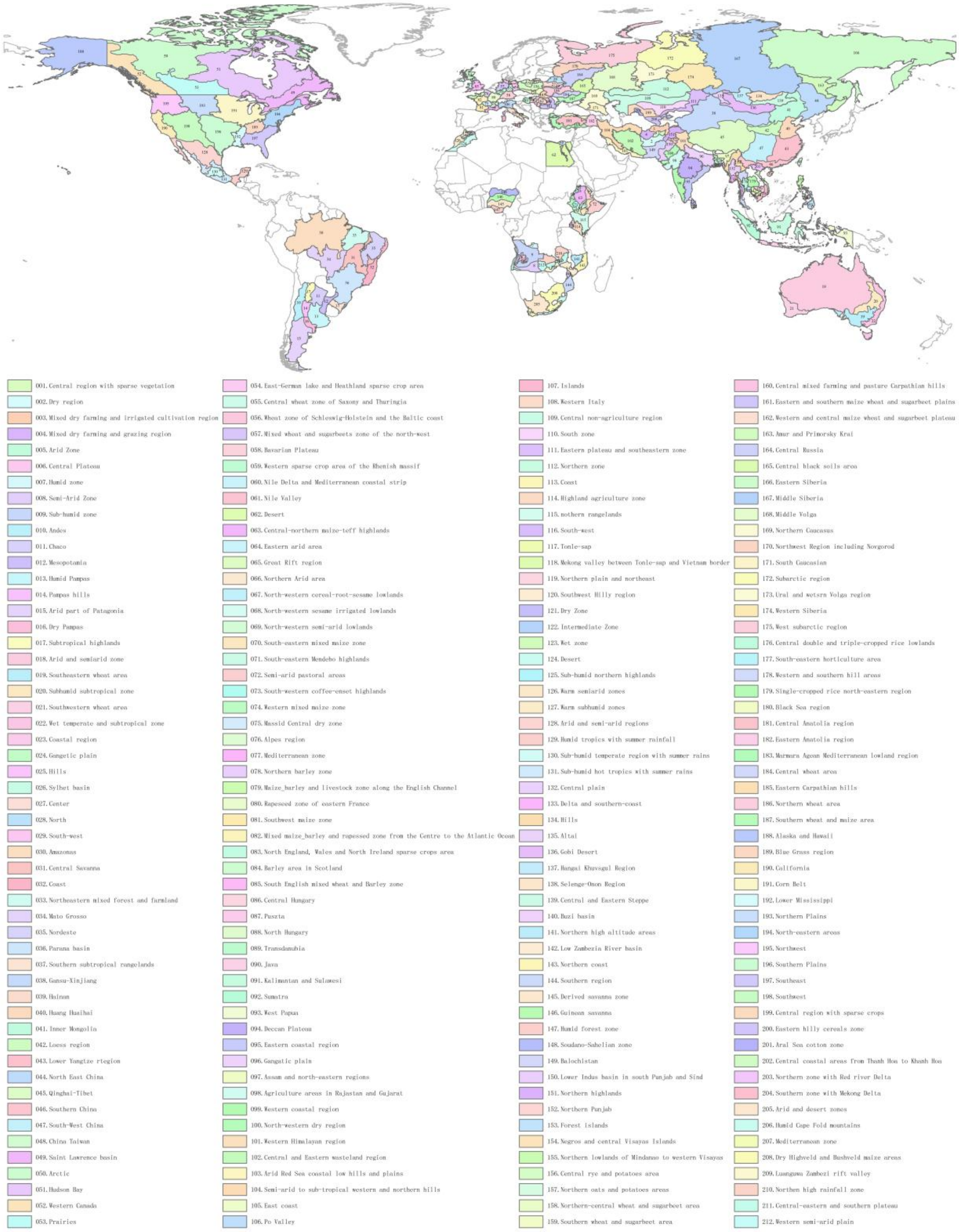
Agroecological zones for 42 key countries

Overview

212 agroecological zones for the 42 key countries across the globe

Description

42 key agricultural countries are divided into 212 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 42 key countries. Some regions are more relevant for rangeland and livestock monitoring, which is also essential for food security.



