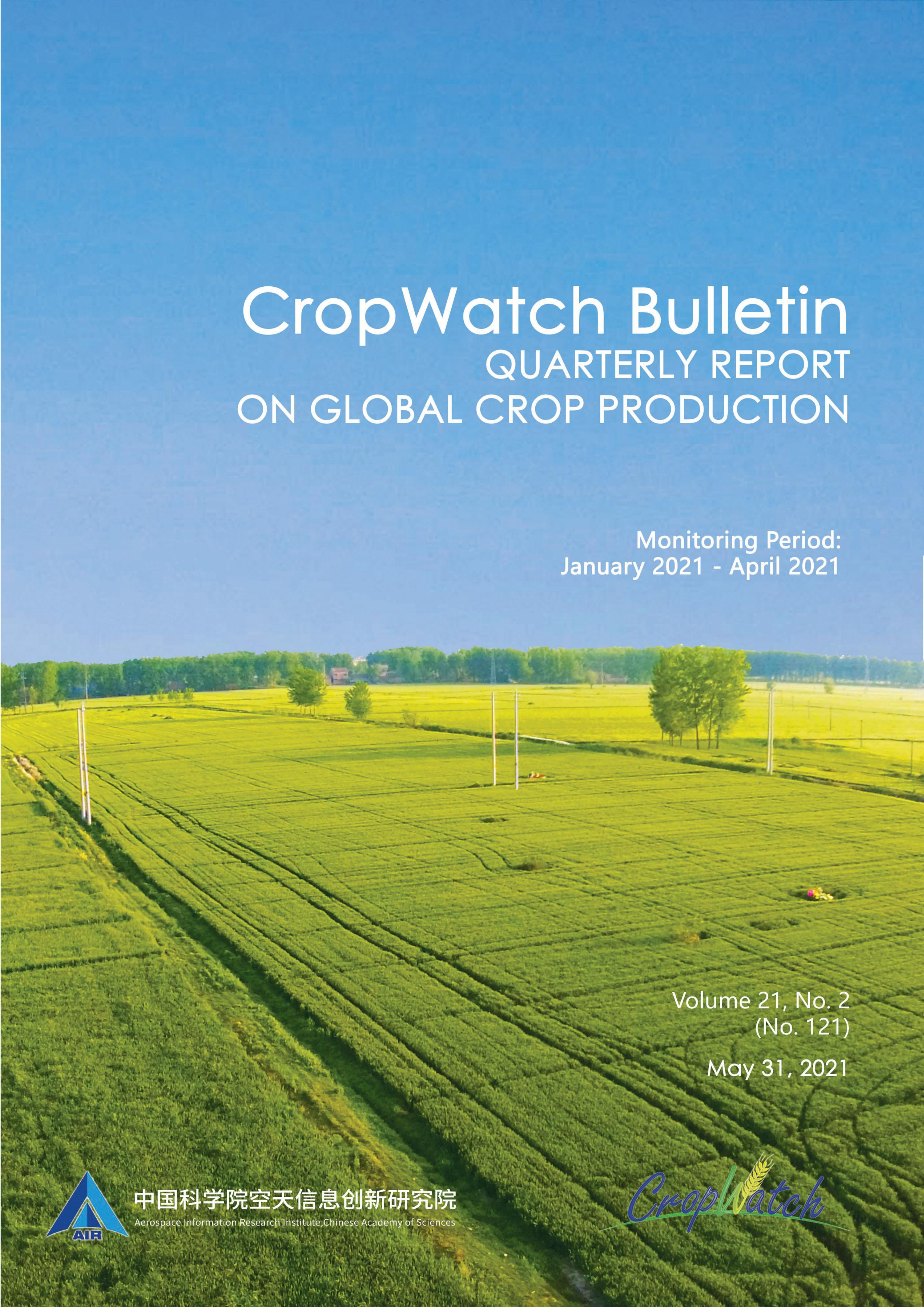

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QUARTERLY REPORT ON GLOBAL CROP PRODUCTION

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CropWatch

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

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ⓘ *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 October to January for 2016-2020; one of the standard reference periods.
15YA	Fifteen-year average, the average for the four-month period from October to January for 2006-2020; 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 from January to April 2021, 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 121st 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 210 AEZs	As above plus NDVI and GVG survey
Chapter 4	China and regions	As above plus high resolution images; Pest and crops trade prospects
Chapter 5	Production outlook, and updates on disaster events and El Niño.	

Regular updates and online resources

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

Executive summary

The current CropWatch bulletin describes world-wide crop condition and food production as appraised by data up to the end of April 2021. It is prepared by an international team coordinated by the Aerospace Information Research Institute, Chinese Academy of Sciences.

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 agroclimatic 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 (the "core countries") while chapter 4 zooms into China. Special attention is paid to the production outlook of main crop producing and exporting countries where major cereal and oil crops (maize, rice, wheat and soybean) are harvested this year or currently still in the field. Subsequent sections of Chapter 5 describe the global disasters that occurred from January to April 2021.

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. The 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. The harvest of the first crop and the subsequent sowing of the second crop in Brazil took place in February, whereas the 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 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.

Agroclimatic conditions

Global agroclimatic conditions are assessed based on CropWatch Agroclimatic Indices which describe weather and climate over agricultural areas only. They are referred to as RAIN, TEMP and RADPAR and expressed in the same units as the corresponding climatological variables (rainfall, temperature and photosynthetically active radiation). BIOMSS is an estimate of the plant biomass production potential.

Weather conditions during this monitoring period were influenced by La Niña and a break-down of the polar vortex. La Niña officially ended in March 2021. It brought wetter conditions to eastern Australia and drier conditions to equatorial Africa. The weakening and break down of the polar vortex caused cold spells mainly in the USA and Europe.

According to the analyses presented in Chapters 1 and 3.1, prevailing climate conditions during the current 2021 JFMA reporting period were dominated by severe drought conditions in Brazil, Mexico, California, Iran, Iraq, Syria, Afghanistan, Southern and Taiwan of China, Angola and Madagascar. In Mexico and Chinese Taiwan, winter rains were far below average, prolonging the severe drought conditions that had started during the rainy season last summer. For the other drought-stricken regions, The time from January to April represents the period during which most of the annual rainfall is usually recorded. In Brazil, the rainy season had started with a delay last October/November and below-average rainfall conditions continued in the Pantanal, Mato Grosso, Rio Grande and the North East. Hence, practically all crop production regions of the country were affected. Rainfall in Argentina, as well as in eastern Europe and the wheat production regions of Russia was above average. This helped restore soil moisture conditions especially in southern Russia, as that region had been affected by drought conditions during the previous reporting period. Precipitation was below average for the Indian subcontinent. However, this had very limited impact on crop production, since almost all of the production is irrigated. For most of the other regions, rainfall was near average. The recovery from drought conditions in Australia is note-worthy, as this helped restore soil moisture for the coming wheat production season.

Temperatures were generally close to average in most regions. However, Central and Eastern Europe were affected by cooler-than-usual temperatures in March and April, which slowed crop growth. However, the crops were still at an early stage in the growth cycle and this should not have a negative impact on yield.

Crop specific impact of weather conditions :

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:

- **Maize**: Argentina and Brazil contribute about 40% to the maize that is being traded internationally. Conditions in Argentina were favorable. In Brazil, rainfall deficits reached 50% and more during this reporting period. The Parana basin received only 348 mm during the January to April period. Hence, supply from Brazil will be below average. In southern Africa, rainfall was generally favorable and normal production can be expected, except for Angola, which was also affected by drought conditions.

- **Rice**: Conditions for winter (Rabi) season rice production were generally favorable in India, the largest rice exporter. Another region with important dry season rice production is Southeast Asia. For Thailand and Vietnam crop conditions were mixed. Rainfall increased to above-average levels in Thailand, after drought conditions in 2020. But low water levels in the dams and rivers at the beginning of the growing season posed challenges for irrigation. Similarly, in the south of Vietnam, crop conditions were rather unfavorable. Water levels in the Mekong River are recovering from record lows observed in 2020. Brazil was affected by severe rainfall deficit. Conditions for the other important rice producing countries and regions, such as the Philippines, Indonesia, Southern Africa and Argentina were generally favorable.

- **Wheat**: Precipitation in most of the rainfed wheat producing areas in the Northern Hemisphere was favorable, especially in Central- and Eastern Europe, the Maghreb, Russia, Ukraine and Kazakhstan. Most countries in the Near East and Central Asia were affected by a lack of winter rains. Especially Iran, Iraq, Syria and Afghanistan suffered from severe rainfall deficits, by more than 40%. Conditions in North America have been rather favorable so far. A severe cold spell in the USA in February seems to have caused only little damage to wheat.

- **Soybean**: In the USA, Canada and the Ukraine, soybean sowing started at the end of this monitoring period, in late April. Soil moisture conditions are mostly favorable in those countries. 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. Conditions in Brazil for soybean production were unfavorable due to the severe drought conditions. Conditions for soybean production in Paraguay were more favorable, although the delayed planting of the first crop subsequently also delayed the sowing of the second crop. Argentina benefited from above-average rainfall, thus yield prospects are favorable for this country.

2021 Global production estimates

Crop conditions in 2020 were generally very favorable. This year, production prospects are mixed, due to some extreme events such as the severe drought conditions in the countries mentioned above. Global maize production in 2021 is expected to decrease by 1.1% or 11.66 million tons to 1.059 billion tons; global rice production is also expected to decrease, by 1.0% to 753 million tons; a sharper decrease by 2.1% is forecasted for wheat, resulting in a production of 726 million tons; the drought in Brazil is expected to cause a decline in global soybean production by 1.0%. Global soybean production in 2021 is expected to 320 million tons.

China

This report covers the main growing period of winter wheat and rapeseed. The sowing of the first summer crops, such as spring maize and early rice started in March. In 2021, the total planted area of early rice of China is estimated at 5029.9 thousand hectares, down from 2020 but still higher than that in 2019. Agroclimatic conditions over the major winter crop producing regions were favorable, especially in the North China Plain (HuangHuaihai). CALF was 7% above average. Rain was above average for most of the country, apart from the Lower Yangtze region and Southern and Taiwan of China. Drought conditions in the South-East continued until the end of April, whereas rainfall returned to slightly above average conditions in the Lower Yangtze. Overall, prospects for crop production in China are favorable. CropWatch puts the total output of winter crops at 132.46 million tons, up by 0.7% or 0.96 million tons from 2020. The total winter wheat output in 2021 is expected to be 122.26 million tons, an increase of 1.11 million tons compared to 2020, or up by 0.9%.

Chapter 1. Global agroclimatic patterns

1.1 Introduction to CropWatch agroclimatic indicators (CWAIs)

This bulletin describes environmental and crop conditions over the period from January 2021 to April 2021, 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 C and serve the purpose of identifying global climatic patterns. Refer to Annex A for definitions and to table A.1 for 2021 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 2006 to 2020. 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. 2016-2020) 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 and 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.

1.2 Global overview

Weather conditions during this monitoring period were influenced by a La Niña conditions and a break-down of the polar vortex. La Niña officially ended in March 2021. It brought wetter conditions to eastern Australia and drier conditions to equatorial Africa. The weakening and break-down of the polar vortex caused cold spells mainly in the USA and Europe. Its break-down in early February caused freezing conditions as far south as Texas in the USA for several days.

Figure 1.1 shows unweighted averages of the CropWatch Agroclimatic 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.

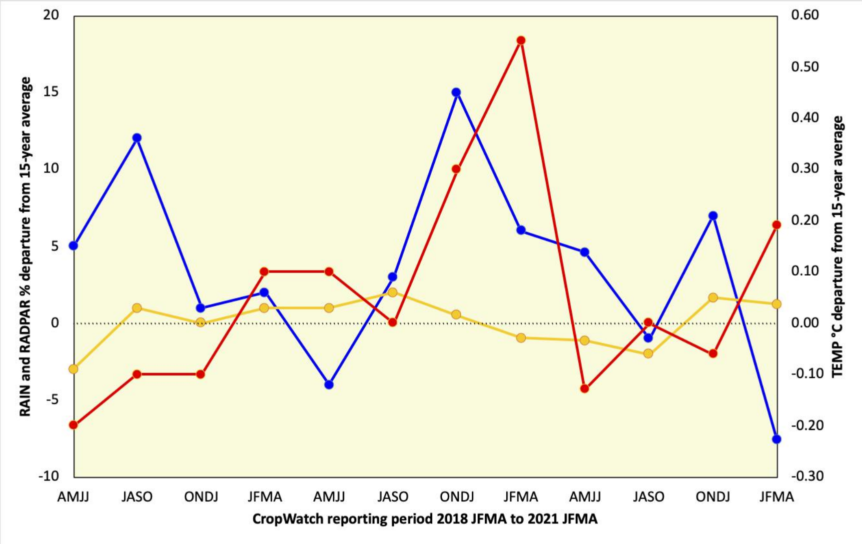


Figure 1.1 global departure from recent 15 year average of the RAIN, TEMP and RADPAR indicators since 2018 JASO period (average of 65 MRUs, unweighted)

1.3 Rainfall (Figure 1.2)

Below average rainfall conditions persisted in the west of North America, from Alaska down to Mexico. The most severe rainfall deficit, with rainfall being more than 30% below average, was observed for Mexico, large parts of Brazil stretching from the Pantanal to Mato Grosso and the North East. The Middle East, Central Asia, Northern South Asia and Tibet also experienced a severe rainfall deficit. The Amazon Basin, Southern Chile, the northeast of the USA, South-Eastern China, as well as West- and Central Africa, including Madagascar experienced a rainfall deficit by 10-30%. These rainfall deficits are especially problematic when they occur during the periods in which most precipitation falls. In this period, this was the case for the West Coast of the USA, the Amazon Basin including most of Brazil, Southern Africa, Madagascar, the Middle East and Central Asia. Western Russia and the Ukraine, as well as Eastern Siberia, North China, the Korean Peninsula and Japan, as well as Australia received above average precipitation. Abundant rainfall helped Australia overcome the severe drought that had occurred in 2020.

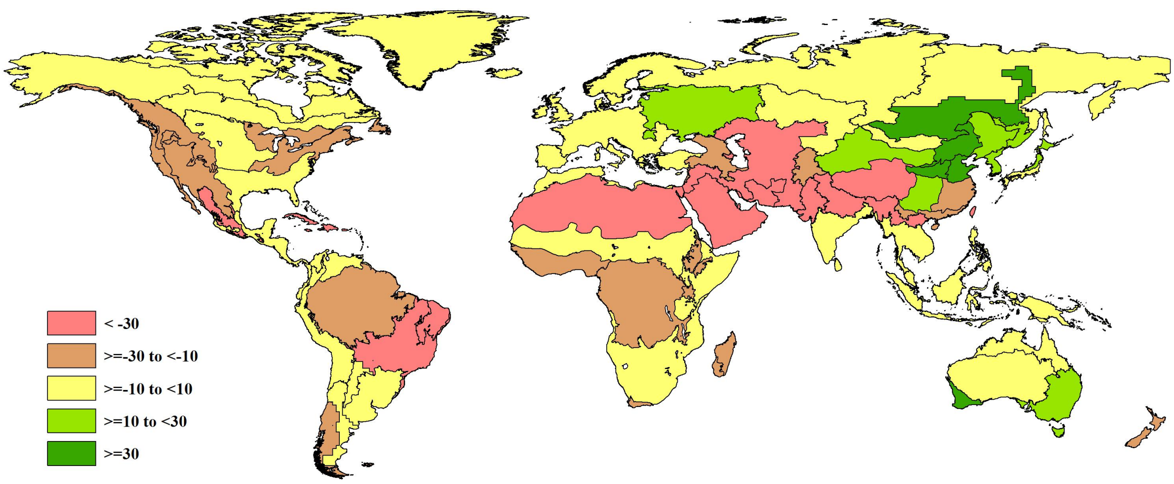


Figure 1.2 Global map of rainfall anomaly (as indicated by the RAIN indicator) by CropWatch Mapping and Reporting Unit: departure of January to April 2021 total from 2006-2020 average (15YA), in percent.

1.4 Temperatures (Figure 1.3)

Most of the regions experienced normal temperatures, i.e., the averages did not depart by more than +/- 0.5°C from the 15YA. Cooler than average temperatures in the range of -1.5 to -0.5°C were observed for the southeast of the USA, most of Europe, except the south and very north, East Africa and Australia. Above average temperatures in the range of +0.5 to +1.5 °C were observed for Brazil, Middle East, Central Asia and East Asia, including China, South-east Siberia, Korea and Japan. Only a couple of relatively small regions experienced above average temperatures exceeding +1.5°C. These areas were a belt stretching across Canada from the Western Prairies to the East Coast and Eastern Japan.

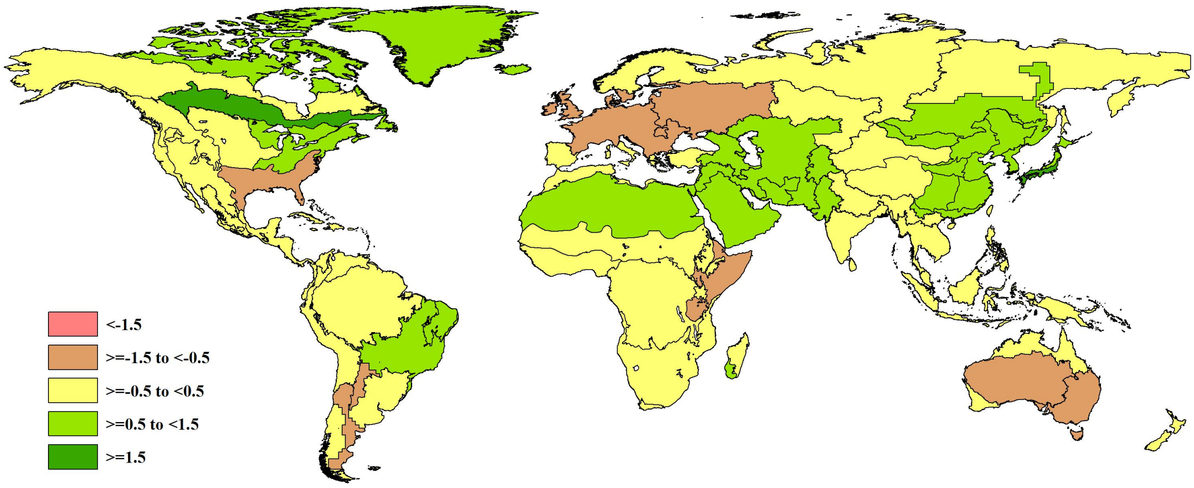


Figure 1.3 Global map of temperature anomaly (as indicated by the TEMP indicator) by CropWatch Mapping and Reporting Unit: departure of January to April 2021 average from 2006-2020 average (15YA), in ℃.

1.5 RADPAR (Figure 1.4)

The west of north America experienced much above average solar radiation, i.e., by more than 3%, together with Madagascar. The entire west of the USA, most of Europe, the Middle East, Central Asia and the Indonesia Archipelago experienced above average solar radiation as well. Below average solar radiation was recorded for the central and eastern part of the USA, most of South America except for Central Brazil, Africa south of the Sahara, Russia and North and Eastern China as well as Australia. The deficits were largest for Australia and Russia.

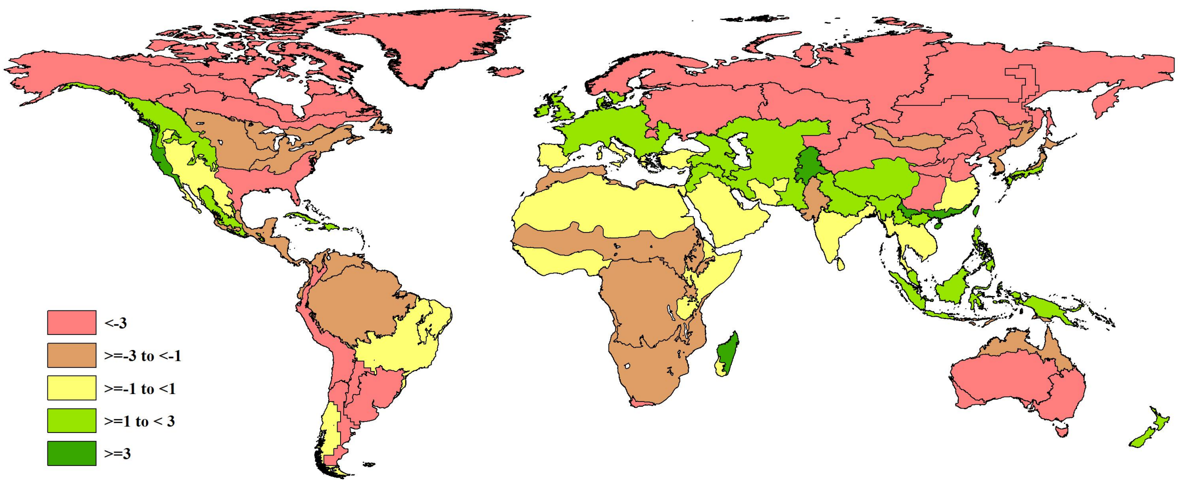


Figure 1.4 Global map of photosynthetically active radiation anomaly (as indicated by the RADPAR indicator) by CropWatch Mapping and Reporting Unit: departure of January to April 2021 total from 2006-2020 average (15YA), in percent.

1.5 BIOMSS (Figure 1.5)

Estimated biomass, which is calculated as a function of temperature, rainfall and solar radiation, showed a relatively large negative departure by more than -5% for Africa, Central Asia, South and Southeast Asia, Europe, Russia, and southern China. Potential biomass was also significantly lower than average in the western United States and central to northeastern Brazil. Northern China, the Korean Peninsula, Japan, and southwestern Australia benefited from abundant precipitation and had significantly above-average potential biomass.

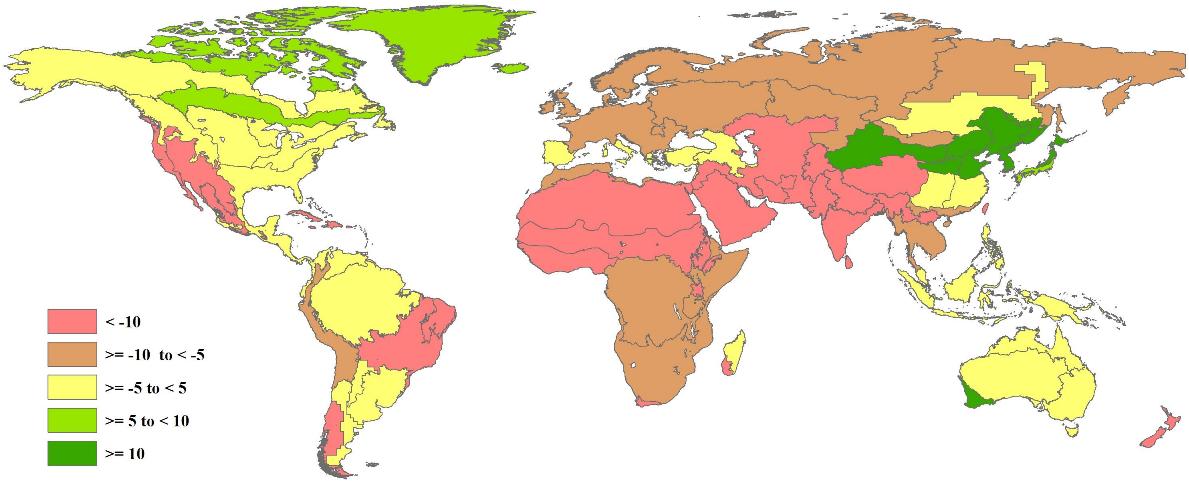


Figure 1.5 Global map of biomass accumulation (as indicated by the BIOMSS indicator) by CropWatch Mapping and Reporting Unit: departure of January to April 2021 total from 2006-2020 average (15YA), in percent.