CropWatch indicators

The CropWatch indicators are designed to assess the condition of crops and the environment in which they grow and develop; the indicators—RAIN (for rainfall), TEMP (temperature), and RADPAR (photosynthetically active radiation, PAR)—are not identical to the weather variables, but instead are value-added indicators computed only over crop growing areas (thus for example excluding deserts and rangelands) and spatially weighted according to the agricultural production potential, with marginal areas receiving less weight than productive ones. The indicators are expressed using the usual physical units (e.g., mm for rainfall) and were thoroughly tested for their coherence over space and time. CWSU are the CropWatch Spatial Units, including MRUs, MPZ, and countries (including first-level administrative districts in select large countries). For all indicators, high values indicate "good" or "positive."

INDICATOR			
BIOMSS			
Biomass accumulation potential			
Crop/ Ground and satellite	Grams dry matter/m^2, pixel or CWSU	An estimate of biomass that could potentially be accumulated over the reference period given the prevailing rainfall and temperature conditions.	Biomass is presented as maps by pixels, maps showing average pixels values over CropWatch spatial units (CWSU), or tables giving average values for the CWSU. Values are compared to the average value for the last five years (2015-2019), with departures expressed in percentage.
CALF			
Cropped arable land and cropped arable land fraction			
Crop/ Satellite	[0,1] number, pixel or CWSU average	The area of cropped arable land as fraction of total (cropped and uncropped) arable land. Whether a pixel is cropped or not is decided based on NDVI twice a month. (For each four-month reporting period, each pixel thus has 8 cropped/ uncropped values).	The value shown in tables is the maximum value of the 8 values available for each pixel; maps show an area as cropped if at least one of the 8 observations is categorized as "cropped." Uncropped means that no crops were detected over the whole reporting period. Values are compared to the average value for the last five years (2015-2019), with departures expressed in percentage.
CROPPING INTENSITY			
Cropping intensity Index			
Crop/ Satellite	0, 1, 2, or 3; Number of crops growing over a year for each pixel	Cropping intensity index describes the extent to which arable land is used over a year. It is the ratio of the total crop area of all planting seasons in a year to the total area of arable land.	Cropping intensity is presented as maps by pixels or spatial average pixels values for MPZs, 42 countries, and 7 regions for China. Values are compared to the average of the previous five years, with departures expressed in percentage.
NDVI			
Normalized Difference Vegetation Index			
Crop/ Satellite	[0.12-0.90] number, pixel or CWSU average	An estimate of the density of living green biomass.	NDVI is shown as average profiles over time at the national level (cropland only) in crop condition development graphs, compared with previous year and recent five-year average (2015-2019), and as spatial patterns compared to the average showing the time profiles, where they occur, and the percentage of pixels concerned by each profile.
RADPAR			
CropWatch indicator for Photosynthetically Active Radiation (PAR), based on pixel based PAR			
Weather /Satellite	W/m^2, CWSU	The spatial average (for a CWSU) of PAR accumulation over agricultural pixels, weighted by the production potential.	RADPAR is shown as the percent departure of the RADPAR value for the reporting period compared to the recent fifteen-year average (2005-2019), per CWSU. For the MPZs, regular PAR is shown as typical time profiles over the spatial unit, with a map showing where the profiles occur and the percentage of pixels concerned by each profile.
RAIN			
CropWatch indicator for rainfall, based on pixel-based rainfall			
Weather /Ground	Liters/m^2, CWSU	The spatial average (for a CWSU) of rainfall accumulation over agricultural	RAIN is shown as the percent departure of the RAIN value for the reporting period, compared to

INDICATOR			
and satellite		pixels, weighted by the production potential.	the recent fifteen-year average (2004-18), 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 (2004-18), per CWSU. For the MPZs, regular temperature is illustrated as typical time profiles over the spatial unit, with a map showing where the profiles occur and the percentage of pixels concerned by each profile.
VCIx			
Maximum vegetation condition index			
Crop/ Satellite	Number, pixel to CWSU	Vegetation condition of the current season compared with historical data. Values usually are [0, 1], where 0 is "NDVI as bad as the worst recent year" and 1 is "NDVI as good as the best recent year." Values can exceed the range if the current year is the best or the worst.	VCIx is based on NDVI and two VCI values are computed every month. VCIx is the highest VCI value recorded for every pixel over the reporting period. A low value of VCIx means that no VCI value was high over the reporting period. A high value means that at least one VCI value was high. VCI is shown as pixel-based maps and as average value by CWSU.
VHI			
Vegetation health index			
Crop/ Satellite	Number, pixel to CWSU	The average of VCI and the temperature condition index (TCI), with TCI defined like VCI but for temperature. VHI is based on the assumption that "high temperature is bad" (due to moisture stress), but ignores the fact that low temperature may be equally "bad" (crops develop and grow slowly, or even suffer from frost).	Low VHI values indicate unusually poor crop condition, but high values, when due to low temperature, may be difficult to interpret. VHI is shown as typical time profiles over Major Production Zones (MPZ), where they occur, and the percentage of pixels concerned by each profile.
VHIn			
Minimum Vegetation health index			
Crop/ Satellite	Number, pixel to CWSU	VHIn is the lowest VHI value for every pixel over the reporting period. Values usually are [0, 100]. Normally, values lower than 35 indicate poor crop condition.	Low VHIn values indicate the occurrence of water stress in the monitoring period, often combined with lower than average rainfall. The spatial/time resolution of CropWatch VHIn is 4km/week for MPZs and 1km/dekad for China.

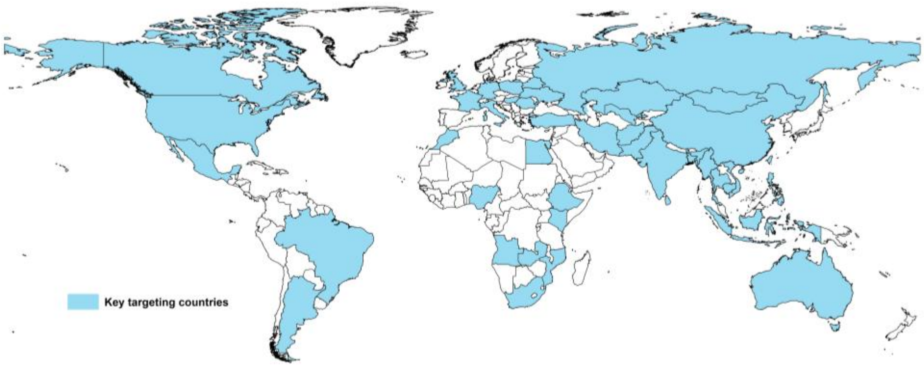
Note: Type is either "Weather" or "Crop"; source specifies if the indicator is obtained from ground data, satellite readings, or a combination; units: in the case of ratios, no unit is used; scale is either pixels or large scale CropWatch spatial units (CWSU). Many indicators are computed for pixels but represented in the CropWatch bulletin at the CWSU scale.

CropWatch spatial units (CWSU)

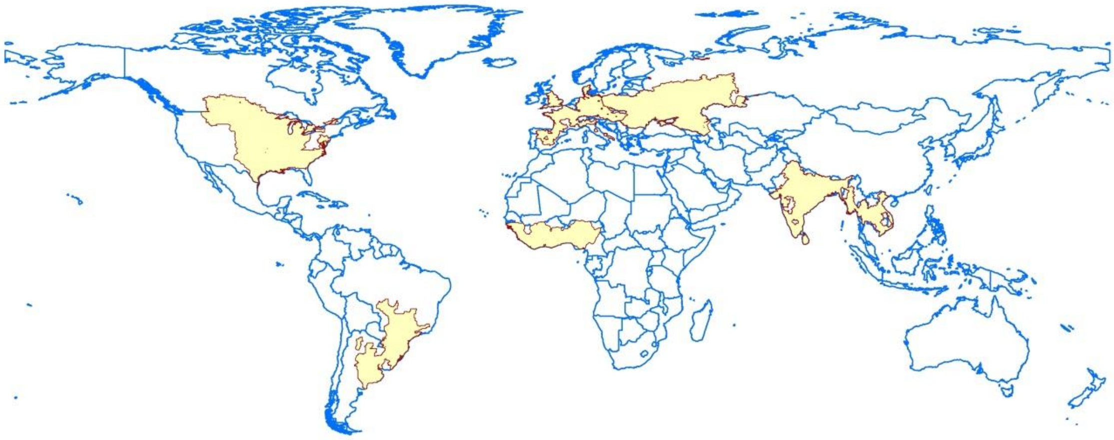
CropWatch analyses are applied to four kinds of CropWatch spatial units (CWSU): Countries, China, Major Production Zones (MPZ), and global crop Mapping and Reporting Units (MRU). The tables below summarize the key aspects of each spatial unit and show their relation to each other. For more details about these spatial units and their boundaries, see the CropWatch bulletin online resources.