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 C 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 2021)

	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
West Africa	93	-28	27.3	0.0	1308	-1	341	-20
North America	333	-3	4.6	-0.1	742	-3	504	2
South America	418	-52	22.9	0.3	1158	0	904	-23
S. and SE Asia	125	-11	23.7	0.2	1207	0	333	-19
Western Europe	296	-8	4.5	-0.3	606	4	509	-6
C. Europe and W. Russia	281	11	-1.2	-0.3	456	-7	353	-7

*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 2006-2020.*

Table2.2 Agronomic indicators by Major Production Zone, current season values and departure from 5YA (January to April 2021)

	CALF (Cropped arable land fraction)		Maximum VCI
	Current (%)	5A Departure (%)	Current
West Africa	50	-7	0.85
North America	44	-3	0.76
South America	99	0	0.92
S. and SE Asia	80	8	0.87

Western Europe	94	-1	0.82
Central Europe and W Russia	55	-18	0.77

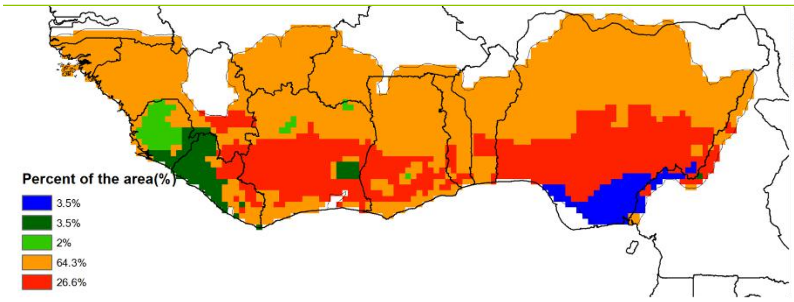
Note: See note for Table 2.1, with reference value R defined as the five-year average (5YA) for the same period (January-April) for 2016-2020.

2.2 West Africa

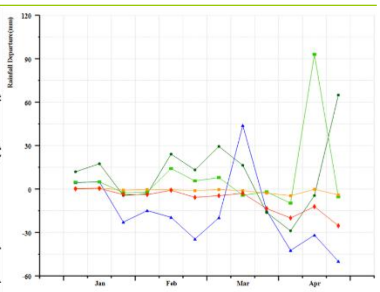
This report covers the end of the harvest of main season crops and of second season rice and maize crops. The period from January to April is the dry season in this region. Cropping activities were mainly limited to the coastal areas of the MPZ while the northern parts remain uncropped. The main farming activities in the coastal areas were mainly related to maize, yams and rice. In Nigeria, harvesting activities of millet, sorghum, rainfed rice and main season maize crops were finalized resulting in an estimated cereal production slightly above the 5-year average. In Nigeria, early and extended rainfall in March favored abundant quality pasture and water resources for livestock in the main grazing areas of the country.

Based on the climatic indicators, the MPZ as a whole received a below-average rainfall (93 mm, -28%) with the highest rainfall amounts received in Gabon (1066 mm, -3.3%), followed by Equatorial Guinea (1031 mm, -10.9%), Liberia (464 mm, +18.3%) and Sierra Leon (226 mm, +72%) while the rest of the region remained relatively dry with less than 200 mm of aggregated rainfall estimates. The rainfall pattern showed the severity of water stress throughout the region as reflected by the VHI map of the region. The regional average temperature was 27.3℃ (0° C) and regional radiation of 1308 MJ/m2 (-0.8%). CALF was below the 5YA (at 50%, -7.4%) with a VCIx of 0.8. The observed potential biomass production for the region was 341 gDM/m2 (-20%) predominantly attributed to the coastal areas. These conditions are normal for the dry season.

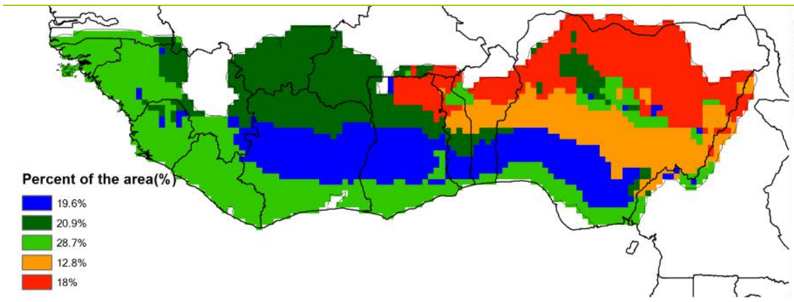
Figure 2.1 West Africa MPZ: Agroclimatic and agronomic indicators, January to April 2021.



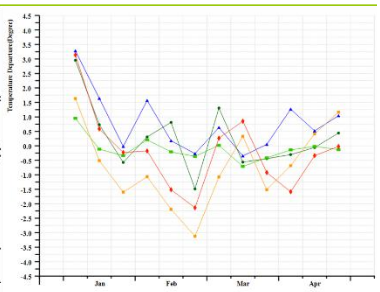
a. Spatial distribution of rainfall profiles



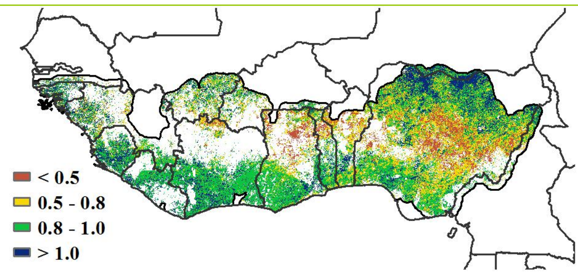
b. Profiles of rainfall departure from average (mm)



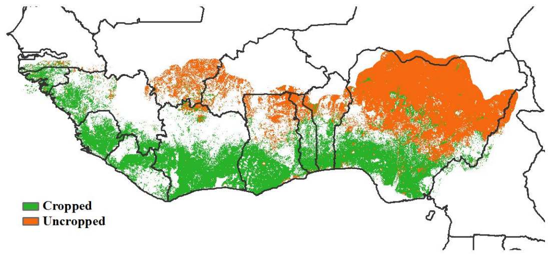
c. Spatial distribution of temperature profiles



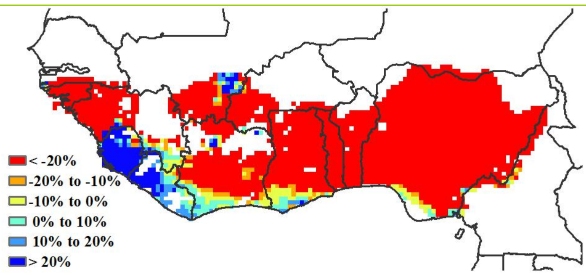
d. Profiles of temperature departure from average (mm)



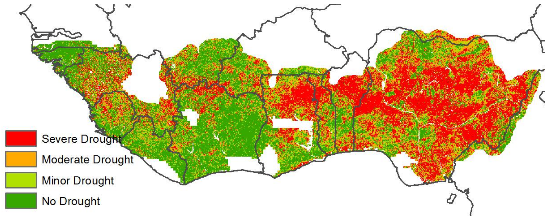
e. Maximum VCI



f. Cropped arable land



g. Biomass accumulation potential departure



h. VHI minimum

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

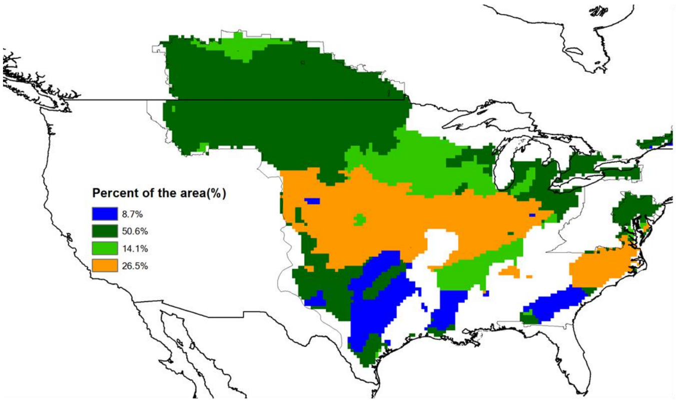
2.3 North America

By the end of this monitoring period, winter wheat reached the jointing to heading stages. The sowing of spring crops (wheat, maize, soybeans and rice) started in late-March and will last till the end of May. In general, the crop conditions were around average.

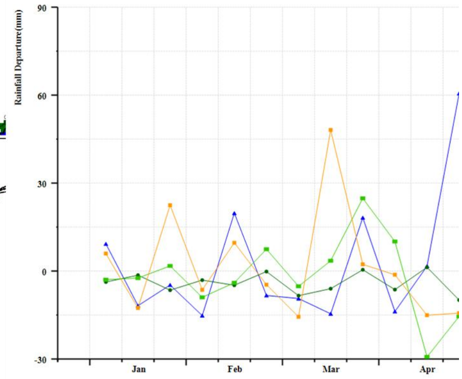
For North America, agro-climatic conditions were average during this period with close-to-average precipitation (-3%), temperature (-0.1℃) and radiation (-3%). Temperatures fluctuated dramatically during the monitoring period. After warmer-than-usual weather in January, temperatures dropped 10℃ to 13℃ below average in mid-February, affecting the winter wheat production regions as far south as Texas. Subsequently, temperatures recovered to 2-6℃ above average in early March. It seems that the unusually cold temperatures did not cause much damage to wheat, but they slowed its growth and development. Precipitation was quite stable and evenly distributed. After receiving average to above-average precipitation until March, precipitation in the Corn Belt and Central Plains decreased to below average. Precipitation in the Southern Plains was overall heavier compared to the 15YA. It was 60 mm above average in late April, which was favorable for winter wheat growth. The VCIx value of 0.76 indicates average crop conditions. Regions with low VCIx values (<0.5) were mainly located in the western part of the main winter wheat production area, coinciding with drought conditions indicated by the Minimum VHI map. CALF was 3% lower than the average of the last 5 years.

Prospects for crop production are generally favorable in North America. Weather conditions in May are crucial for the establishment of the summer crops and the grain filling stage of winter wheat.

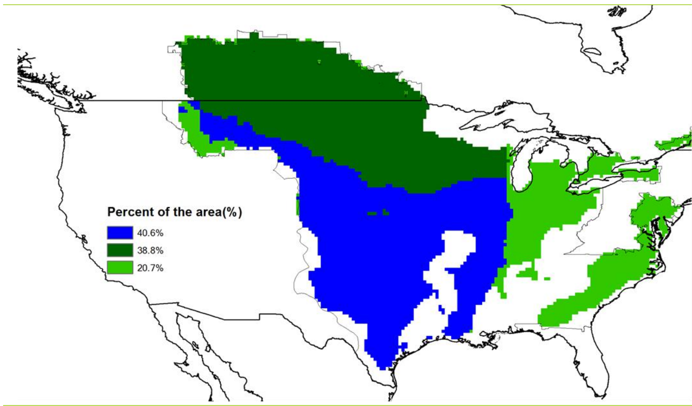
Figure 2.2 North America MPZ: Agroclimatic and agronomic indicators, January to April 2021



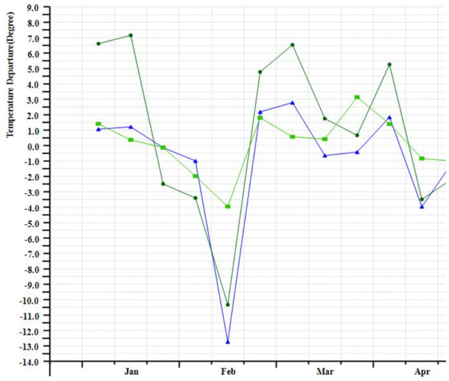
a. Spatial distribution of rainfall profiles



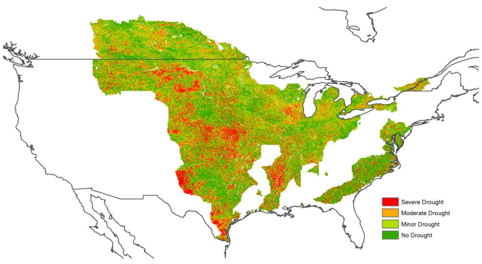
b. Profiles of rainfall departure from average (mm)



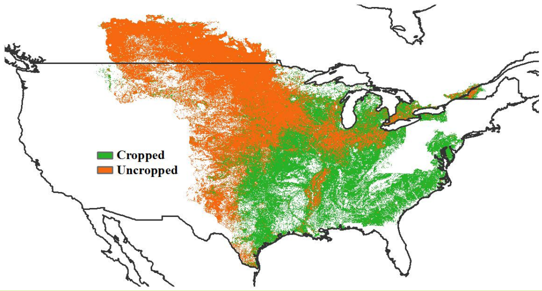
c. Spatial distribution of temperature profiles



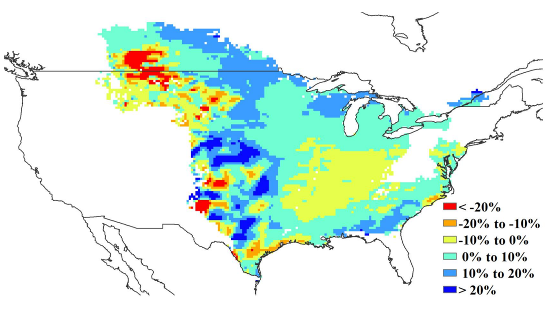
d. Profiles of temperature departure from average (°C)



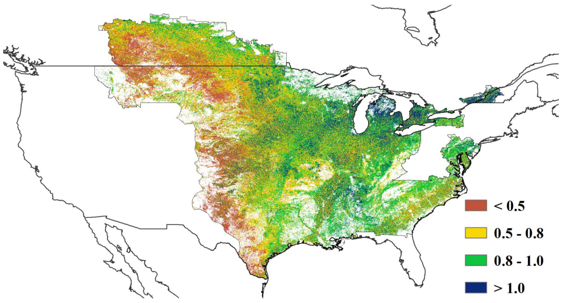
e. VHI Minimum



f. Cropped and uncropped arable land



g. Biomass accumulation potential departure



h. Maximum VCI

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

2.4 South America

This report covers the main growing period of summer crops, as well as the harvest of early planted summer crops. The overall situation for South America is poor to regular. Negative anomalies in RAIN and TEMP, as well as predominantly negative BIOMSS anomalies, poor Minimum VHI and the presence of areas with low Maximum VCI values were observed.

Spatial distribution of rainfall profiles showed four homogeneous patterns mostly distributed along a North- South direction. Northeast of Brazilian agricultural area was dominated by a situation with below average RAIN conditions all along the reporting period, with stronger anomalies during January. South of Brazil, Paraguay, Mesopotamia in Argentina and North of Uruguay (light green area) showed positive anomalies at the beginning, and a tendency to reduced, yet negative anomalies for the rest of the period. North of Pampas and South of Uruguay showed a highly variable profile with positive anomalies at the beginning and the end of the reporting period and no anomalies in the middle of the period. In contrast, South Pampas, Chaco and Subtropical Highlands in Argentina showed a stable temporal profile with almost no anomalies.

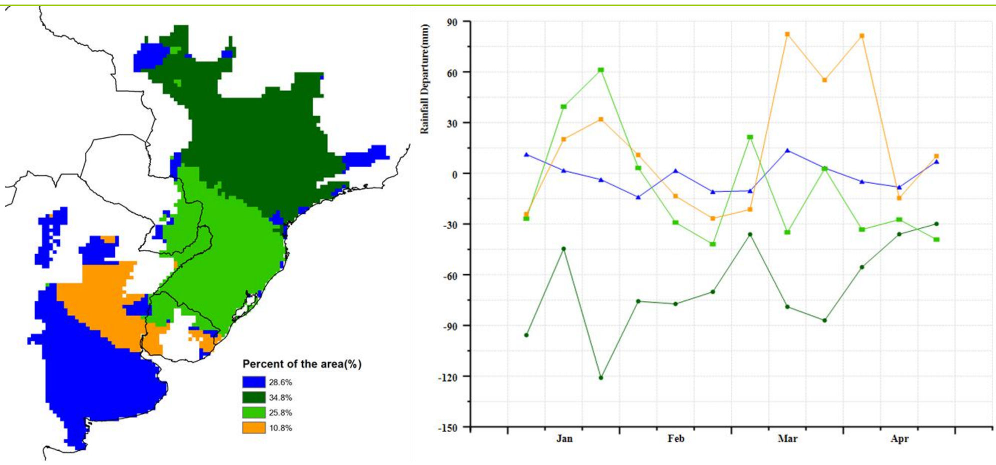
Temperature profiles showed for North of Brazil two different patterns with positive anomalies along the period, but with different intensity. An area with stronger positive anomalies (light green area) was surrounded by an area with moderate positive anomalies (dark green area). South of Brazil, Paraguay, Mesopotamia in Argentina, and East Uruguay showed a profile with strong negative TEMP anomalies at the beginning of February, and near average conditions during the rest of the period. Almost all Argentina and West Uruguay showed a highly variable pattern with strong negative anomalies in January, beginning of February and March, as well as positive anomalies during end February and April.

BIOMSS departure map showed a higher frequency of more negative than positive anomalies for this MPZ. Stronger negative anomalies were observed in most of Brazilian agricultural area. Slight positive anomalies were observed in Argentina and Uruguay.

Maximum VCI showed for most of the MPZ values higher than 0.92. Values lower than 0.8 were observed in South West Pampas and in other isolated cases along the Pampas. Minimum VHI showed a generalized pattern of severe and moderate drought conditions, in particular in Center and South of Brazilian agricultural areas, Paraguay, Pampas, Subtropical Highlands and part of Chaco in Argentina. Crop Arable Land Fraction was almost complete, except for a small portion in South West Pampas that remained uncropped.

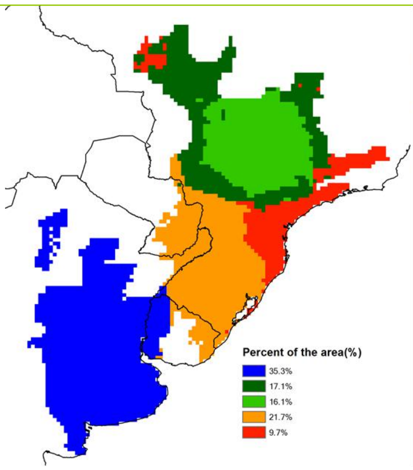
In general, South America showed regular conditions for crop production.

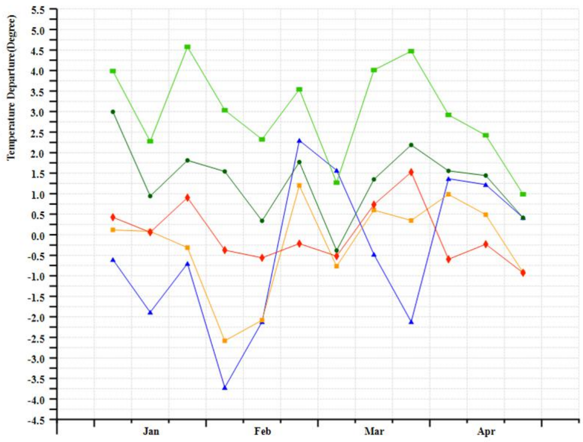
Figure 2.3 South America MPZ: Agroclimatic and agronomic indicators, January to April 2021



a. Spatial distribution of rainfall profiles

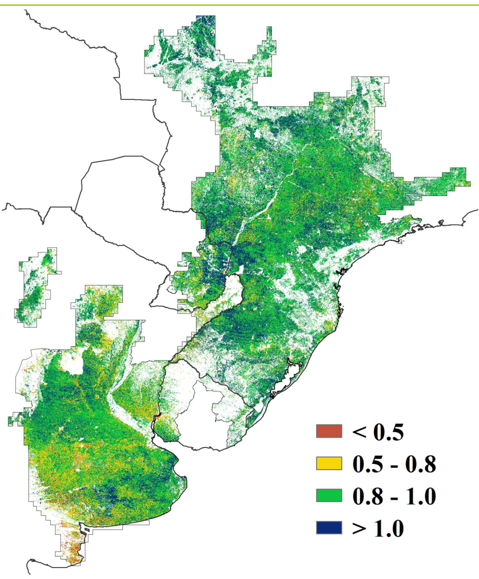
b. Profiles of rainfall departure from average (mm)

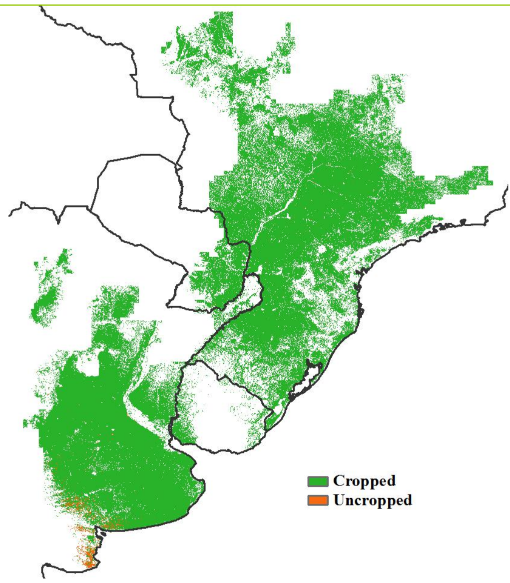




c. Spatial distribution of temperature profiles

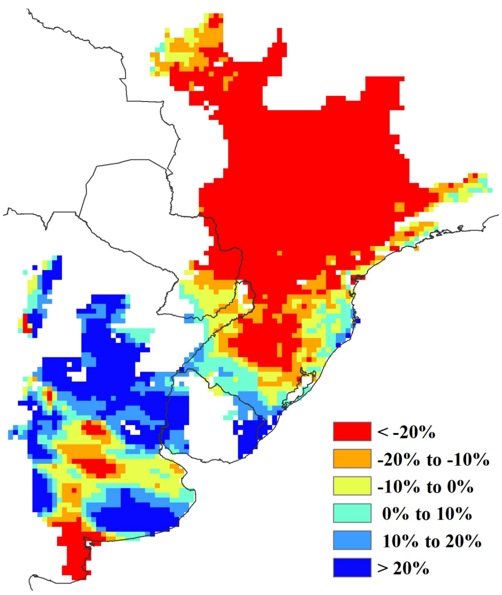
d. Profiles of temperature departure from average (mm)

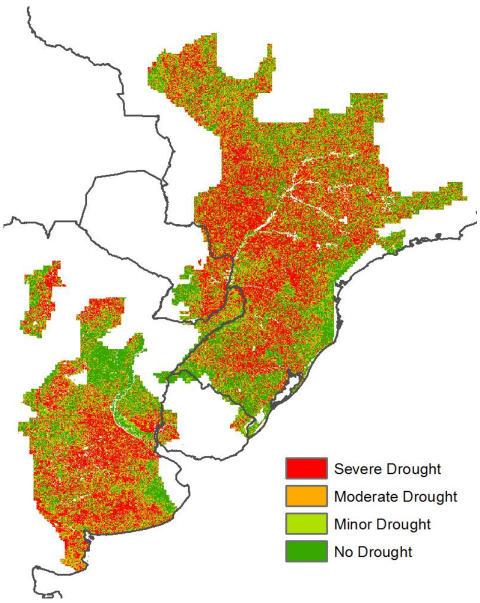




e. Maximum VCI

f. Cropped arable land





g. Biomass accumulation potential departure

h. VHI minimum

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

2.5 South and Southeast Asia

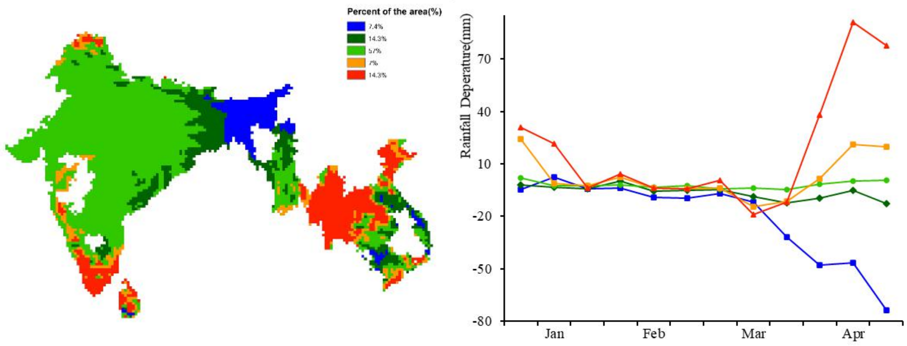
South and Southeast Asia includes India, Bangladesh, Cambodia, Myanmar, Nepal, Thailand and Vietnam. The reporting period covers the main growing period of winter crops, as well as the harvest of earlier planted crops. The main crops grown in South and Southeast Asia are maize, rice, wheat and soybean. Agro-climatic indicators showed that precipitation decreased by 11%, temperature rose by 0.2% and RADPAR was slightly higher by 0.5% compared to the 15YA, which led to a 19% drop in BIOMSS. CALF exceeded the 5YA by 8%, reaching 80%. The VCIx was at 0.86. Most crops grown in the winter season are irrigated. In India, ground water is a main source of irrigation water, and the drought conditions had limited impact on wheat production. However, in South-East Asia, surface water abstracted from rivers, dams and lakes is the main source of irrigation water. Thus the drought conditions had more of a negative impact on rice production in South-East Asia.