SPATIAL LUNITS	
CHINA	
Overview	*Description*
Seven monitoring regions	The seven regions in China are agro-economic/agro-ecological regions that together cover the bulk of national maize, rice, wheat, and soybean production. Provinces that are entirely or partially included in one of the monitoring regions are indicated in color on the map below.

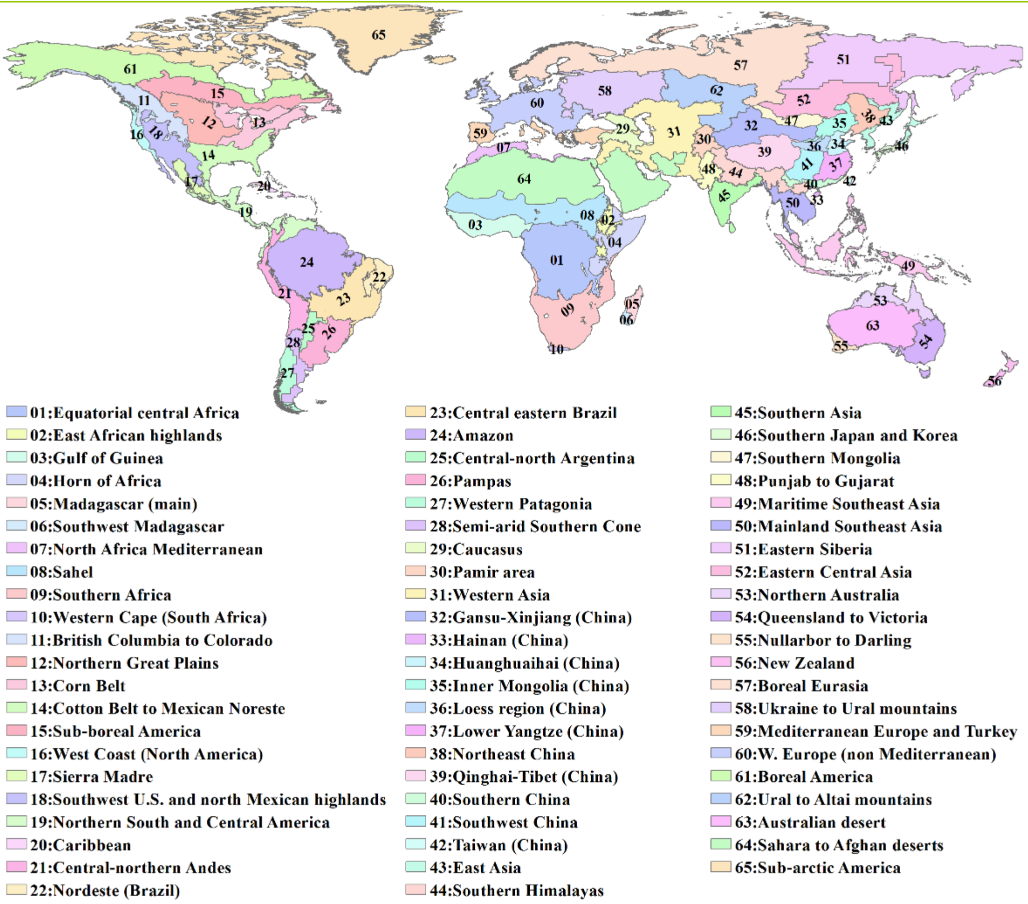
Countries (and first-level administrative districts, e.g., states and provinces)	
Overview	*Description*
43 countries to represent main producers/exporters and other key countries.	CropWatch monitored countries together represent more than 80% of the production of maize, rice, wheat and soybean, as well as 80% of exports. Some countries were included in the list based on criteria of proximity to China (Uzbekistan, Cambodia), regional importance, or global geopolitical relevance (e.g., four of five most populous countries in Africa). The total number of countries monitored is "42 + 1," referring to 42 and China itself. For the nine largest countries—, United States, Brazil, Argentina, Russia, Kazakhstan, India, China, and Australia, maps and analyses may also present results for the first-level administrative subdivision. The CropWatch agroclimatic indicators are computed for all countries and included in the analyses when abnormal conditions occur. Background information about the countries' agriculture and trade is available on the CropWatch Website, **www.cropwatch.com.cn**.