The spatial distribution of rainfall profiles showed slightly below-average conditions for 71.3% of the MPZ. These areas are located in India, Myanmar, Central Vietnam, and Bangladesh. Precipitation for 21.3% of the region, located in Myanmar and southern India, fluctuated slightly above and below the average value from January to mid-March. After mid March, a positive departure was observed. The precipitation in 7.4% of the main production area in eastern India and Bangladesh was below average with the exception of mid-January, reaching the strongest negative anomalies in April. Spatial distribution of temperature profiles showed above-average conditions for 20.6% of the MPZ, mainly in western and eastern India, Bangladesh and parts of Myanmar. Other areas showed an alternating pattern with positive and negative anomalies during the reporting period, with the strongest positive anomalies in early January (northern and mid India) and negative anomalies in mid-January (Thailand, Cambodia, Vietnam and Laos).

Most BIOMSS anomalies were in the negative range (0 to -20%), located mostly in India (eastern India and southeastern India), Nepal, Bangladesh, central Myanmar, , Cambodia and Vietnam. Maximum VCIx showed low values for central Myanmar, scattered areas in eastern and western India with values below 0.5. CALF indicates that a high portion of the region was planted, with the exception of areas in northern Rajasthan, eastern Bangladesh and southern Vietnam. The VHI minimum map shows that northern India, regions in central Myanmar and the west of Cambodia were most affected by periods of severe drought conditions.

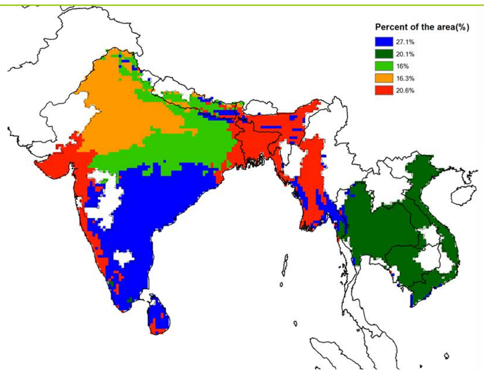
In general, the growth conditions of winter crops in this MPZ were close to normal in India, and below average in South-East Asia due to drought.

Figure 2.4 South and Southeast Asia MPZ: Agroclimatic and agronomic indicators, January to April 2021

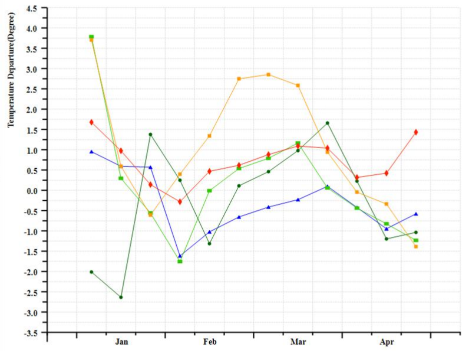


a. Spatial distribution of rainfall profiles

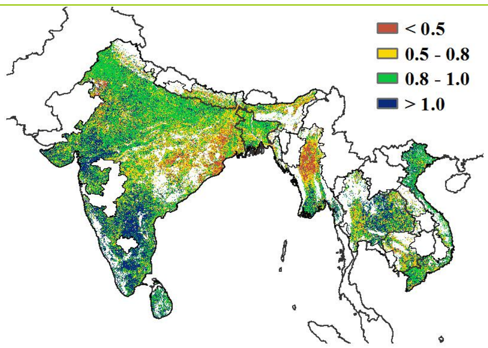
b. Profiles of rainfall departure from average (mm)



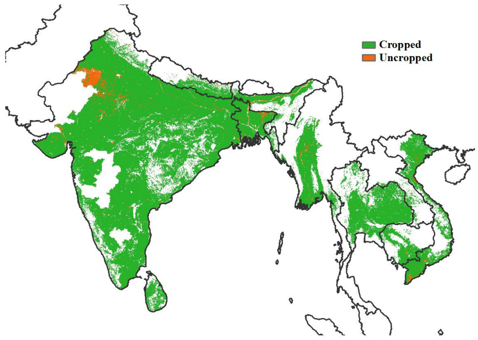
c. Spatial distribution of temperature profiles



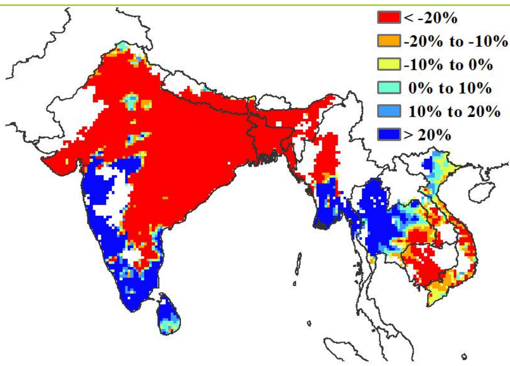
d. Profiles of temperature departure from average (℃)



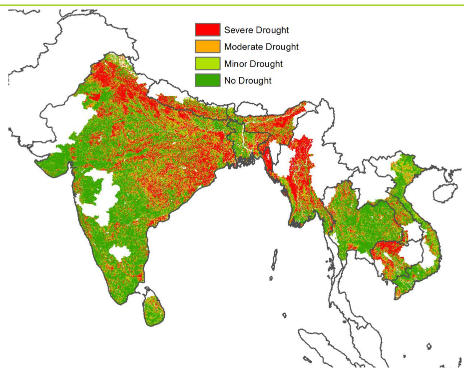
e. Maximum VCI



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). The sowing of summer crops started in March. Overall, crop conditions were near average in most parts of the MPZ based on the interpretation of agroclimatic and agronomic indicators (figure 2.5).

The whole MPZ showed a drop in RAIN (-8% below average). Almost all the main agricultural production areas of Western European countries had lower-than-average precipitation during this monitoring period except for Germany and the Czech Republic. The temporal and spatial distribution characteristics of precipitation are as follows: (1) RAIN was below average in early-January and April in western Spain, most of France, Germany and UK, accounting for 59.8% of the entire MPZ areas; However, the precipitation in these areas was significantly higher than average from mid-January to early February, and in mid-March. (2) The precipitation in almost the entire MPZ areas was lower than the average level during the period from mid-February to early March, and in late March. Countries with the most severe precipitation deficit included Denmark (RAIN -22%), France (RAIN -19%), Italy (RAIN -17%), Hungary (RAIN -11%) and Austria (RAIN -8%), while Germany had normal and the Czech Republic above average precipitation (RAIN +4%).

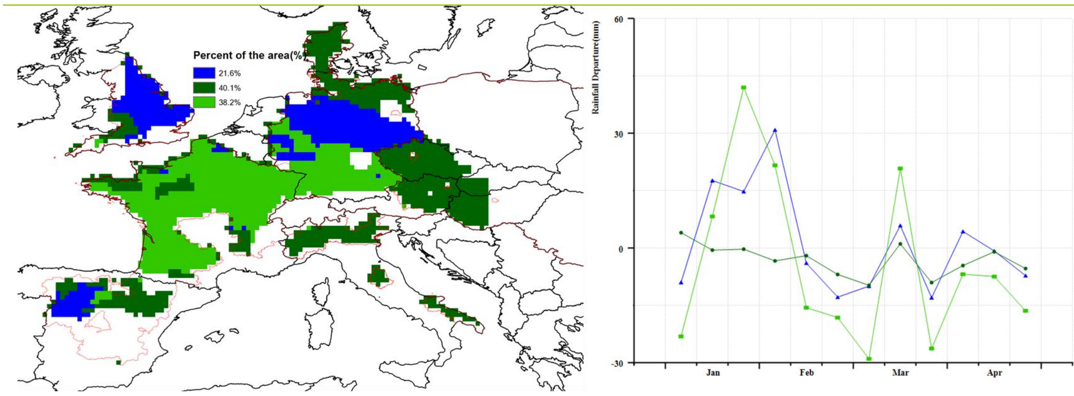
Temperature for the MPZ was sighltly below average (TEMP -0.3°C) while radiation was above average (RADPAR +4%). During the entire monitoring period, the characteristics of temporal and spatial distribution of temperature were as follows: (1) Temperature in most parts of southern Germany, France, Italy and Spain was above average from late-January to early-March, and in late March; (2) Temperature in northwestern France, UK, north-central Germany and Denmark was above average in late February and late March, while the temperature in those area was below average at other times during this monitoring period; (3) the entire MPZ had normal or below-average temperature during the remaining periods, especially in April, when temperature in 81.5% of the MPZ areas was significantly below average. This in turn slowed growth and development of the crops.

Despite of sunnier conditions, the potential BIOMSS was 6% below average due to the rainfall deficit and lower-than-usual temperatures. The lowest BIOMSS values (-20% and less) occurred in the central north of Spain, the west of France, and northwest of Italy . In contrast, BIOMSS was above average (10% and more) mainly in cenral Spain.

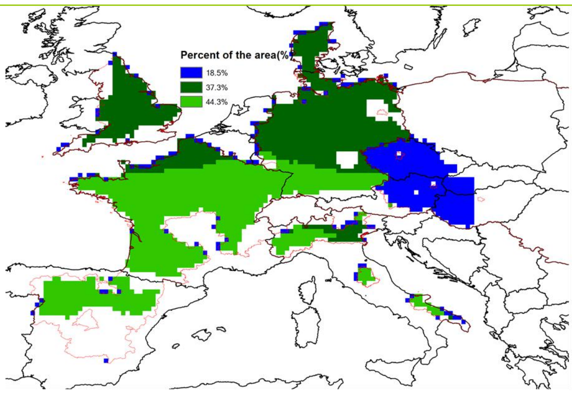
The average maximum VCI for the MPZ reached a value of 0.82 during this reporting period, and more than 94% of arable land was cropped (i.e. 1% below the recent five-year average) in the whole MPZ. The uncropped areas of arable land were mainly located in Spain, south-eastern France, south-western Austria and northern Italy, with also discrete distributions in parts of southern Germany, northern France and the UK. The VHI minimum map shows that some pockets of France, Germany, the eastern part of the UK and Spain were affected by short spells of drought conditions.

Generally, the conditions of winter crops in the MPZ were near average. However, more rain will be needed in several important crop production areas to ensure an adequate soil moisture supply for a proper yield of winter wheat in the grain filling phase.

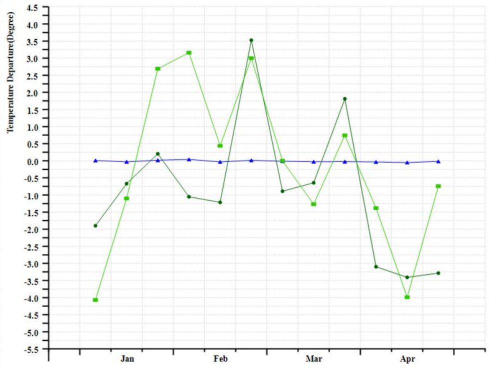
Figure 2.5 Western Europe MPZ: Agroclimatic and agronomic indicators, January-April 2021



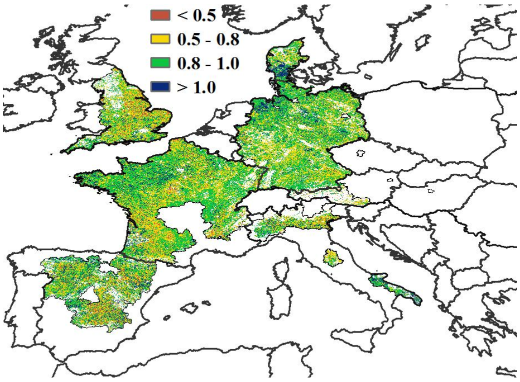
a. Spatial distribution of rainfall profiles | b. Profiles of rainfall departure from average (mm)



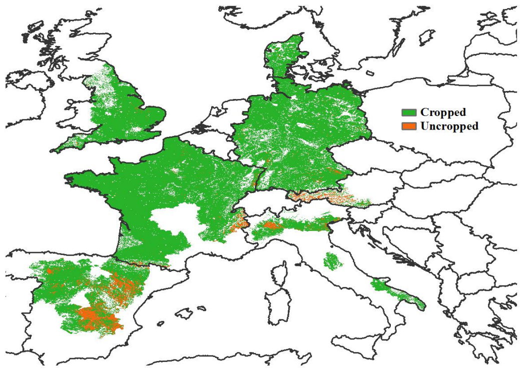
c. Spatial distribution of temperature profiles



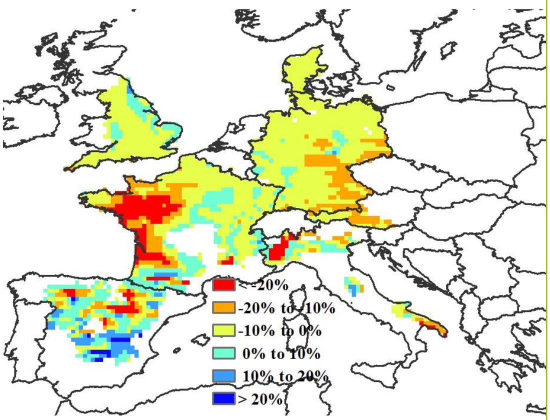
d. Profiles of temperature departure from average (mm)



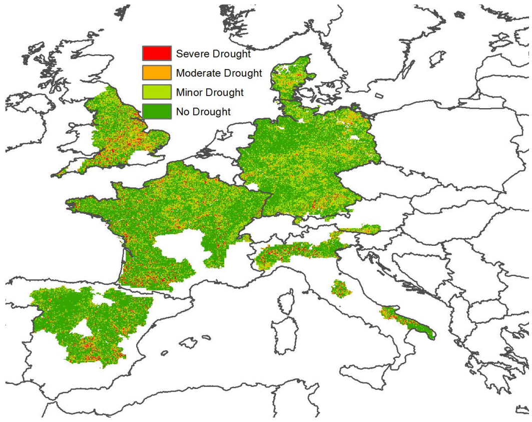
e. Maximum VCI



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 the spring green-up of winter cereals in Central Europe and western Russia. The sowing of summer crops was underway, starting in the west and south of the MPZ. In general, the rainfall was higher than average (+11%), with lower TEMP (-0.3℃), and RADPAR (-7%).

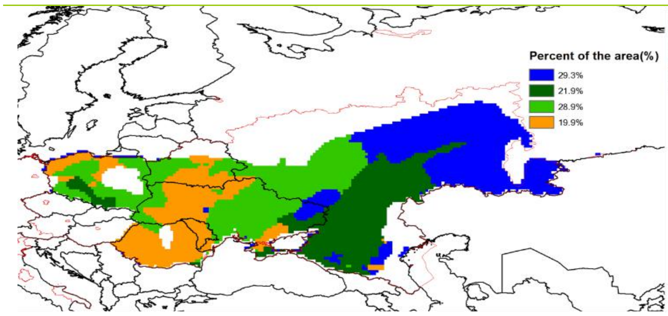
As shown on the spatial distribution map of rainfall departure, the precipitation in most areas of the MPZ fluctuated around the mean during the monitoring period. The spatial and temporal distribution characteristics were as follows: (1) From January to mid-February and from late March to April in 2021, the precipitation in southeastern Russia and some parts of Ukraine (51.2% of the MPZ) was above average. (2) From January to early March, the precipitation in most of the western MPZ (70.7% of the MPZ) continued to decline. (3) Between late February and early March, the precipitation was below average in all regions except parts of western Russia (29.3% of the MPZ).

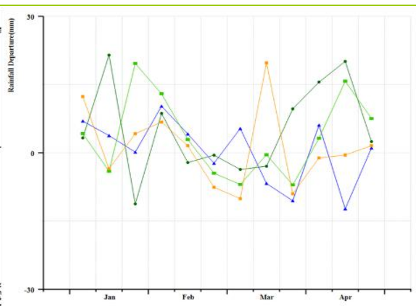
The temperature departure distribution map shows that for most of the MPZ the temperature fluctuated strongly from January to April. On average, temperatures in the MPZ were lower than the 15YA (-0.3 ℃). From January to February 2021, the west of Russia, the south of Belarus, Ukraine and most of Moldova (79.3% of the MPZ) had a large temperature variation, with a biggest negative departure of nearly 8.0 ℃ . The temperature began to rise in March. Parts of western Russia and eastern Ukraine (51.8 % of the MPZ) were warmer than average, while most of southern Belarus, Poland, Moldova, Romania and Ukraine (48.2% of the MPZ) remained below average.

The potential biomass in the MPZ was 7% lower than the 15YA.The areas with a 10% or more negative departure were mainly found in the west of MPZ . A higher-than 0.8 VCIx value was observed in the south-west of Ukraine, Moldova and the north-east of Romania, while areas with a VCIx value below 0.5 included most of the western part of Russia and the north-west of Ukraine, mainly due to uncultivated land. As a whole, CALF is 18% lower than the average level in the past five years, which may be due to abnormal phenology.

In summary, CropWatch agroclimatic and agronomic indicators for the monitoring period demonstrated that, though there was abundant precipitation in the MPZ, the decreased temperature and RADPAR cumulatively affected the crops in the growth period, resulting in a lower BIOMSS. In conclusion, the growth condition of crops of the MPZ was unfavorable during this period, and the crop yields are likely to be lower than average.

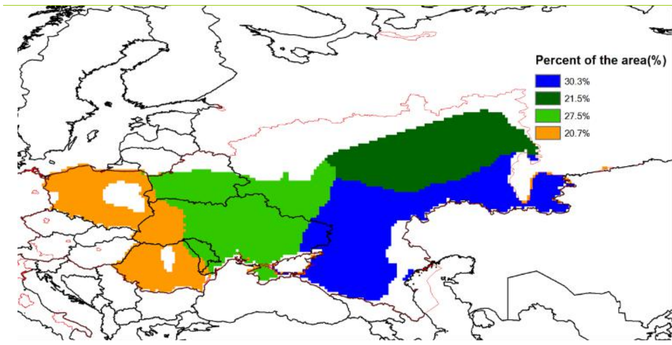
Figure 2.6 Central Europe-Western Russia MPZ: Agroclimatic and agronomic indicators, January to April 2021

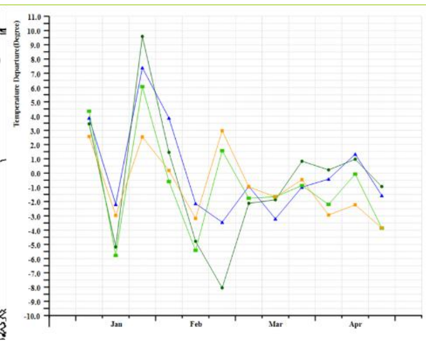




a.

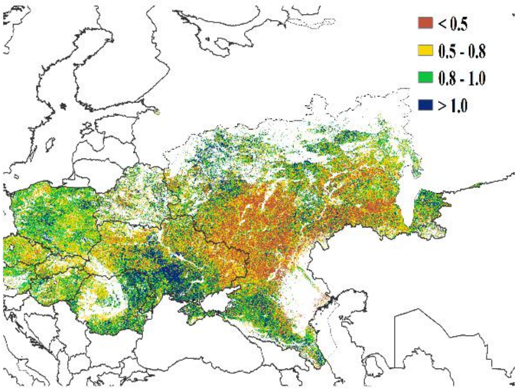
Spatial distribution of rainfall profiles b. Profiles of rainfall departure from average (mm)



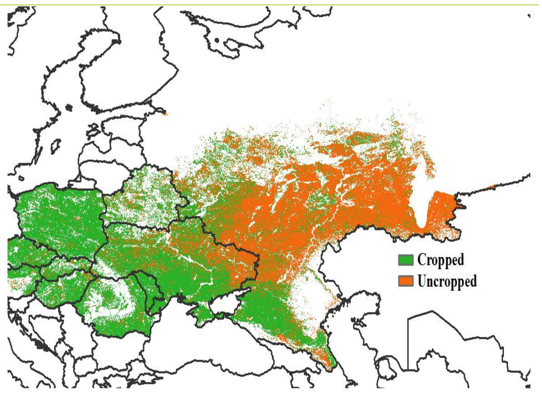


c.

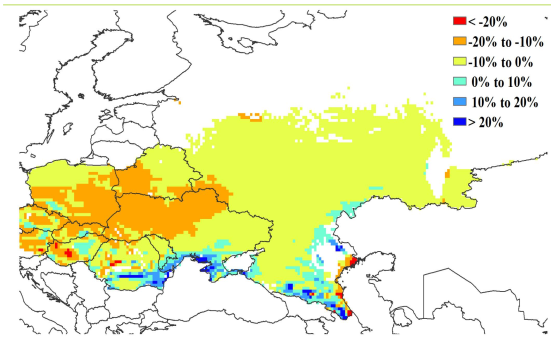
Spatial distribution of temperature profiles d. Profiles of temperature departure from average (℃)



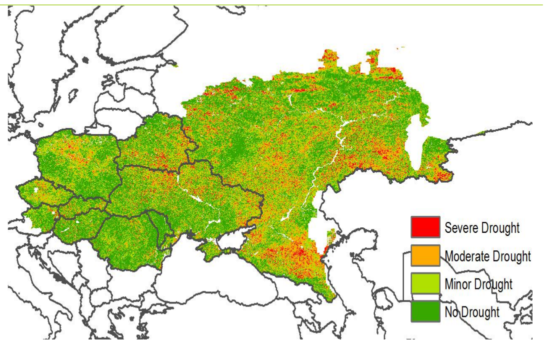
e. Maximum VCI



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

Chapters 1 and 2 have 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 agroclimatic 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 agroecological 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 among the major exporters of maize, rice, wheat and soybeans, conventionally taken as the countries that export at least one million tons of the covered commodities. There are only 20 countries that rank among the top ten exporters of maize, rice, wheat and soybeans respectively. The United States and Argentina rank among the top ten of all four crops, whereas Brazil, Ukraine and Russia rank among the top ten of three crops.