Major Production Zones (MPZ)	
Overview	*Description*
Seven globally important areas of agricultural production	The six MPZs include West Africa, South America, North America, South and Southeast Asia, Western Europe and Central Europe to Western Russia. The MPZs are not necessarily the main production zones for the four crops (maize, rice, soybean, wheat) currently monitored by CropWatch, but they are globally or regionally important areas of agricultural production. The seven zones were identified based mainly on production statistics and distribution of the combined cultivation area of maize, rice, wheat and soybean.



Global Mapping and Reporting Unit (MRU)	
Overview	*Description*
65 agro-ecological/agro-economic units across the world	MRUs are reasonably homogeneous agro-ecological/agro-economic units spanning the globe, selected to capture major variations in worldwide farming and crops patterns while at the same time providing a manageable (limited) number of spatial units to be used as the basis for the analysis of environmental factors affecting crops. Unit numbers and names are shown in the figure below. A limited number of units (e.g., MRU-63 to 65) are not relevant for the crops currently monitored by CropWatch but are included to allow for more complete coverage of global production. Additional information about the MRUs is provided online under **www.cropwatch.com.cn** .



Production estimation methodology

The main concept of the CropWatch methodology for estimating production is the calculation of current year production based on information about last year's production and the variations in crop yield and cultivated area compared with the previous year. The equation for production estimation is as follows:

$$Production_i = Production_{i-1} * (1 + \Delta Yield_i) * (1 + \Delta Area_i)$$

Where i is the current year, $\Delta Yield_i$ and $\Delta Area_i$ are the variations in crop yield and cultivated area compared with the previous year; the values of $\Delta Yield_i$ and $\Delta Area_i$ can be above or below zero.

For the 42 countries monitored by CropWatch, yield variation for each crop is calibrated against NDVI time series, using the following equation:

$$\Delta Yield_i = f(NDVI_i, NDVI_{i-1})$$

Where $NDVI_i$ and $NDVI_{i-1}$ are taken from the time series of the spatial average of NDVI over the crop specific mask for the current year and the previous year. For NDVI values that correspond to periods after the current monitoring period, average NDVI values of the previous five years are used as an average expectation. $\Delta Yield_i$ is calculated by regression against average or peak NDVI (whichever yields the best regression), considering the crop phenology of each crop for each individual country.

A different method is used for areas. For China, CropWatch combines remote-sensing based estimates of the crop planting proportion (cropped area to arable land) with a crop type proportion (specific type area to total cropped area). The planting proportion is estimated based on an unsupervised classification of high resolution satellite images from HJ-1 CCD and GF-1 images. The crop-type proportion for China is obtained by the GVG instrument from field transects. The area of a specific crop is computed by multiplying farmland area, planting proportion, and crop-type proportion of the crop.

To estimate crop area for wheat, soybean, maize, and rice outside China, CropWatch relies on the regression of crop area against cropped arable land fraction of each individual country (paying due attention to phenology):

$$Area_i = a + b * CALF_i$$

where a and b are the coefficients generated by linear regression with area from FAOSTAT or national sources and CALF the Cropped Arable Land Fraction from CropWatch estimates. $\Delta Area_i$ can then be calculated from the area of current and the previous years.

The production for "other countries" (outside the 31 CropWatch monitored countries) was estimated as the linear trend projection for 2017 of aggregated FAOSTAT data (using aggregated world production minus the sum of production by the 31 CropWatch monitored countries).

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Online resources

Online Resources posted on **www.cropwatch.com.cn** , **http://cloud.cropwatch.com.cn/**

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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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