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. Argentina experienced favorable conditions for maize production, as rainfall was 10-30% above the 15YA. CALF was high, and thus above-average production can be expected. Brazil, to the contrary, suffered from drought conditions. The Parana basin, an important producer of maize, was badly hit. The rainfall deficit was 63%, and total rainfall for the 4 months was only 348 mm. The Central Savanna or Cerrado, was equally as badly affected: rainfall was 343 mm, a reduction by 62% from the 15YA. The drought also caused problems with shipping, as water levels in many rivers are too low for the barges to navigate. Hence, maize supply from Brazil is expected to drop to below-average levels. Rainfall was much below average during the monitoring period in India as well. However, rainfall during the dry winter season is generally very low, and farmers rely on irrigation for maize production during the winter months. The main maize production season is during the monsoon (Kharif), and production during the winter months (Rabi) contributes about 15% only to the total production. With temperatures and solar radiation being close to normal, average maize production can be expected for India during the monitoring period. South Africa is the largest maize exporter in Africa. All meteorological conditions were close to normal and average production can be expected. Maize planting started in April in North America and Europe. So far, weather conditions have been favorable, although temperatures were on the cooler side in Europe. In the USA, the conditions for planting and crop establishment have been favorable due to adequate soil moisture levels Similarly, conditions were favorable for maize planting in the Ukraine as well.

Rice: Conditions for winter (Rabi) season rice production were generally favorable in India, the largest rice exporter. The region of irrigated dry season (Boro) rice production is limited to West Bengal, Telangana, Andhra Pradesh and Assam. However, Boro rice yields are much higher than those obtained in the Kharif (rainy) season. Another region with important dry season rice production is Southeast Asia. Thailand and Vietnam rank in the 2nd and the 3rd position of exporting countries. In these two countries, crop conditions were mixed. Rainfall increased to above-average levels in Thailand, after drought conditions in 2020. But low water levels in the dams and rivers at the beginning of the growing season posed challenges for irrigation. Similarly, in the south of Vietnam, crop conditions were rather unfavorable. Water levels in the Mekong River are recovering from record lows observed in 2020, and prospects for the summer rice production are favorable in South-East Asia. Brazil was affected by severe rainfall deficit. Conditions for the other important rice producing countries and regions, such as the Philippines, Indonesia, Southern Africa and Argentina were generally favorable. Hence, all in all, rice production is stable at a global level.

Wheat: Spring wheat sowing in Australia, Canada, Russia and Kazakhstan started in April. Depending on the local conditions, the sowing period lasts until May or early June. Wheat tends to be grown in drier regions, where water is the limiting factor, except for the Indo-Gangetic Plain and the North-China Plain, where wheat is irrigated. In these two regions, conditions for wheat production have been favorable and high yields are expected for India and China. Precipitation in most of the rainfed wheat producing areas in the northern hemisphere was favorable, especially in Central- and Eastern Europe, the Maghreb, Russia, Ukraine and Kazakhstan. Most countries in the Near East and Central Asia were affected by a lack of winter rains. Especially Iran, Iraq, Syria and Afghanistan suffered from severe rainfall deficits, by more than 40%. Conditions in North America so far have been rather favorable. Rainfall is slightly below average, except for Mexico, where a severe drought has caused a shortage of irrigation water for the winter crops. A severe cold spell in the USA in February seems to have caused little damage to wheat. In South America, as well as in southern Africa, no wheat was in the fields. Sowing started in April. In Brazil, conditions for wheat planting in the Parana basin are unfavorable due to the severe drought. In the East African Highlands, conditions for wheat sowing in April were generally favorable.

Soybean: In the USA, Canada and the Ukraine, soybean sowing started at the end of this monitoring period, in late April. Soil moisture conditions are mostly favorable in those countries. 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. Conditions in Brazil for soybean production were unfavorable due to the severe drought conditions. Conditions for soybean production in Paraguay are more favorable, although the delayed planting of the first crop subsequently also delayed the sowing of the second crop. Argentina benefitted from above average rainfall, thus yield prospects are favorable for this country.

3. Weather anomalies and biomass production potential changes

(1) Rainfall (Figure 3.1)

Most of Brazil's regions that produce crops for export were affected by lower-than-average precipitation. The planting of the first crop was delayed due to a late start of the rainy season. This in turn also delayed the planting of the second crop in February and March. Apart from the coastal regions, most of Brazil suffered from a severe rainfall deficit, generally in the range of 30-60% below the 15YA. Argentina, on the other hand, benefitted from above-average rainfall. It exceeded the 15YA by 15% to 25%. While summer rains contribute to most of Mexico's rainfall, the lack of winter rains extended the drought period which had started in 2020. It is rated as one of the most widespread and intense droughts in recent history of this country. Another region that is plagued by prolonged drought is the West of the USA. Winter rains were far below average. California received only 230 mmm which is only 60% of the 15YA for this period. The rainfall deficit was less pronounced in the Northwest and Southwest, where rainfall reached around 80% of normal levels. In France and Italy, the rainfall deficits varied among the regions. The north of France was less affected than the south. In Italy, the Po Valley (-23%) and the East-coast (-19.7%) were most hit. The rainfall deficits were severe for Iran (-47% to -68%), Iraq and Afghanistan (-27% to -69%). Eastern Europe and most of the wheat production regions of Russia benefitted from above average rainfall. Similarly, Central and Northern China benefitted from above average rainfall, whereas rainfall in Southern China (-24%) and the Lower Yangtze region (-23%) were affected by a rainfall deficit. This in turn may delay the planting of the rice crop. Taiwan of China was also affected by a severe drought. Rainfall was down by -58%, as compared to the 15YA. Above average rainfall in Thailand (+25%) and in Australia helped overcome the drought conditions from 2020.

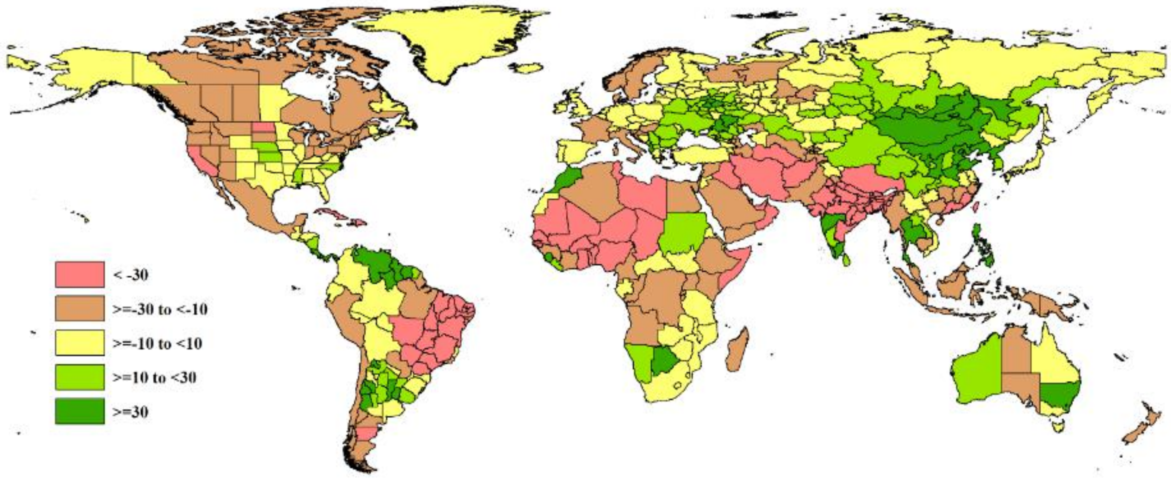


Figure 3.1 National and subnational rainfall anomaly (as indicated by the RAIN indicator) of January to April 2021 total relative to the 2006-2020 average (15YA), in percent.

(2) Temperature anomalies (Figure 3.2)

Temperatures stayed mostly within the normal ranges. The north-west of Argentina experienced slightly cooler than average temperatures, as well as the High Plains in the USA. In Central and Eastern Europe, the weather was also cooler than normal. The cooler temperatures in April delayed the planting and establishment of the summer crops. Warmer-than-usual temperatures were observed for Eastern Canada, the north-east of Brazil and the Near East. Temperatures departed by more than 1.5℃ from the 15YA in Iran. Similarly, the weather was also much warmer than usual in Southeast China, and most of southern, central and northern China experienced temperatures that were more than 0.5℃ above the 15 YA.

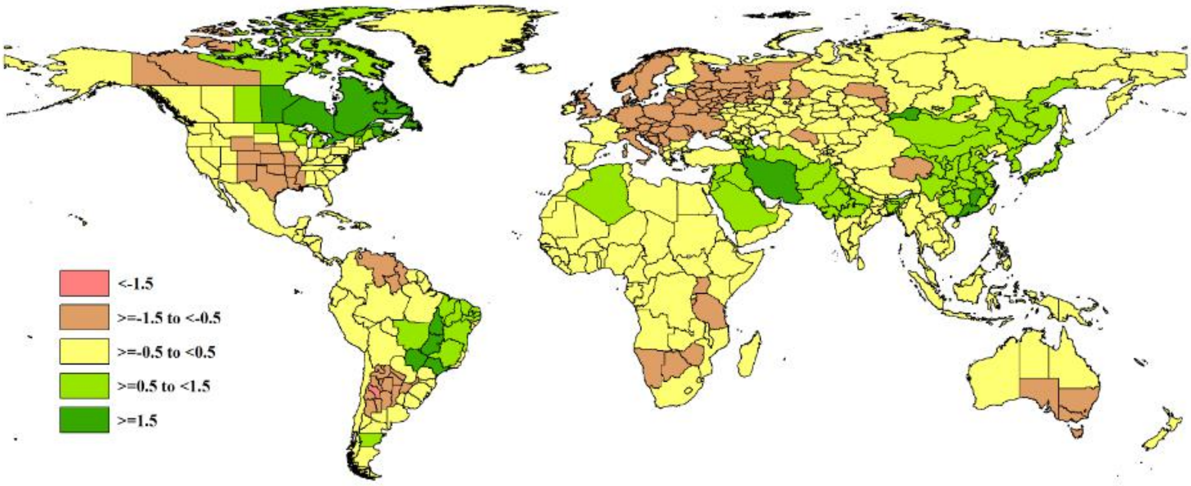


Figure 3.2 National and subnational temperatute rainfall anomaly (as indicated by the RAIN indicator) of January to April 2021 average relative to the 2006-2020 average (15YA), in °C

(3) RADPAR anomalies (Figure 3.3)

For most of Africa, solar radiation was below average. Similarly, radiation deficits were also observed for most of South America, except for some coastal regions of Brazil. Most of the western half of North America received above average solar radiation, whereas a deficit was observed for the eastern half. Western Europe, especially France and the United Kingdom, experienced more sunshine than usual (>+3%). Solar radiation was below average for Eastern Europe, Russia and China. The impact on crop production is minimal, as winter conditions were limiting crop growth in these regions. Above average (>+3%) solar radiation was observed for the drought-stricken Near East.

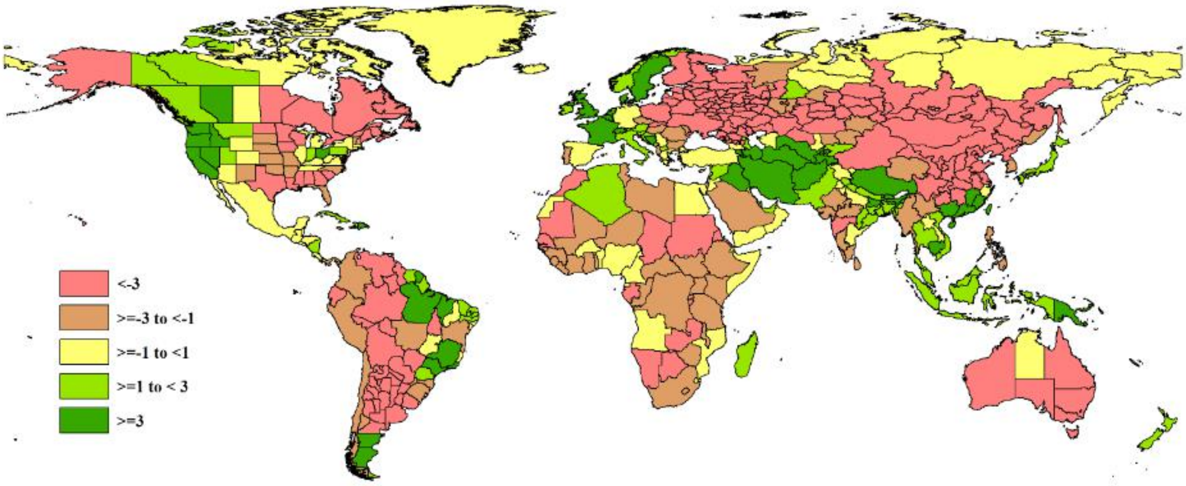


Figure 3.3 National and subnational sunshine anomaly (as indicated by the RADPAR indicator) of January to April 2021 total relative to the 2006-2020 average (15YA), in percent.

(4) Biomass accumulation potential BIOMSS (Figure 3.4)

The BIOMSS indicator is controlled by temperature, rainfall and solar radiation. In some regions, rainfall is more limiting, whereas in other ones, mainly the tropical ones, solar radiation tends to be the limiting factor. For high latitude regions, temperature may also become the most critical limiting factor. During the monitoring period, the BIOMSS indicators of most countries in Africa, Central Asia, and Europe were lower than the average level of the past 15 years by more than 5%. For several countries in South Asia and Southeast Asia such as Pakistan, Nepal, Bhutan, Myanmar, Cambodia and Malaysia, the BIOMSS indicators were also lower by more than 5%. As far as the nine major agricultural producing countries are concerned, the BIOMSS distance has increased on average. In western Russia, northern Kazakhstan and some neighboring regions in Russia, the northern and central states in India, the four provinces of Guangdong, Fujian, Hainan and Taiwan in China, the states of California, Arizona and Montana in the western United States, South Australia in Australia and most of the states of Brazil, the potential biomass was all significantly lower than average. Interestingly, apart from Morocco, Sri Lanka, Japan, North Korea, South Korea, the Philippines, Portugal, and a small number of countries in Central America and West Africa, whose potential biomass was more than 5% higher than usual, all the remaining regions with significantly higher potential biomass are also located in the 9 major agricultural producing countries, including the central and northern United States, the eastern provinces of Canada, the northern provinces of Argentina, the three southern states of India, the Western Australia and Queensland states of Australia, the three southern regions of Kazakhstan, and most of the provinces (municipalities) north of the Yangtze River in China.

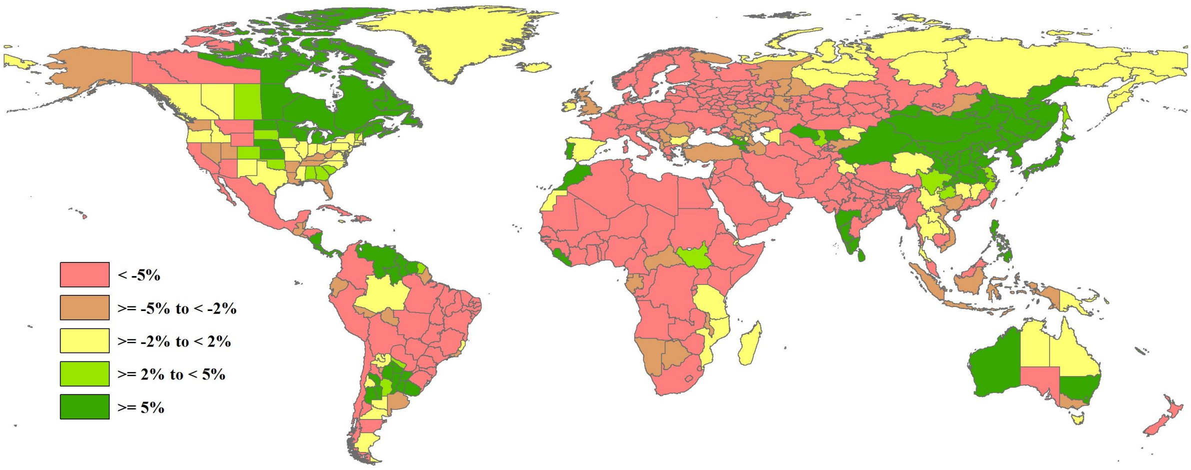


Figure 3.4 National and subnational biomass production potential anomaly (as indicated by the BIOMSS indicator) of January to April 2021 total relative to the 2006-2020 average (15YA), in percent.

3.2 Country analysis

This section presents CropWatch analyses for each of 42 key countries (China is addressed in Chapter 4). The maps and graphs refer to crop growing areas only: (a) Phenology of major crops; (b) Crop condition development based on NDVI over crop areas at national scale, comparing the January - April 2021 period to the previous season and the five-year average (5YA) and maximum; (c) Maximum Vegetation Condition Index over arable land (VCIx) for January - April 2021 by pixel; (d) Spatial NDVI patterns up to January - April 2021 according to local cropping patterns and compared to the 5YA; and (e) NDVI profiles associated with the spatial pattern under (d). Next, separate graphs (labeled as figures (f), (g), and subsequent letters) are included to illustrate crop condition development graphs based on NDVI average over crop areas for different agro-ecological zones (AEZ) within a country, again comparing the January - April 2021 period to the previous season and the five-year average (5YA) and maximum.

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

Figures 3.5 - 3.45: Crop condition for individual countries ([AFG] Afghanistan to [ZMB] Zambia) including agro-ecological zones (AEZ) from January - April 2021.

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

[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.

During this reporting period, the RAIN in Afghanistan was lower than the 15YA and lower than in 2020. Temperature was higher than average in early January and April 2021. BIOMSS was estimated to be 33% below the 15YA. According to crop condition development graphs based on NDVI, the national crop conditions were below average starting from mid-March.

The cropped arable land is mainly located in Badghis, Faryab, Balkh, Kunduz, Takhar, Badakhshan, and Nuristan. The cropped arable land fraction (CALF) decreased by 37% from the 5YA. According to the maximum vegetation condition index (VCIx) map, the vegetation in the south was better than in the north. As to the spatial distribution of NDVI profiles, crop conditions in most of the area (about 53.3% of cropped area) were above average or close to average from January to April. For 46.6% of the area, the conditions were below average. This was mainly in the northwest part of Baghlan (Maymana, Mari Chaq).

In general, the conditions for wheat were unfavorable due to below-average rainfall in January, February and April.

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.

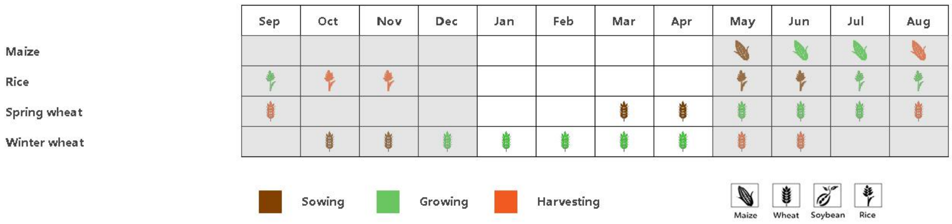
The RAIN in the Central region with sparse vegetation was 167 mm (-42%). The TEMP was 2.1 ℃ (+2.3°C), and the RADPAR was 1026 MJ/m2 (+3%). According to the NDVI-based crop condition development graph, the NDVI was higher than the average level until March. BIOMSS decreased by 17%, CALF had decreased (-3%) and VCIx was 0.58.

The Dry region recorded 74 mm of rainfall (RAIN -67%), TEMP was higher than average at 10.1 ℃ (+1.7°C), and RADPAR was 1105 MJ/m2 (+5%). According to the NDVI-based development graph, crop conditions were better than the five-year average in January and February, and lower than average in March and April. CALF in this region decreased by 1% and VCIx was 0.26.

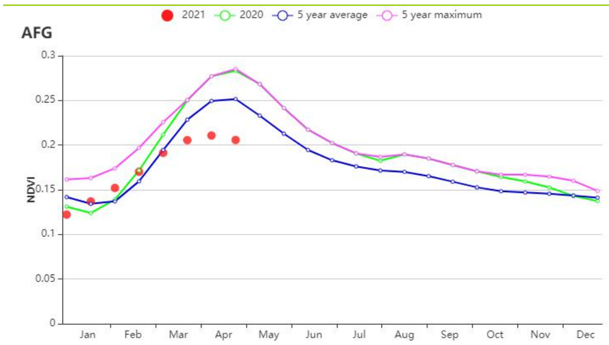
In the Mixed dry farming and irrigated cultivation region, the following indicator values were observed: RAIN 309 mm (-27%); TEMP 4.3 ℃ (+0.8°C); RADPAR 932 MJ/m2 (+5%). BIOMSS was 414 g DM/m2 (-19%) and CALF was 29% below average. According to the NDVI-based crop condition development graph, NDVI was lower than the average level and VCIx was 0.58.

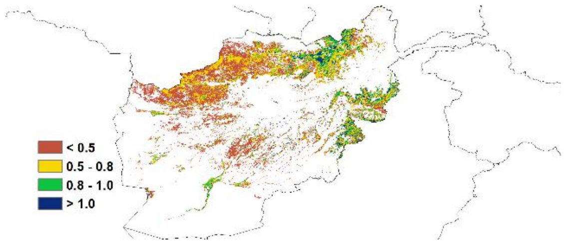
The Mixed dry farming and grazing region recorded 71 mm of rainfall (RAIN -69%). TEMP was 8.0 ℃ (+1.7°C) and the RADPAR was 1028 MJ/m2 (+5%). CALF was 75% below than the 5YA. VCIx was 0.30 and BIOMSS decreased by 38%. According to the crop condition development graph, the NDVI was much lower than the 5YA in March and April.

Figure 3.5 Afghanistan's crop condition, January - April 2021

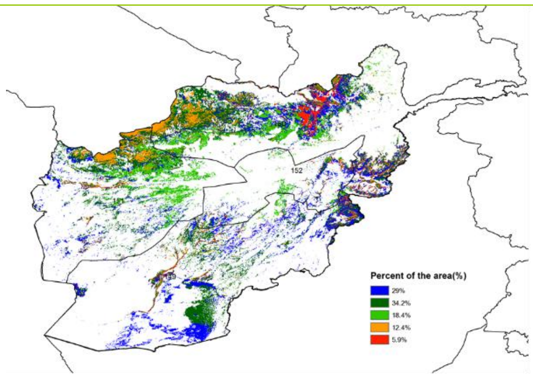


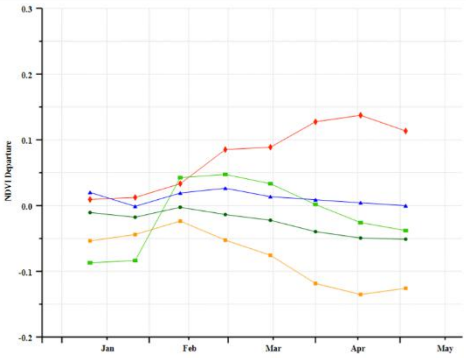
(a). Phenology of major crops



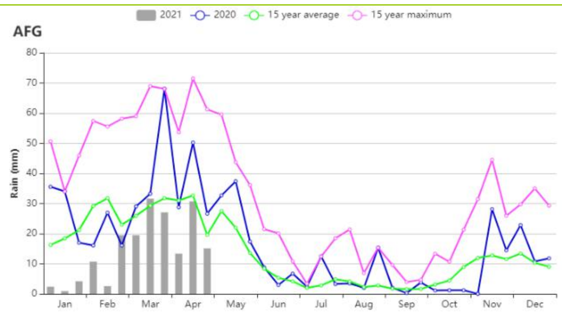


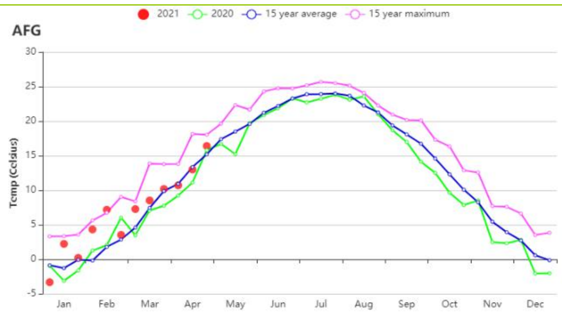
(b) Crop condition development graph based on NDVI (c) Maximum VCI



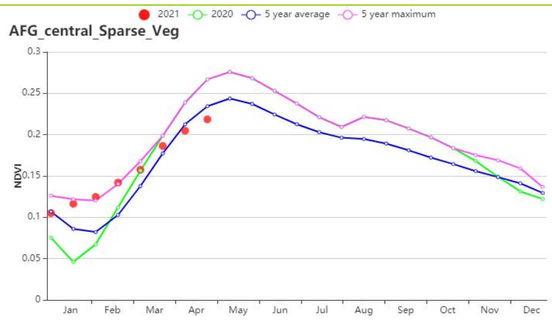


(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles

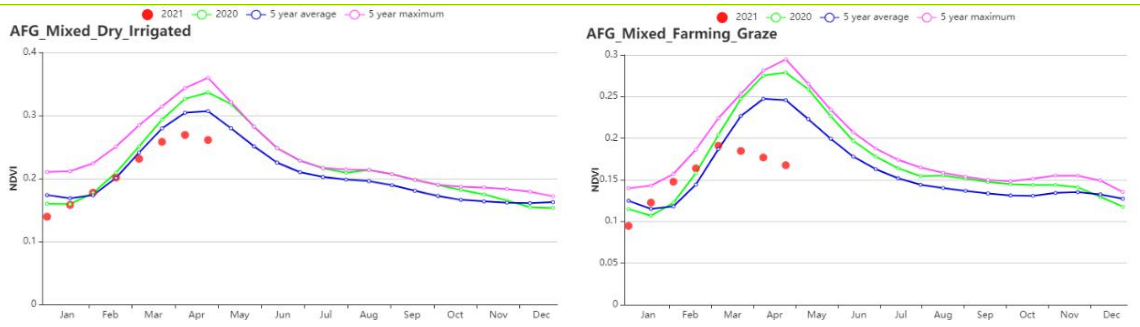




(f) Rainfall profiles (g) Temperature profiles



(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 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Central region	167	-42	2.1	2.3	1026	3	333	-17
Dry region	74	-67	10.1	1.7	1105	5	253	-45
Mixed dry farming and irrigated cultivation region	309	-27	4.3	0.8	932	5	414	-19
Mixed dry farming and grazing region	71	-69	8.0	1.7	1028	5	309	-38

Table 3.2 Afghanistan's agronomic indicators by sub-national regions, current season's values and departure from 5YA, January - April 2021

Region	Cropped arable land fraction		Cropping intensity		Maximum VCI
	Current (%)	Departure (%)	Current (%)	Departure (%)	Current
Central region	6	-3	-	-	0.58
Dry region	4	-1	-	-	0.26
Mixed dry farming and irrigated cultivation region	14	-29	-	-	0.58
Mixed dry farming and grazing region	3	-75	-	-	0.30

[AGO] Angola

The January-April monitoring period covers most of the maize, wheat and rice production. Harvest of maize will be completed in early May. The CropWatch agroclimatic indicators show that at the national level, both RAIN and TEMP decreased by about 28% and -0.2ºC, respectively, while RADPAR increased by just 1%. During this period, the decreases recorded in precipitation led to a decrease in the total BIOMSS production by about 17% as compared to the 15-years average.

Nationwide crop conditions were generally below the average as well as below the 5-year maximum during the entire period, as shown by the crop conditions development graph based on the NDVI. With the country recording a decrease in the total CALF (-2%), the overall VCIx during this period was 0.81. However, as can be seen from the spatial distribution map of maximum VCIx, mainly the southwest region registered low VCIx values (less than 0.8). The spatial patterns of VCIx were found to be consistent with those of the spatial NDVI patterns as well as the NDVI profiles. The crop conditions were continuously below the 5-year average in nearly 67% of the cropped area, especially in the southwest. Overall, crop conditions in Angola were not favourable due to severe drought conditions.

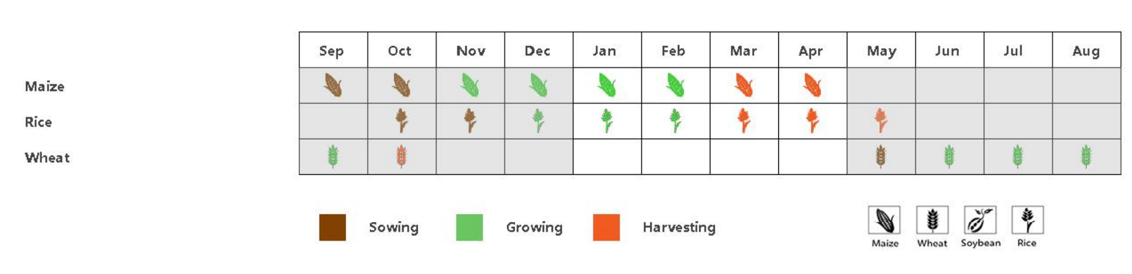
Regional Analysis

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

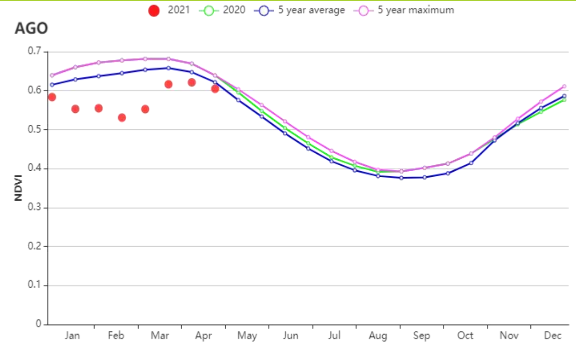
During this monitoring period, precipitation was far below average in all agroecological regions. The largest decreases were registered in the Central Plateau, Arid zone, Sub-humid, and Semi-arid zone with decreases of about 50%, 33%, 31%, and 26% respectively. With the exception of the Central Plateau region, the remaining agroecological regions recorded lower temperatures. Radiation for the Central Plateau and the Sub-humid zone recorded increases by about 5% and 2%, while the radiation in the Arid and Humid zone was near the past 15-years average. The Semi-arid zone was the only region that recorded a decrease in RADPAR (-1%). The total biomass production decreased in all the agroecological zones with the Central Plateau and Arid zones suffering the largest decreases by 30% and 24%, respectively.

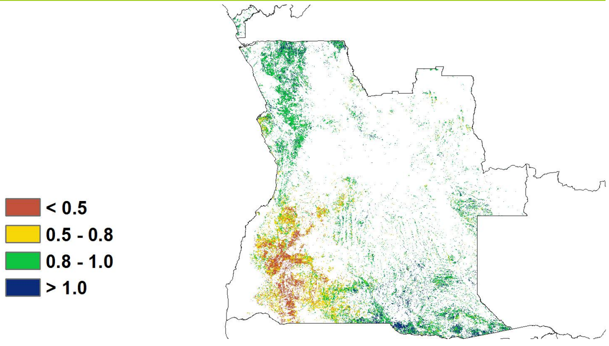
The crop conditions development graphs based on NDVI show the crop conditions were unfavourable during the entire monitoring period. However, crop conditions recovered in late April in the Arid, Humid and Semi-arid zones. The agronomic indicators show that apart from the Humid zone (with CALF near average), the remaining regions recorded decreases in CALF with large decreases of about 11% and 10% being observed in the Central Plateau and Arid zones. The maximum VCIx values varied from 0.63 (in the Central Plateau) to 0.94 (in the Humid zone).

Figure 3.6 Angola's crop condition, January - April 2021



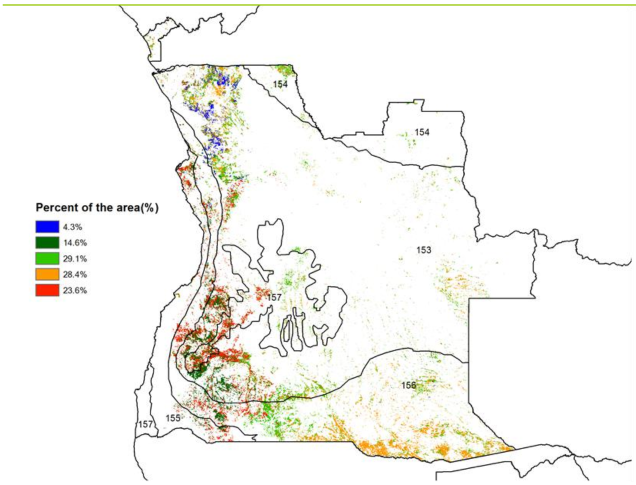
(a). Phenology of major crops

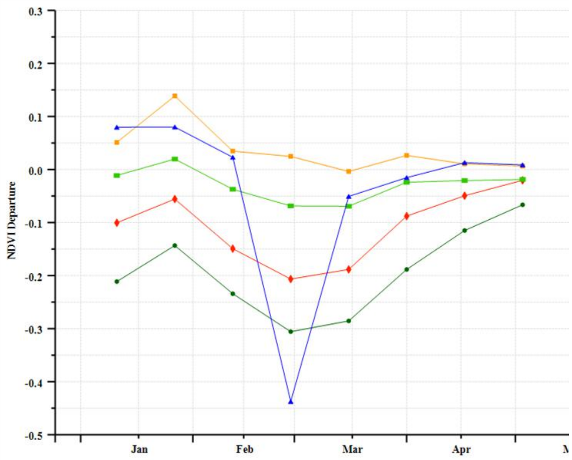




(b) Crop condition development graph based on NDVI

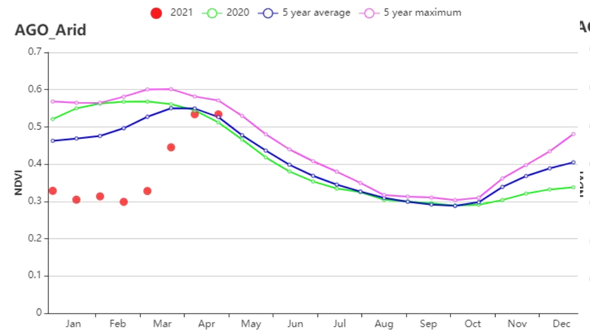
(c) Maximum VCI

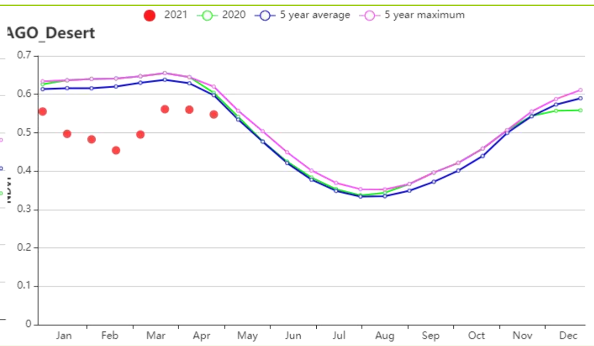




(d) Spatial NDVI patterns compared to 5YA

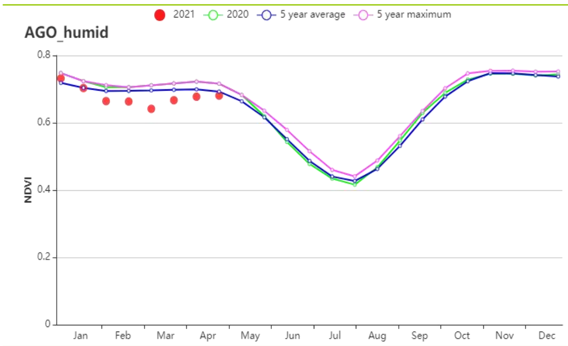
(e) NDVI profiles

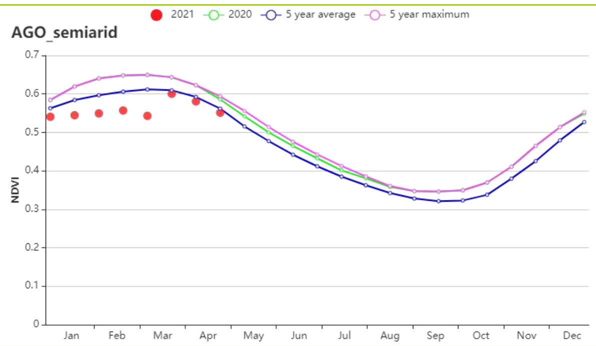




(f) Crop condition development graph based on NDVI-Arid zone

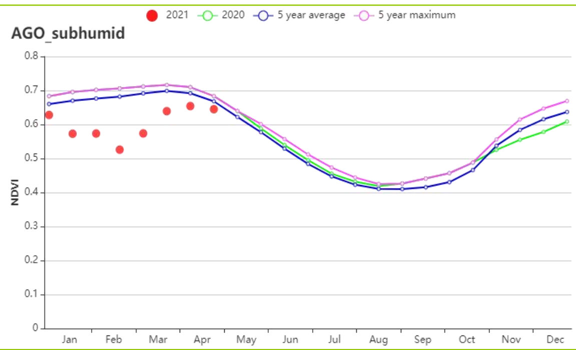
(g) Crop condition development graph based on NDVI - Central Plateau



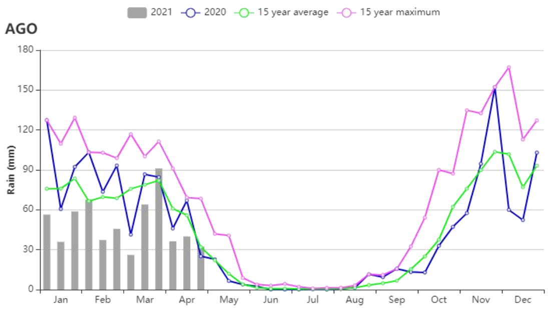


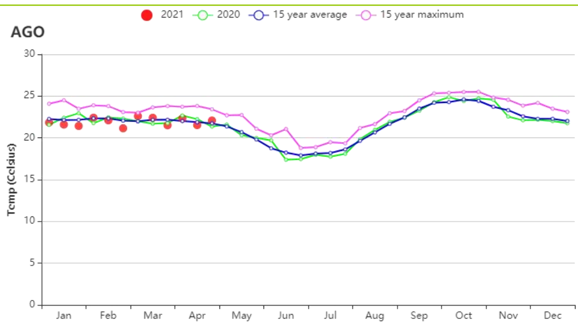
(h) Crop condition development graph based on NDVI-Humid zone

(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's agroclimatic indicators by sub-national regions, current season's values, and departure from 15YA, January - April 2021

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 (%)
Arid Zone	338	-33	24.9	-0.1	1249	0	785	-24
Central Plateau	471	-50	18.4	0.2	1169	5	875	-30
Humid zone	874	-18	22.1	-0.1	1152	0	1409	-7
Semi-Arid Zone	473	-26	22.3	-0.3	1189	-1	936	-18
Sub-humid zone	639	-31	21.6	-0.1	1171	2	1096	-17

Table 3.4 Angola's agronomic indicators by sub-national regions, current season's values, and departure from 5YA, January - April 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current
Arid Zone	79	-10	0.72
Central Plateau	88	-11	0.63
Humid zone	100	0	0.94
Semi-Arid Zone	97	-1	0.87
Sub-humid zone	97	-3	0.78

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

[ARG] Argentina

The reporting period covers the main growing season of summer crops: soybean, maize and rice, and the harvesting period of early planted summer crops. For the whole country, rainfall showed a 16% positive anomaly. Temperature was 0.5 ℃ below average. RADPAR were 7% below average, and and BIOMSS were 4% above average. CALF showed almost no anomaly and Maximum VCI was on average 0.87. Overall, crop conditions improved to normal over this monitoring period.

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.

The main agricultural regions showed positive anomalies in RAIN: Chaco (+21%), Mesopotamia (+17%), Humid Pampas (+16%) and Subtropical Highlands (+16%). Temperature showed negative anomalies: Chaco (-0.9°C), Subtropical Highlands (-0.9°C), Mesopotamia (-0.5°C) and Pampas (-0.2°C). RADPAR showed negative anomalies: Subtropical Highlands (-11 %), Humid Pampas (-7%), Chaco (-6 %) and Mesopotamia (-5 %). BIOMSS also showed negative anomalies for the main regions: Subtropical Highlands (-19 %), Mesopotamia (-7 %), Humid Pampas (-6%) and Chaco (-6%).

CALF was complete (100 %) for Chaco, Mesopotamia and Subtropical Highlands, while in Humid Pampas it was 99 %, but with no anomalies compared to the 5-year average. Maximum VCI showed in general good conditions, with the highest observed value in Subtropical Highlands (0.91), followed by Humid Pampas (0.89), Chaco (0.87) and Mesopotamia (0.85).

For the whole country, Crop condition development graph based on NDVI showed negative anomalies at the beginning of the period. By the end of April, conditions had improved to the levels of the 5YA. Regions showed more temporal variability than for national level. Chaco showed negative anomalies in January and March, but no anomalies in February and April. Pampas showed negative anomalies up to beginning of March, and positive anomalies in April. Mesopotamia showed negative anomalies in January and beginning March, no anomalies in February and end of March, and positive anomalies in April. Subtropical Highlands changed from negative anomalies during January and February, to no anomalies in March, and again negative anomalies in April.

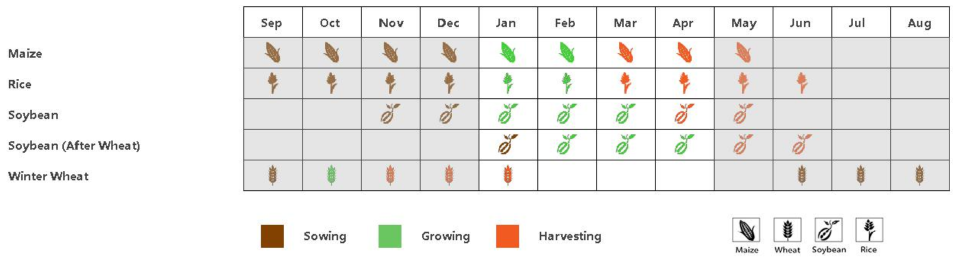
Rainfall temporal profile for the whole country was similar to the 2020 profile, and in relation to the 15 years average, it showed positive anomalies during January, March and April, and negative and consecutive anomalies in late February and at the beginning March. Temperature profile showed variability below and above the 15-year average profile. Negative anomalies were mainly observed in February and end of March, while positive anomalies were observed at the end of February and beginning of March.

Maximum VCI showed in general good conditions (higher than 0.8). Highest values were observed in North and South East Pampas, as well as in Subtropical Highlands. Lower values were observed in South West and Center Pampas.

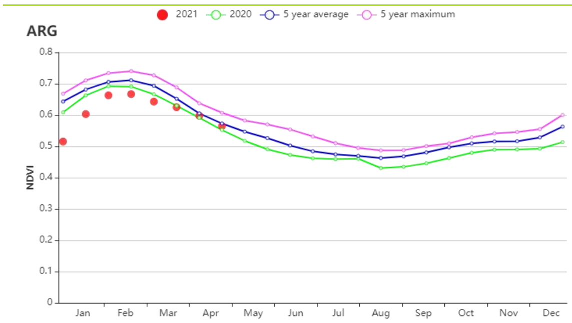
NDVI departure profiles were clustered in several homogeneous areas. The red profile, which showed near average conditions all along the period, was grouped in South East Pampas, Subtropical Highlands and East Chaco. The yellow profile showed positive anomalies during end January and February, and slight negative anomalies during April, and was observed mainly in North Pampas. The light green pattern, with negative anomalies from January to March and positive anomalies in April, spanned along Center Pampas and South Mesopotamia. The dark green pattern showed a strong negative anomaly at the beginning of January and slight positive anomalies during the rest of the period. It covered the North Pampas and Chaco. The blue pattern, with almost no anomalies up to mid of February and negative anomalies during the rest of the period, was observed over the South West Pampas boundary.

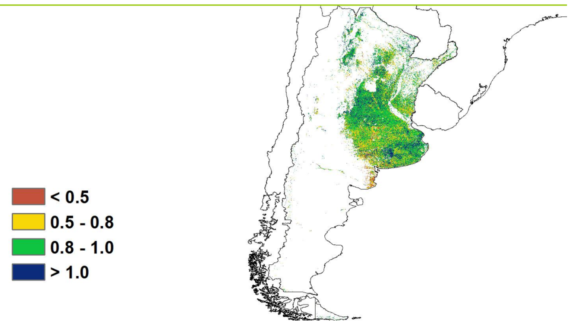
In summary, Argentina showed regular to poor conditions. RADPAR and BIOMSS showed negative anomalies in the main agricultural regions. Despite average positive anomalies in RAIN, negative anomalies were observed from mid-February to early March when most summer crops are in grain-filling stage. The low rainfall in Feb to March resulted in minor to moderate water deficit which hampered the yield formation. Maximum VCI showed mostly good conditions, but low values were also observed in south-western Pampas.

Figure 3.7 Argentina's crop condition, January - April 2021

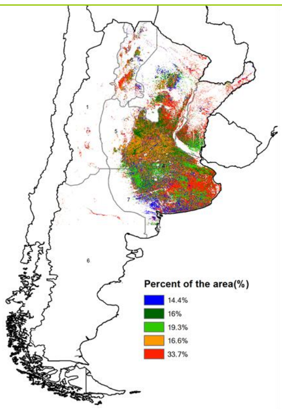


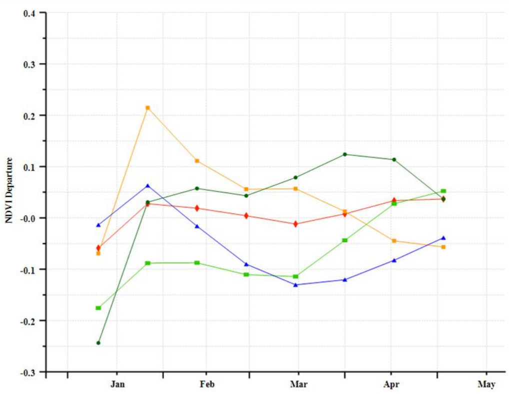
(a) Phenology of major crops



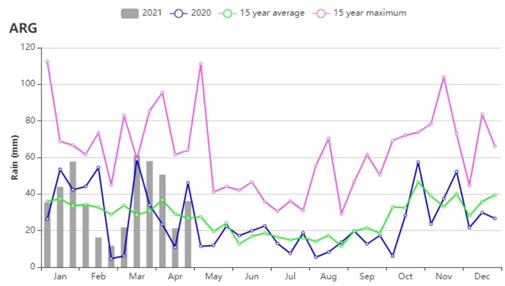


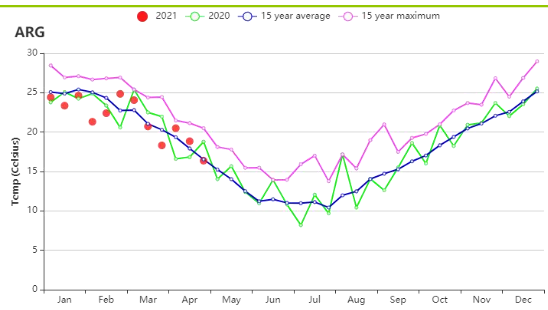
(b) Crop condition development graph based on NDVI (c) Maximum VCI



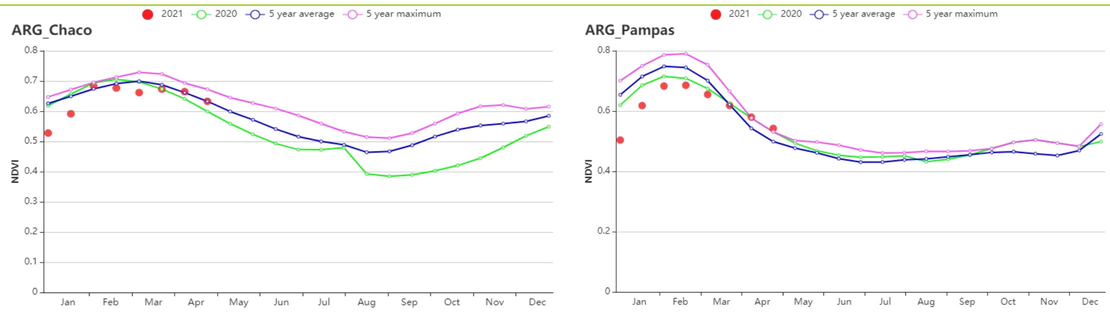


(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles

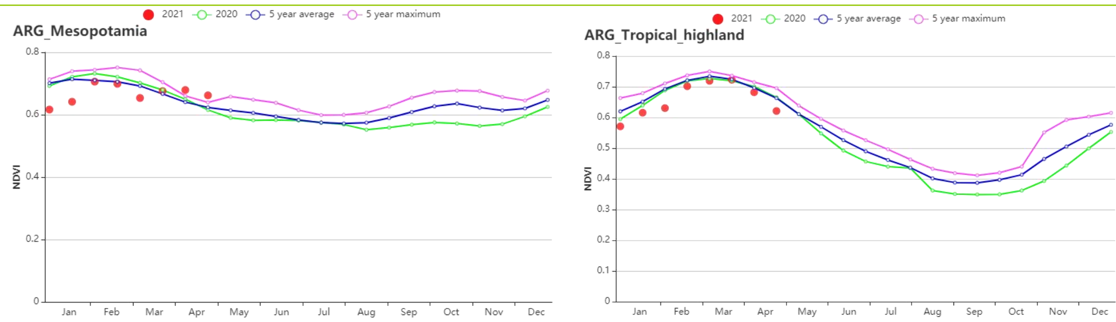




(f) Rainfall profiles (g) Temperature profiles



(h) Crop condition development graph based on NDVI (Chaco (left) and Pampas (right))



(i) Crop condition development graph based on NDVI (Mesopotamia (left) and Subtropical Highlands (right))

Table 3.5 Argentina's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Chaco	533	21	24	-0.9	1078	-6	1096	10
Mesopotamia	560	17	23	-0.5	1126	-5	1068	5
Humid Pampas	308	16	21.4	-0.2	1126	-7	801	3
Subtropical highlands	894	16	19.8	-0.9	993	-11	1133	2

Table 3.6 Argentina's agronomic indicators by sub-national regions, current season's values and departure from 5YA, January - April 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Chaco	100	0	0.87
Mesopotamia	100	0	0.85
Humid Pampas	99	0	0.89
Subtropical highlands	100	0	0.91

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[AUS] Australia

Wheat and barley are the two main cereal crops grown in Australia. Their harvest ended in January this year. Therefore, there were no winter cereal crops in the field for most of this reporting period, which limited the relevance of NDVI-based indicators.

Australia had relatively wet and cool weather in the current period, with above-average rainfall (RAIN, +14%), cooler temperatures (TEMP, -0.8°C) and below-average sunshine (RADPAR, -4%). This led to a above-average biomass accumulation potential (+4%). Sufficient rainfall has created favorable soil moisture conditions for the planting of wheat and barley in the coming months. CALF increased by 21% compared with the recent five-year average, while the maximum VCI was 0.72.

In the four main wheat production states, rainfall was above average in New South Wales (+39%), Victoria (+5%), and Western Australia (+13%), only South Australia encountered lower rainfall (-14%). All the other agro-climatic indicators (temperature, solar radiation and biomass) in the 4 states were below average.

The NDVI profile was generally close to the maximum levels observed over the past 5 years. The clustering map shows that only 22.9% of the cropland was below average in the last 4 months, mostly located in southern and western Australia.

Regional analysis

This analysis adopts five agro-ecological zones (AEZs) 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). The Arid and Semi-arid Zone, in which hardly any crop production takes place, was not analyzed.

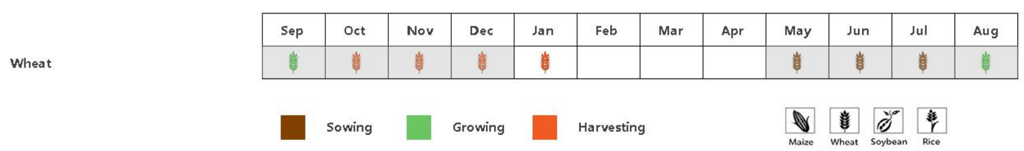
The conditions in the 4 AEZs could be divided into two groups.

Group 1 included Southeastern Wheat Area, Subhumid Subtropical Zone, and Wet Temperate and Subtropical Zone. The 3 zones had similar agro-climatic indicator departures, which were abundant rainfall (+18%, +15%, +18%), cool temperature (-1.5°C, -0.9°C, -0.8 ° C) and less sunshine (-5%, -3%, -5%). The CALF in these 3 zones were above average (+25%, +49%, +5%), with a maximum VCI of 0.65, 0.88 and 0.87, respectively.

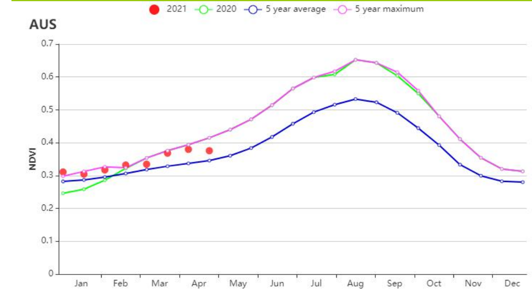
Group 2 only included the Southwestern Wheat Zone. The rainfall increased by 47% to 154 mm, while the temperature was average. The sunshine was below average (-4%) and biomass was above average(+11%). The CALF was slightly above average (+6%), and the VCIx was 0.67.

Overall, the agro-climatic indicators in the reporting period, especially rainfall, predict a favorable prospect for the coming wheat planting season in Australia.

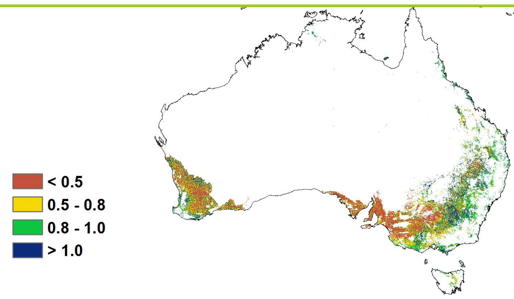
Figure 3.8 Australia crop condition, January - April 2021



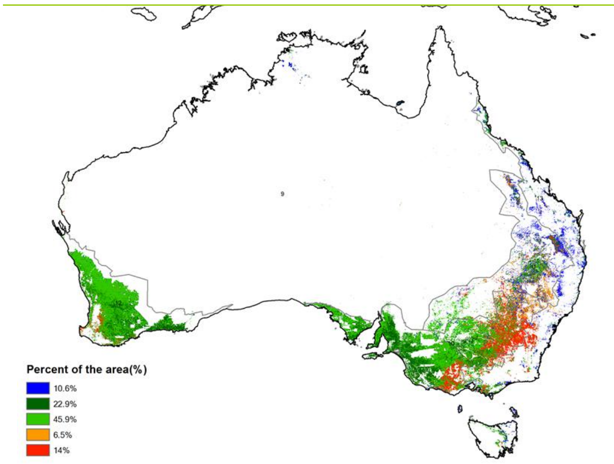
(a). Phenology of major crops



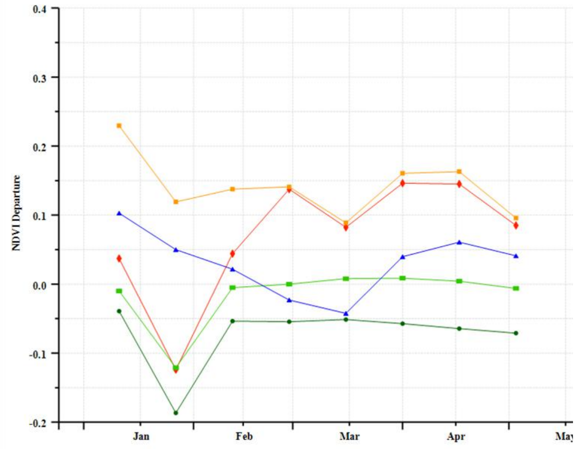
(b) Crop condition development graph based on NDVI



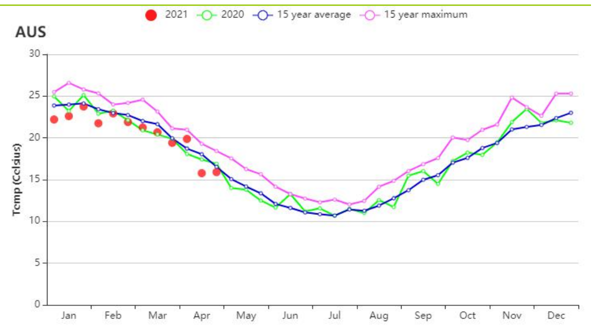
(c) Maximum VCI



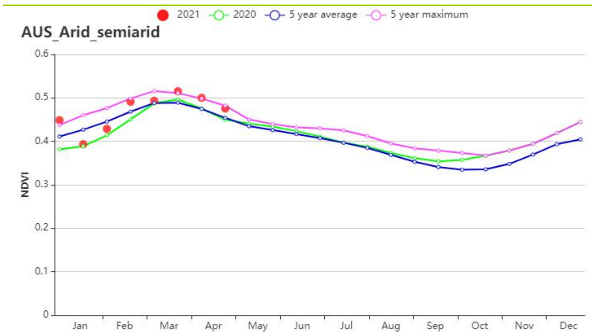
(d) Spatial NDVI patterns compared to 5YA

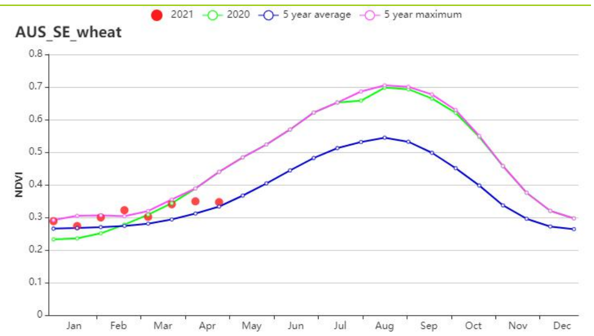


(e) NDVI profiles

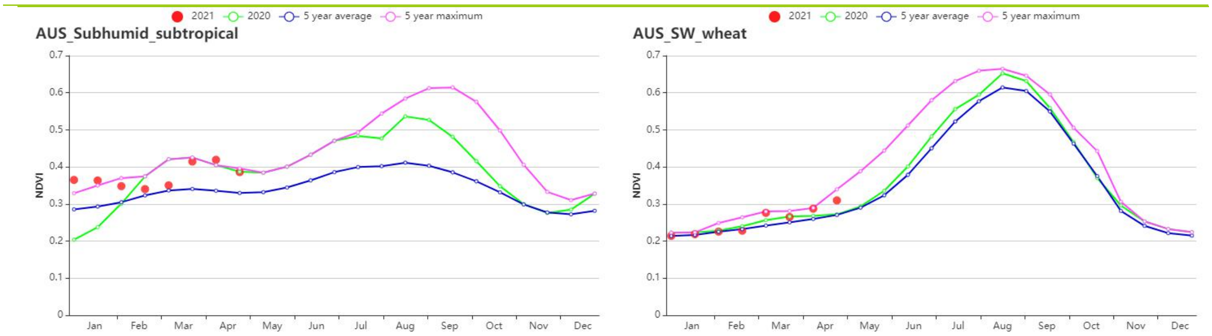


(f) Time series rainfall profile (left) and temperature profile (right))

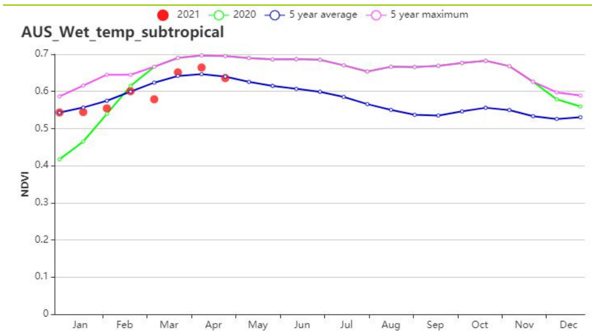




(g) Crop condition development graph based on NDVI (Arid and semiarid zone (left) and Southeastern wheat area (right))



(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 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Arid and semiarid zone	720	-5	25.9	-0.2	1215	-1	941	-3
Southeastern wheat area	180	18	19.5	-1.5	1146	-5	596	0
Subhumid subtropical zone	265	15	22.8	-0.9	1217	-3	769	8
Southwestern wheat area	154	47	21.0	0.0	1191	-4	610	11
Wet temperate and subtropical zone	463	18	18.8	-0.8	1078	-5	865	2

Table 3.8 Australia's agronomic indicators by sub-national regions, current season's values and departure from 5YA, January - April 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Arid and semiarid zone	71	6	0.88
Southeastern wheat area	34	25	0.65
Subhumid subtropical zone	55	49	0.88
Southwestern wheat area	18	6	0.67
Wet temperate and subtropical zone	98	5	0.87

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[BGD] Bangladesh

This report covers the full cycle of dry winter season rice (Boro) and wheat crops, both of which are irrigated. The winter months were much drier than usual. Rainfall was 97% below average over the monitoring period between January and April. The temperature at 24℃ was 0.7℃ above the 15YA. The recorded RADPAR was higher than average by 3%. The severe drought resulted in a sharp decline in biomass (BIOMSS -58%). The drought also caused a slight reduction in CALF to 95% and VCIx was only 0.81. The nationwide NDVI spatial pattern shows that 12.3% of the cultivated area, mainly distributed in the Sylhet basin, was above the 5YA, 41.8% was below and 16.5% was above the 5YA until March. The maximum Vegetation Condition Index (VCIx) map shows that the condition for the winter crops were unfavorable. The national NDVI development curve shows that crop conditions across the country were lower than the 5-year average during the whole monitoring period. Overall, crop conditions in the country were below average, although most rice, wheat and maize production is irrigated.

Regional analysis

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

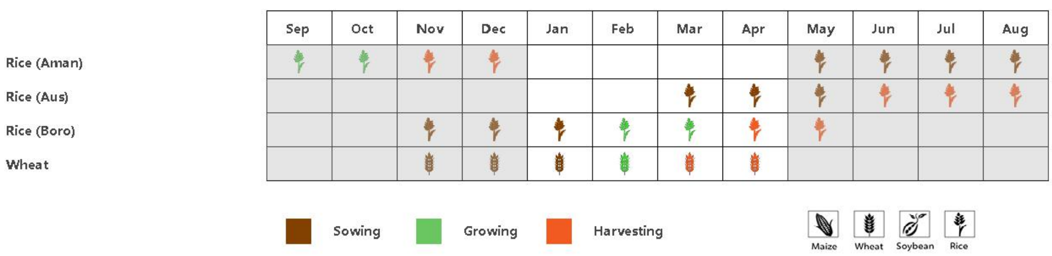
In the **Coastal region**, both RAIN and BIOMSS were below average with significant decrease (-97% and -62%, respectively), TEMP was above average (+0.7 °C) and RADPAR increased by about 1%. The crop condition development graph based on NDVI shows that crop conditions were below 5-year average. CALF was at 84% and VCIx at 0.76. They indicate unfavorable conditions in this region.

The Gangetic plains experienced a large drop in rainfall (-98%). TEMP and RADPAR were above average (+0.5℃ and +4%, respectively). The crop condition development graph based on NDVI shows that crop conditions were significantly lower than the 5-year average during the whole monitoring period except for March, and BIOMSS decreased by 54% due to severe drought. CALF (96%) and VCIx at 0.8 indicate below-average prospects.

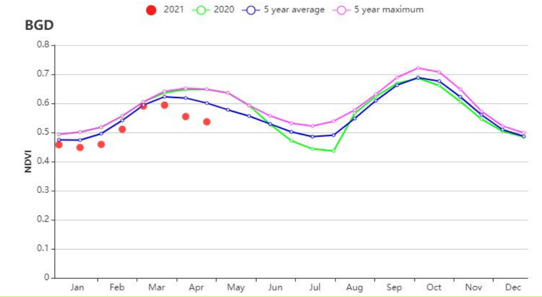
In the **Hills**, rainfall was 98% below average. TEMP was above average (+0.5°C) and RADPAR increased by 1%. The crop condition development graph based on NDVI shows that crop conditions were close to average at early stage of monitoring, and then below average . BIOMSS was below average (-70%) with scarce precipitation, CALF was 93% and VCIx was 0.78, indicating crop conditions was far below average.

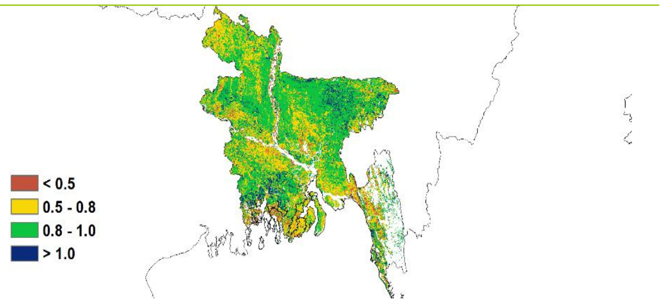
In the **Sylhet Basin**, RAIN was far below average (-96%). TEMP was 0.9℃ above average and RADPAR was 4% above. The crop condition development graph based on NDVI shows that crop conditions were below average from January to April. The BIOMSS was 52% below average, with a low VCIx of 0.85 and CALF at 98%, indicating bad crop conditions.

Figure 3.9 Bangladesh's crop condition, January -April 2021.

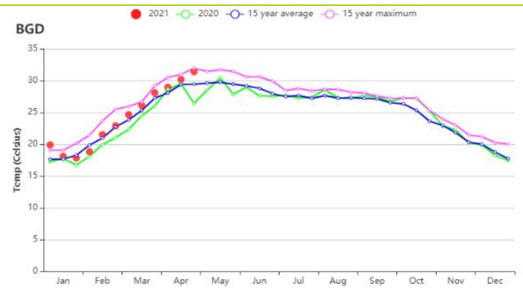


(a). Phenology of major crops

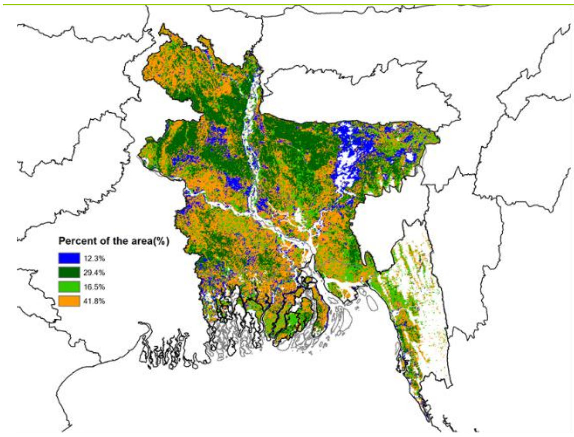


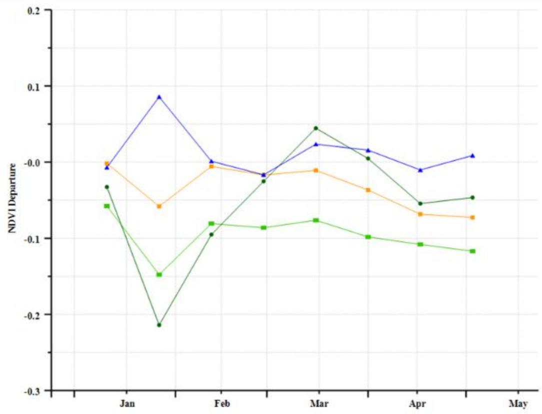


(b) Crop condition development graph based on NDVI (c) Maximum VCI

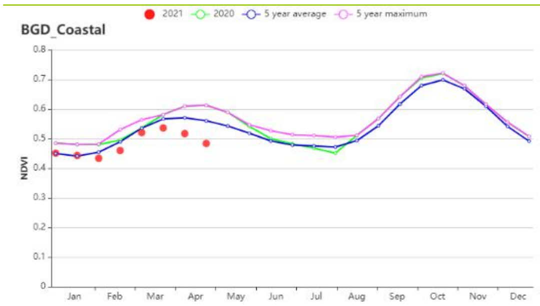


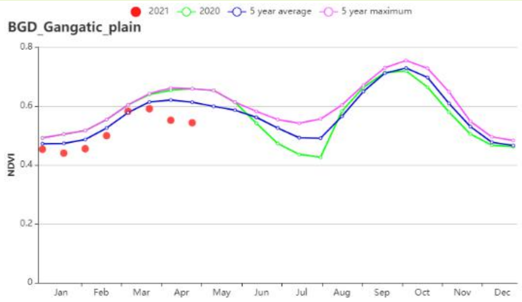
(d) Rainfall Index (e) Temperature Index



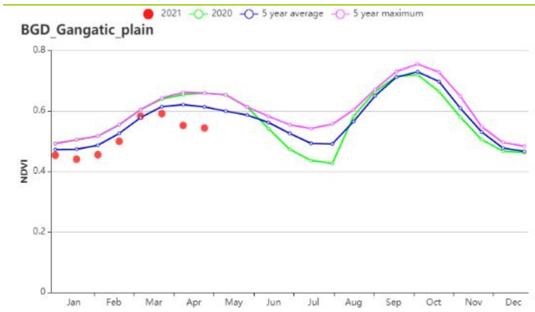


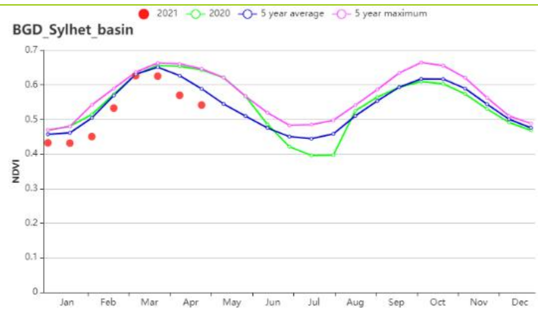
(f) Spatial NDVI patterns compared to 5YA (g) NDVI profiles





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





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

Table 3.9 Bangladesh's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure (°C)	Current (MJ/m2)	Departure from 15YA (%)	Current (gDM/m2)	Departure from 15YA (%)
Coastal region	4	-97	25.2	0.7	1232	1	164	-62
Gangetic plain	2	-98	24.3	0.5	1215	4	197	-54
Hills	3	-98	23.1	0.5	1268	1	135	-70
Sylhet basin	7	-96	23.9	0.9	1206	4	245	-52

Table 3.10 Bangladesh's agronomic indicators by sub-national regions, current season's values and departure from 5YA, January - April 2021

Region	CALF		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current
Coastal region	84	-1	0.76
Gangetic plain	96	-1	0.8
Hills	96	0	0.78
Sylhet basin	98	-1	0.85

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[BLR] Belarus

Winter wheat was the major crop in the field during this monitoring period. The sowing of spring wheat started in March. Rainfall and temperature were above the 15YA (RAIN +5%, TEMP +1.2°C), whereas solar radiation was below average (RADPAR -23%). This resulted in a potential biomass decrease (-11%). Agronomic indicators showed a satisfactory maximum vegetation condition index (VCIx 1.0) while the cropped arable land fraction (CALF) decreased by about 2%. The NDVI profile shows very low values in January and February, presumably due to snow cover. Cooler than normal temperatures slowed the development of the crops in March and April. The spatial patterns of NDVI profiles show that around 88.2% of cropped areas eventually approached the 5-year average levels. Some areas in the southwest and middle west (Gomel and Minsk Oblasts) had a sharp drop in NDVI in April. 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 east. At the end of current monitoring period, winter wheat was in normal conditions.

Regional analysis

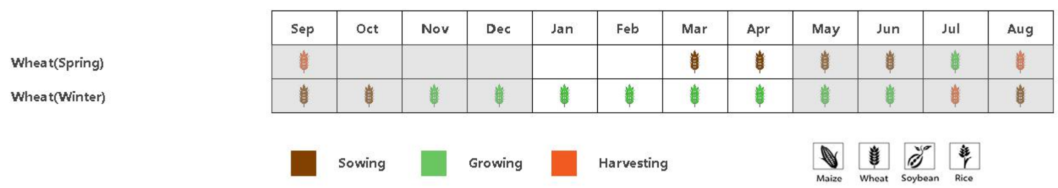
Based on cropping system, climatic zones and topographic conditions, regional analyses are provided for three agro-ecological zones (AEZ): Northern Belarus (028, Vitebsk, northern area of Grodno, Minsk and Mogilev), Central Belarus (027, Grodno, Minsk and Mogilev and Southern Belarus (029) which includes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

Northern Belarus suffered deficit in radiation (-4%), while temperature and rainfall were above average (TEMP +1.3°C, RAIN +3%). This condition resulted in a potential biomass decrease by 12%. Agronomic indicators showed that CALF remained at the 5YA level, while VCIx reached a high value (1.00). Starting from March, the regional NDVI development curve gradually approached the long-term average.

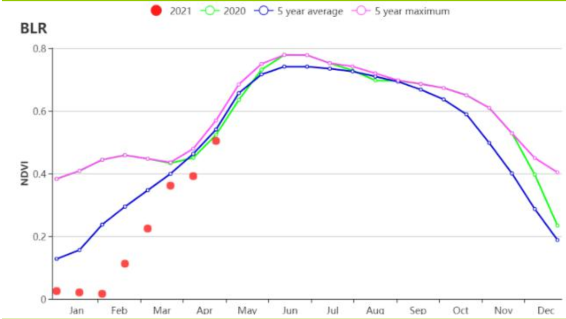
Central Belarus was also affected by low photosynthetically active radiation (25% lower), while temperature and rainfall were above the 15YA (TEMP +1.0°C, RAIN +6%). The VCIx had reached 0.99, and CALF had reached 100%. However, the potential biomass was expected to decrease (-10%). Similar to Northern Belarus, the NDVI growth curve started to improve to close to the average trend in March, but stayed slightly below the 5YA.

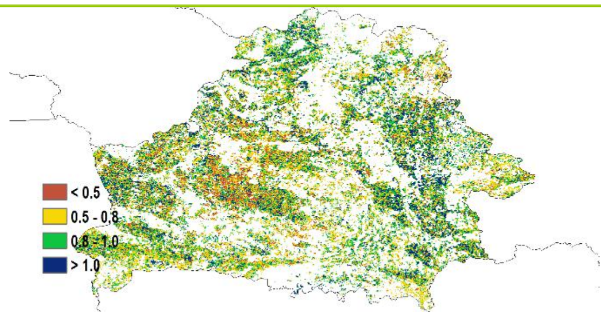
Radiation in **southern Belarus** was significantly lower by 23%, while temperature and rainfall were higher by 1.0℃ and 10%, respectively. Potential biomass was also expected to decrease by 12%. The CALF and the VCIx were 100% and 1.0 respectively.

Figure 3.10 Belarus's crop condition, January - April 2021.

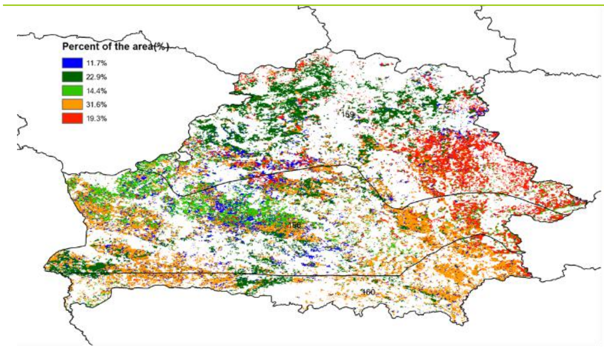


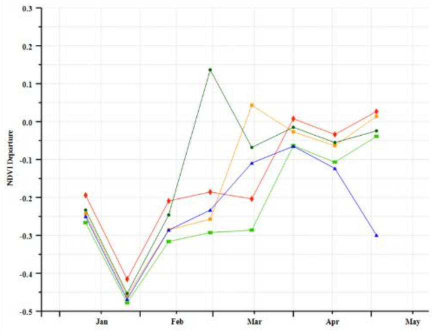
(a). Phenology of major crops



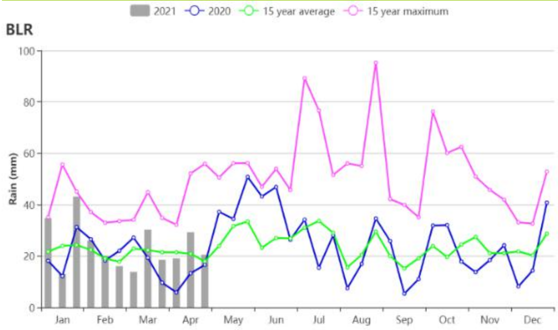


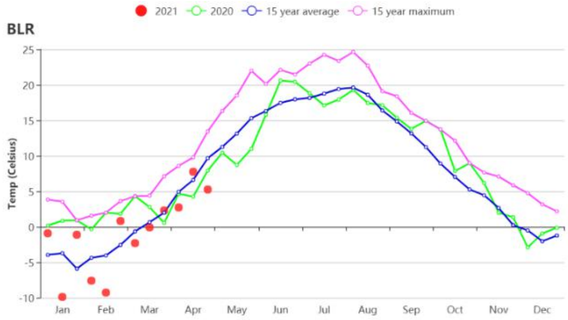
(b) Crop condition development graph based on NDVI (c) Maximum VCI



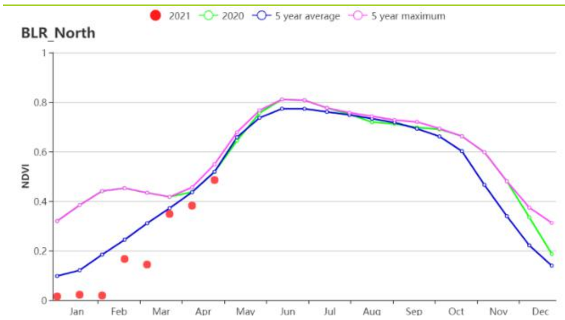


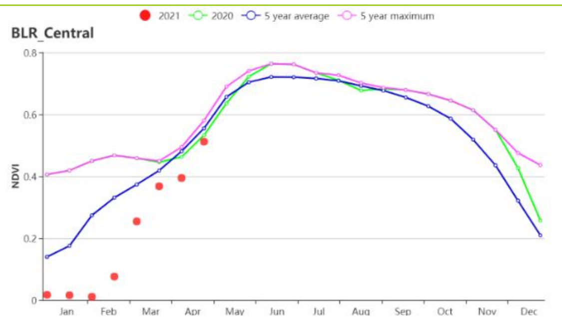
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles





(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 2021.

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Center	292	6	2.3	1.0	127	-25	358	-12
North	296	3	1.5	1.3	117	-20	326	-10
South-west	286	10	2.6	1.0	147	-23	375	-12

Table 3.12 Belarus's agronomic indicators by sub-national regions, current season's values and departure from 5YA, January - April 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Center	100	2	0.99
North	100	0	1.00
South-west	100	3	1.00

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

[BRA] 巴西

During this reporting period, the rice and main season maize in Central and Southern Brazil as well as soybean reached maturity. Their harvest was almost concluded by the end of April. The sowing of rice in the north and northeast and second maize in Central and Southern Brazil started in early January. They will reach maturity in June. The sowing of maize in the northeast and wheat in the south started in April. Generally, crop conditions in Brazil were below average compared to the previous five years.

Prolonged dry and hot weather dominated the monitoring period in Brazil since the start of the summer growing season in October 2020. Agro-climatic indicators present that rainfall dropped by 39% from the 15YA, while temperature was 0.8 ℃ higher. RADPAR remained at average levels. Significanlyt below-average rainfall resulted in a 22% reduction of potential biomass compared with the 15YA. According to the national rainfall profiles, the 10-day accumulations of rainfall were below average throughout the four-month monitoring period, except for mid-January and mid-February when rainfall was close to the 15YA. When looking into sub-national levels, almost all states experienced drier and warmer weather with some exceptions in northwestern Brazil, including Roraima (-1.2 ℃ in TEMP and +44% in RAIN compared with the 15YA), Amazonas (-0.3 ℃ in TEMP and +3% in RAIN), and Rondonia (-0.2 ℃ in TEMP and +5% in RAIN). Twelve out of the 27 states in Brazil received less than half of the normal rainfall which resulted in water deficit for summer crops. Major agricultural producing states including Goias (-80% in RAIN compared with the 15YA), Sao Paulo (-74%), Mato Grosso Do Sul (-69%), Ceara (-61%) and Minas Gerais (-55%) are among those states suffering from the largest water deficits. The unfavorable dry and hot weather resulted in generally below average BIOMSS in most states except for Para and Maranhao, with 2% and 3% higher than average BIOMSS, respectively. The largest drop in BIOMSS from 15YA were observed in Mato Grosso Do Sul, Goias, Santa Catarina, Acre, Sao Paulo, and Parana with 15%, 14%, 14%, 13%, 12%, and 12% lower than the 15YA BIOMSS, respectively. The BIOMSS departure map also presents the overall below-average situation across Brazil except for the northern parts.

The crop condition development graph based on NDVI for Brazil presents below-average values throughout the reporting period mainly because of prolonged dry weather in most of Brazil. According to the NDVI departure clustering map and profiles, most cropland showed below-average conditions, starting in mid-February. Average crop conditions were mostly located in northern and southern part of Parana Basin, Southern subtropical rangelands, and the east coast. Crops in Mato Gross, Mato Grosso Do Sul, Parana, Sao Paulo, and Santa Catarina presented below-average crop conditions as affected by the continuous low rainfall and severe drought. The NDVI anomaly map during early to mid-March also confirmed the below average crop conditions over those states. According to the bar graph drought proportions, the percentages of cropland suffering from moderate to severe drought showed an increasing trend from January - April 2021, indicating that the drought situations were becoming more severe. Although VCIx map showed overall high values across the country, the insufficient water supply after the flowering stage (the peak growing season) will negatively affect grain-filling and reduce crop yield.

All in all, crop conditions in Brazil were below average and CropWatch estimates unfavorable outputs for summer crops.

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.

Seven zones received below-average rainfall while rainfall in Southern subtropical rangelands was 1% above the 15YA. Among the seven zones with low rainfall, six of them including Amazonas, Central Savanna, Northeastern mixed forest and farmland, Mato Grosso, Nordeste, and Parana Basin suffered persistent dry conditions since the last reporting period. The dry situation negatively impacted the crop development and resulted in below-average crop conditions. However, the main limiting factors varied from region to region. As indicated by the NDVI and rainfall profiles, crop conditions in Northeastern mixed forest and farmland, and Nordeste were all below average throughout the monitoring period mainly due to the prolonged dry weather and the resulting drought. Nordeste received the least rainfall among the AEZs with only 171 mm, down by 60% from the 15YA. Accordingly, the VCIx value in Nordeste zone also ranked as the lowest among AEZs.

Central Savanna, and Parana Basin are the two AEZs with largest temperature and rainfall anomalies, at 1.6 ℃ and 1.3 ℃ above-average in temperature and 62% and 63% below-average in rainfall, respectively. The hot weather further accelerated the loss of soil moisture and enhanced the severity of drought. As a result, the negative NDVI departures from the 5YA increase, especially in March. The BIOMSS departures in the two AEZs were also the largest two among all the AEZs, confirming the unfavorable climatic conditions for the crops.

Amazonas received the largest rainfall during the monitoring period with 1169 mm, but it was still 13% below the 15YA.

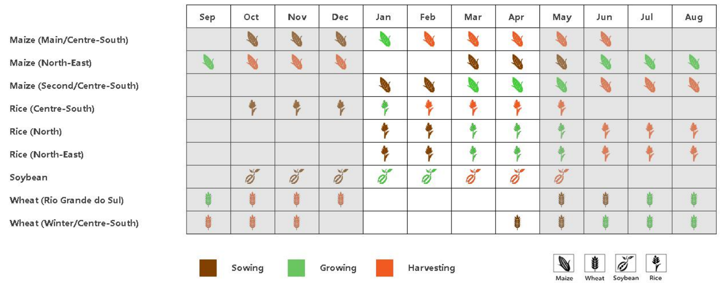
Although the coast zone received average rainfall in the previous monitoring period, the low rainfall especially in March to early April did not meet the high water demand in the grain-filling stage and resulted in unfavorable crop conditions. The insufficient rainfall is projected to have negative impacts on the yield of summer crops.

Rainfall in Mato Grosso varied from month to month during the monitoring period. The most significant drop in rainfall compared with the 15YA occurred in early January, late January and early February. The negative departures in those periods resulted in delayed sowing of second maize as well as the emergence and early development. Thus, crop conditions were significantly below average from mid-February to early April and recovered to close to average level in late April. In general, the impact of dry weather is limited to the first season maize but might reduce yield for the second season maize as well.

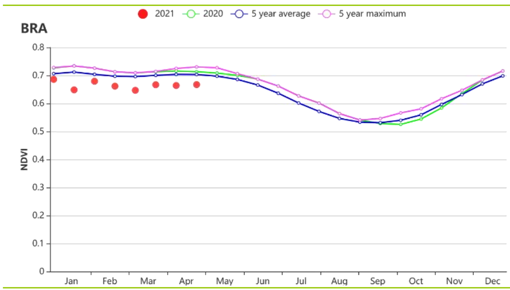
Normal agro-climatic conditions in Southern subtropical rangelands resulted in above-average crop conditions as indicated by the NDVI based crop development profiles. Rainfall was 1% above the 15YA with significantly above-average rainfall in late January to mid-February and late March, which provide favorable soil moisture for crop development. Crop conditions in the zone were above the 5YA and reached the 5-year maximum values in February during the peak growing stage. Summer crops outputs for the zone are expected to be above average level.

Although adverse conditions dominated most AEZs, CALF was at or above average level, indicating limited effects from unfavorable weather during the sowing period. VCIx values were mostly higher than 0.90 except for Nordeste zone. However, below average rainfall and high temperature could impede the grain-filling period.

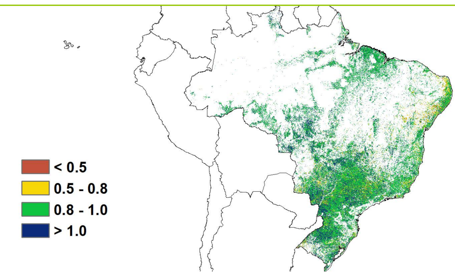
Figure 3.11 Brazil's crop condition, January - April 2021



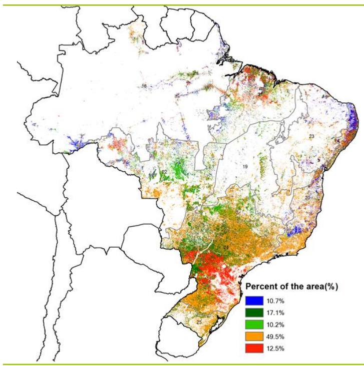
(a) Phenology of major crops

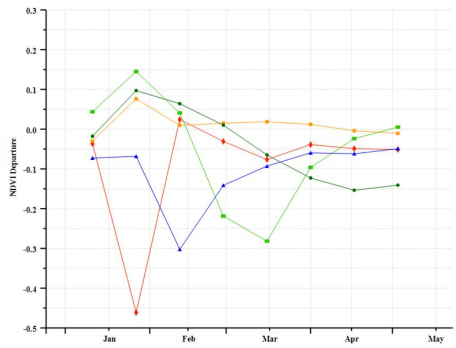


(b) Crop condition development graph based on NDVI

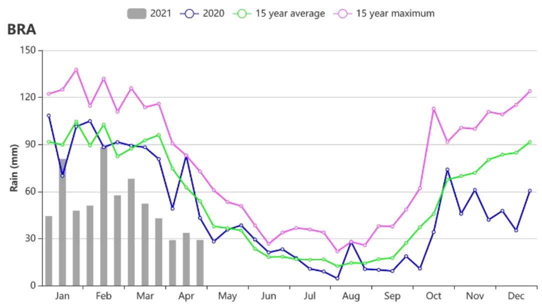


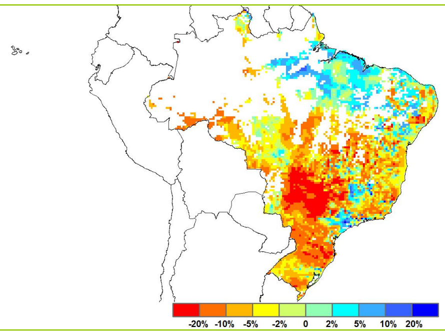
(c) Maximum VCI





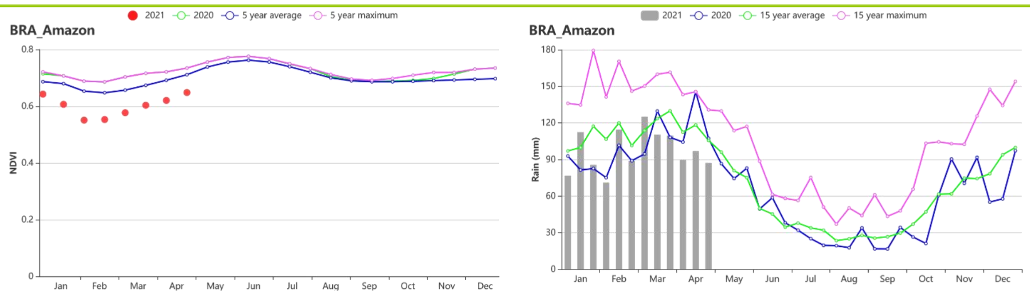
(d) Spatial distribution of NDVI departure from 5YA (e) NDVI departure profiles corresponding to the spatial pattern



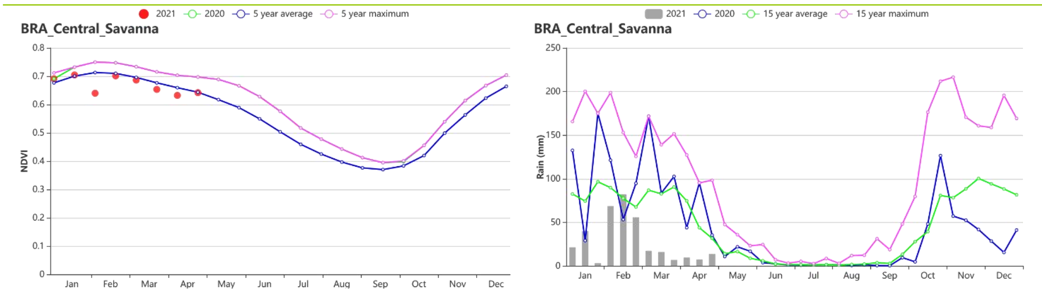


(f) Rainfall profiles

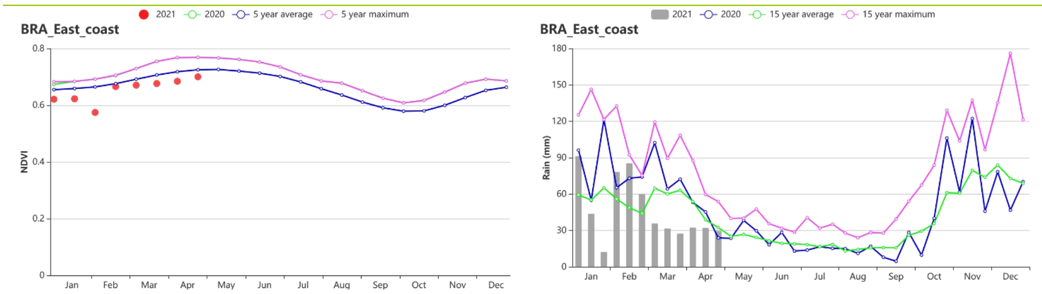
(g) BIOMSS departure from 15YA



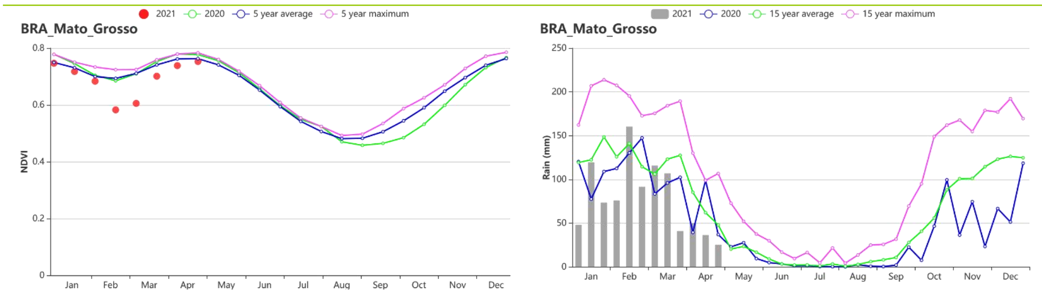
(h) Crop condition development graph based on NDVI (left) and time series rainfall profile (right) of Amazonas



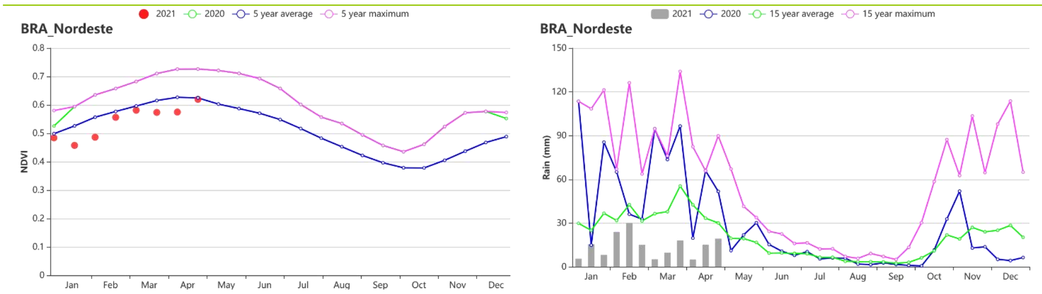
(i) Crop condition development graph based on NDVI (left) and time series rainfall profile (right) of Central Savanna



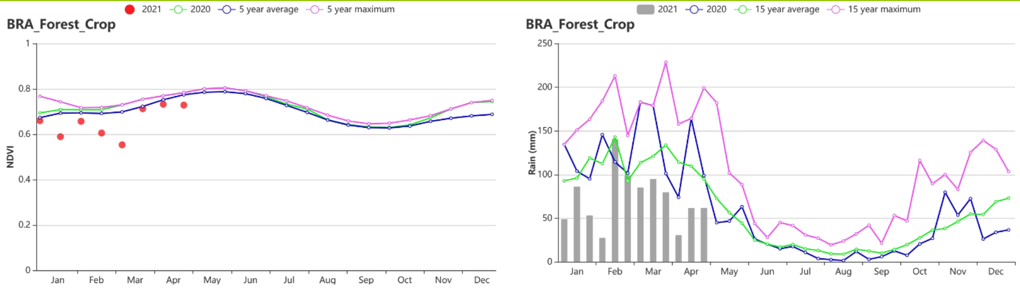
(j) Crop condition development graph based on NDVI (left) and time series rainfall profile (right) of East Coast



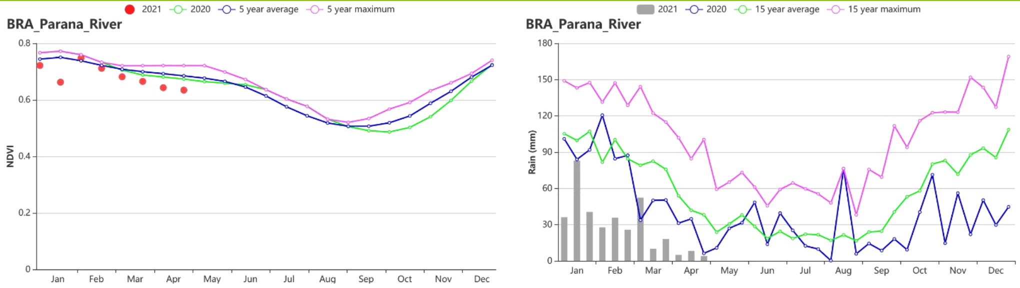
(k) Crop condition development graph based on NDVI (left) and time series rainfall profile (right) of Mato Grosso Zone



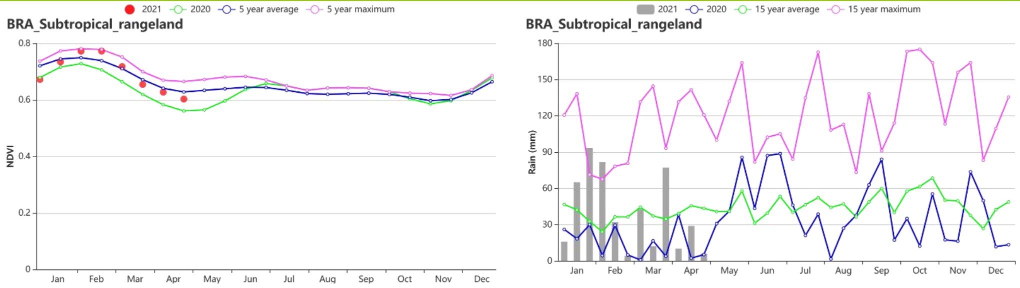
(L) Crop condition development graph based on NDVI (left) and time series rainfall profile (right) of Nordeste



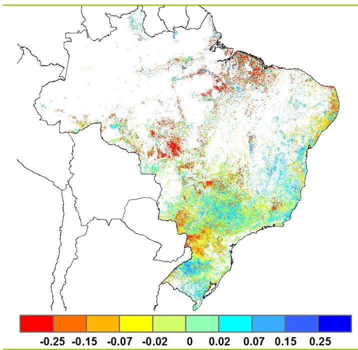
(m) Crop development graph based on NDVI (left) and time series rainfall profile (right) of Northeastern mixed forest and farmland

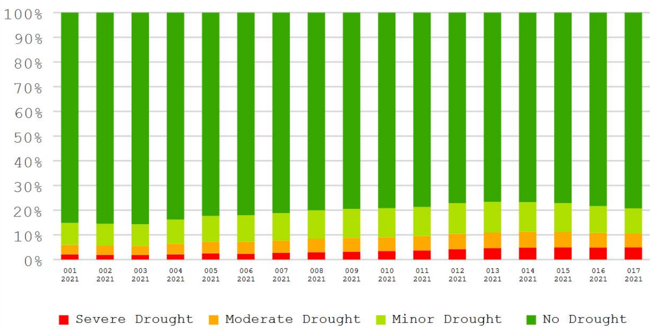


(n) Crop condition development graph based on NDVI (left) and time series rainfall profile (right) of Parana river basin



(o) Crop condition development graph based on NDVI (left) and time series rainfall profile (right) of Subtropical Rangelands





(p) NDVI anomaly compared with 5YA from 6 March to 21 March, 2021 (q) Proportion of drought categories from January - April 202

Table 3.13 Brazil's agroclimatic indicators by AEZs, current values and departure from 15YA, January - April, 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m2)	Departure (%)	Current (gDM/m2)	Departure (%)
Amazonas	1169	-13	24.9	-0.1	1068	0	1491	0
Central Savanna	343	-62	24.9	1.6	1218	-1	907	-33
East Coast	560	-13	23.1	-0.1	1255	2	1089	-8
Northeastern mixed forest and farmland	869	-35	25.5	0.6	1173	3	1480	-8
Mato Grosso	943	-29	24.8	0.6	1068	-3	1280	-16
Nordeste	171	-60	26.3	0.7	1255	0	719	-29
Parana basin	348	-63	23.4	1.3	1197	2	837	-40

Southern subtropical rangelands	471	1	22.4	-0.1	1143	-3	1035	-2

Table 3.14 Brazil's agronomic indicators by AEZs, current values and departure from 5YA, January - April, 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	**Departure (%)**	**Current**
Amazonas	100	1	0.96
Central Savanna	100	0	0.93
East Coast	99	0	0.90
Northeastern mixed forest and farmland	100	0	0.95
Mato Grosso	100	0	0.97
Nordeste	96	3	0.85
Parana basin	100	0	0.94
Southern subtropical rangelands	100	0	0.95

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[CAN] Canada

Winter wheat is the only crop that was grown in Canada during this monitoring period. It accounts for about 10% of Canadian wheat production. It is mainly grown in Ontario and Quebec, followed by Saskatchewan, Alberta and Manitoba provinces. In general, below-average precipitation and above-average temperatures occurred in Ontario, Quebec, Manitoba and Saskatchewan. According to CropWatch Agroclimatic indicators, the precipitation was below the recent 15-year average by 13% over the whole country, while temperatures were above average by 1.3 ℃ . Radiation was below average by 2%. Above-average temperature resulted in a slight increase of potential biomass. Overall, the winter wheat conditions were above the 5-year average. Precipitation in April was near normal, which would provide good conditions for the sowing and establishment of the summer crops.

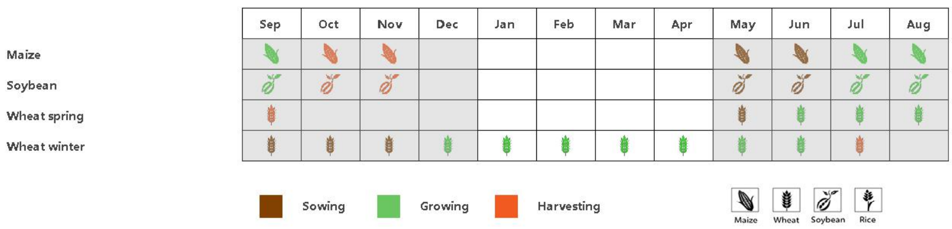
Regional analysis

The **Prairies** (area identified as 30 in the NDVI clustering map) and **Saint Lawrence basin** (26, covering Ontario and Quebec) are the major agricultural regions.

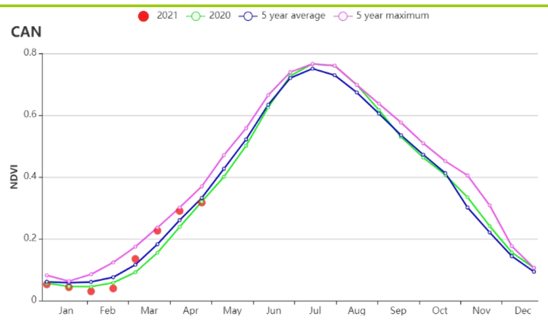
In the **Prairies**, precipitation was significantly below average (RAIN -13%), while the temperature were higher than the 15-year average (TEMP +1.0℃) accompanied by average radiation (RADPAR 0%). As a result, all of these indicators led to a slight increase of potential biomass (BIOMSS +3%). At the same time, the Cropped Arable Land Fraction fell to 3%, which was below the 5YA by -57%. VCIx was 0.67. The crop condition development graph based on NDVI fluctuated around the average level.

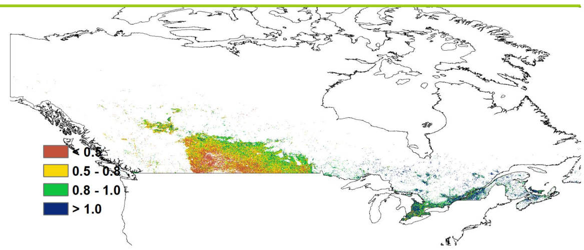
In the **Saint Lawrence basin,** the main winter wheat production area in Canada, the precipitation and radiation were below the 15-year average (RAIN -16%; RADPAR -5%), and the temperatures were significantly above average (TEMP +1.7 ℃). The above-average temperature had accelerated the green-up of winter wheat, which resulted in an increased CALF and better-than-average crop conditions. The Cropped Arable Land Fraction increased significantly to 74%, which was above the 5YA by 48%. The VCIx was 1.18, which indicates that the crop conditions were above the 5YA. Therefore, prospects are favorable for winter wheat in this region.

Figure 3.12 Canada's crop condition, January - April 2021

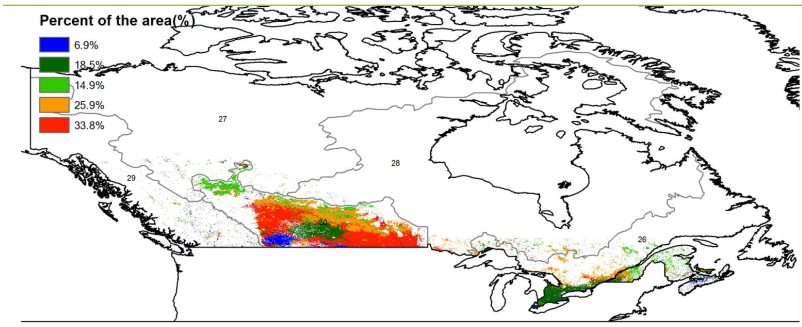


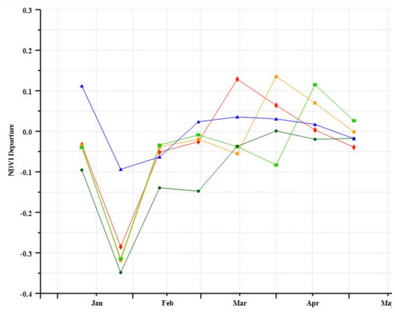
(a) Phenology of major crops



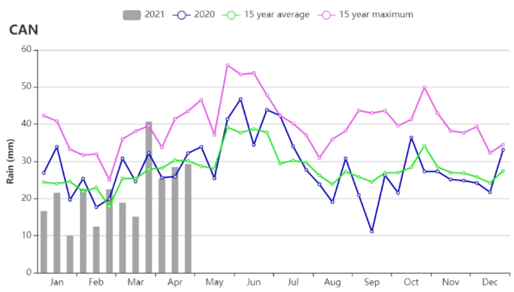


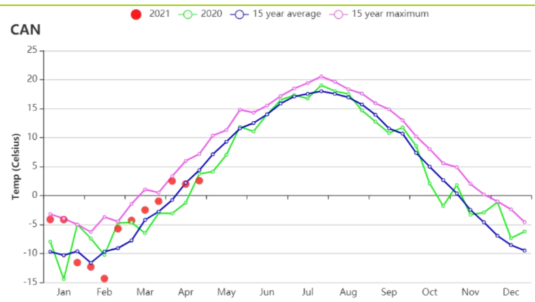
(b) Crop condition development graph based on NDVI (c) Maximum VCI



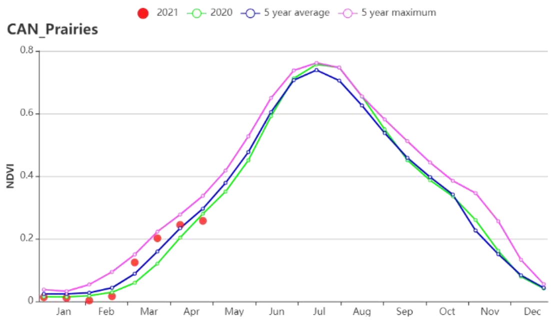


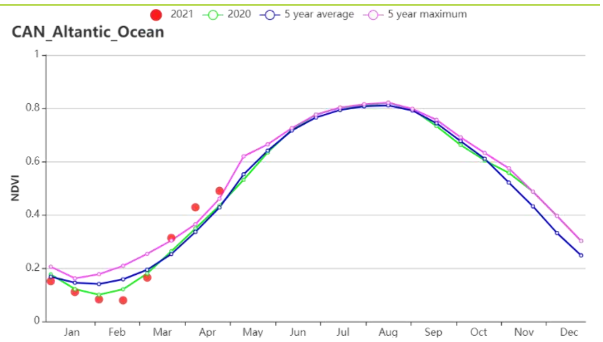
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles





(f) Rainfall profiles (g) Temperature profiles





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

Table 3.15 Canda's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Saint Lawrence	355	-16	-2.9	1.7	555	-5	300	12

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
basin								
Prairies	160	-13	-4.6	1.0	577	0	277	3

Table 3.16 Canada's agronomic indicators by sub-national regions, current season's values and departure from 5YA, January - April 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Saint Lawrence basin	74	48	1.18
Prairies	3	-57	0.67

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[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 near average in most regions based on the agroclimatic and agronomic indicators.

At the national level, total precipitation and solar radiation were above average (RAIN, +5%; RADPAR, +0.9%), whereas temperatures were below average (TEMP, -0.9°C). High rainfall occurred from mid-January to early February and in mid-March, whereas negative rainfall departures were observed from mid-February to early March and in late-March. Most of the country experienced cooler-than-usual conditions during this reporting period, except for late-February and late-March. Due to cooler-than-normal temperatures, the biomass production potential (BIOMSS) is estimated to decrease 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 below average due snow cover in January. These observations are confirmed by the clustered NDVI profiles: 54.6% of regional NDVI values were below average in late January, and 91.9% of the area dropped to below average in early February. Overall VCIx for Germany was 0.84. CALF during the reporting period was 1% below the recent five-year average.

Generally, the agronomic indicators show that the crops developed more slowly than usual, due to below-average temperatures. But prospects for crop production are favorable.

Regional analysis

Based on cropping systems, climatic zones and topographic conditions, six sub-national agro-ecological regions are adopted for Germany. They include: the Wheat zone of Schleswig-Holstein and the Baltic coast, Mixed wheat and sugar beets zone of the North-west, Central wheat zone of Saxony and Thuringia, Sparse crop area of the east-German lake and Heathland area, Western sparse crop area of the Rhenish massif and the Bavarian Plateau.

Schleswig-Holstein and the Baltic Coast are among the major winter wheat zones of Germany. The region experienced cooler weather (TEMP, -0.6°C), below-average radiation (RADPAR, -1%) and rainfall (RAIN -13%). As a result, BIOMSS is expected to decrease by 6% as compared to the average. As shown in the crop condition development graph (NDVI), the values were significantly below average in the first part of this monitoring period, and then improved to close to average from late February to late April. The area has a high CALF (99%) as well as a favorable VCIx (0.86), indicating a highly cropped area.

Wheat and sugarbeets are the major crops in the **Mixed Wheat and Sugarbeet Zone of the Northwest.** According to the CropWatch agroclimatic indicators, temperature was below average (TEMP -0.8°C), while rainfall and radiation were both above average (RAIN +5%; RADPAR +11%), which led to a decrease in BIOMSS by 7%. As shown in the crop condition development graph based on NDVI, the values were significantly below average in early January and early February, and then near average from late February to late April. The area has a high CALF (99%) and crop conditions for the region are favorable according to the high VCIx (0.88).

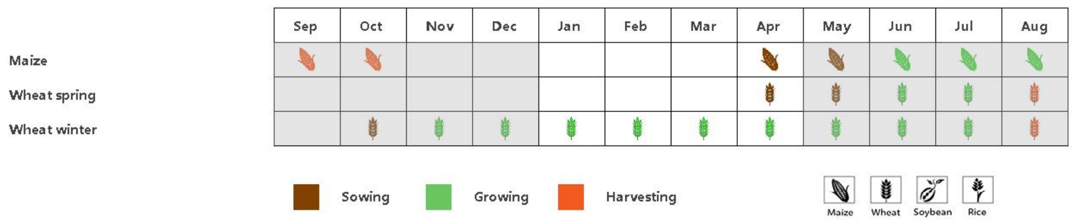
Central Wheat Zone of Saxony and Thuringia is another major winter wheat zone. RAIN was above average (+9%) , but TEMP and RADPAR were below average (-1.2℃ and -2% respectively) . Mostly due to cooler-than-normal temperatures and less sunshine, the biomass potential (BIOMSS) decreased by 8% as compared to the 15YA. As shown in the crop condition development graph based on NDVI, the values were significantly below average in the first part of this monitoring period, and remained below average from late February to late April. The area has a high CALF (99%) and the VCIx was 0.85 for this region.

Average to above-average precipitation was recorded in the **East-German Lake and Heathland Sparse Crop Area** (RAIN +7%). TEMP and RADPAR were below average (-1.2 ℃ and -5%). The biomass potential (BIOMSS) decreased by 10% as compared to the 15YA. As shown in the crop condition development graph based on NDVI, the values were significantly below average in the first part of this monitoring period, and remained below average from late February to late April. The area has a high CALF (98%) and the VCIx was 0.82 for this region.

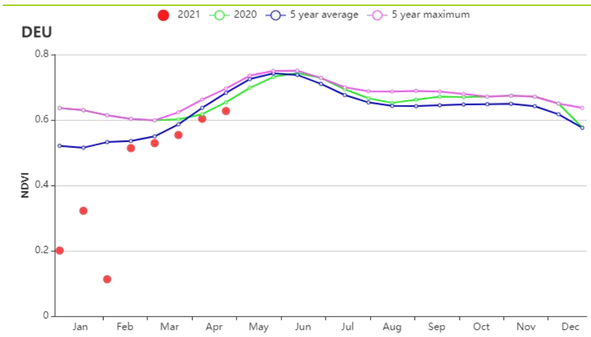
Crop conditions were also unfavorable in the **Western Sparse Crop Area of the Rhenish Massif**. Average to above-average precipitation was recorded in this region (RAIN +6%), with below-average temperature (TEMP -0.8°C) and above-average solar radiation (RADPAR +2%). The biomass potential (BIOMSS) decreased by 6% compared to the 15YA. As shown in the crop condition development graph based on NDVI, the values were significantly below average in the first part of this monitoring period, and stayed below average from late February to late April. The VCIx values was 0.81 for the western areas. The CALF was 99% for the regions.

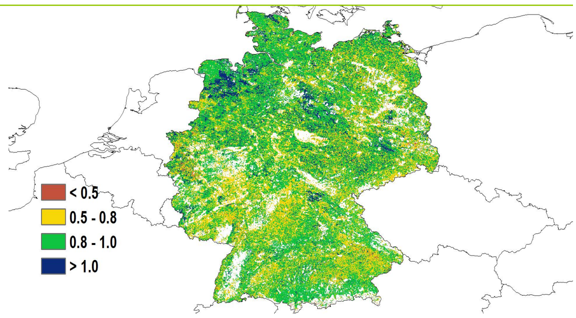
On average, almost normal rainfall was recorded for the **Bavarian Plateau** (RAIN -4%), with below-average temperature (-0.9°C) and above-average radiation (RADPAR +5%). Compared to the five-year average, BIOMSS decreased by 9%. The area had a high CALF (97%) as well as a favorable VCIx (0.82). As shown in the crop condition development graph based on NDVI, the values were significantly below average in the first part of this monitoring period, and remained below average from late February to late April.

Figure 3.13 Germany's crop condition, January-April 2021

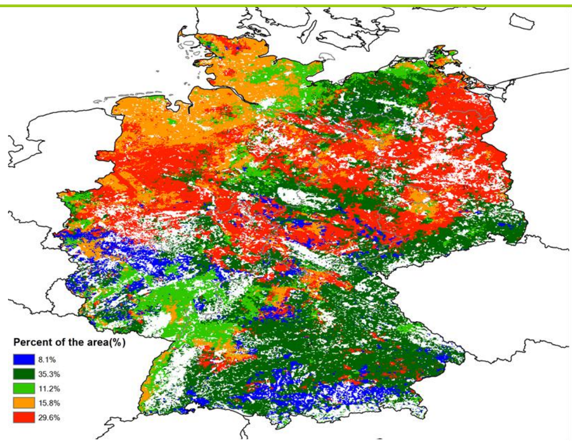


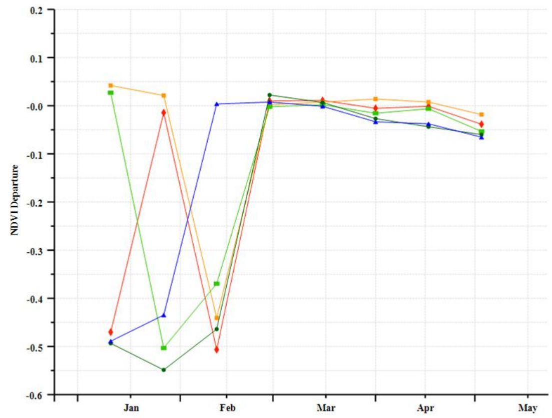
(a) Phenology of major crops





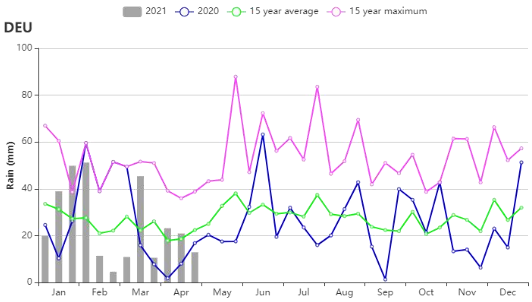
(b) Crop condition development graph based on NDVI (c) Maximum VCI

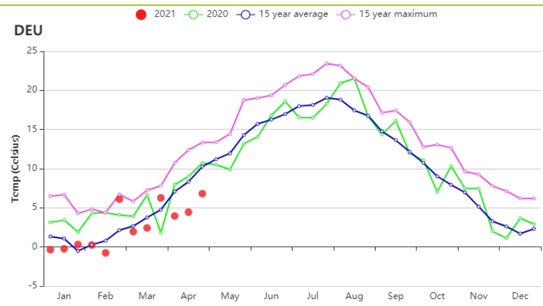




(d) Spatial NDVI patterns compared to 5YA

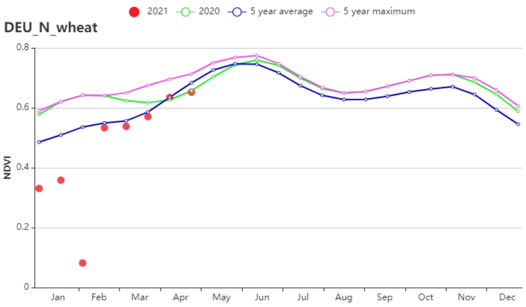
(e) NDVI profiles

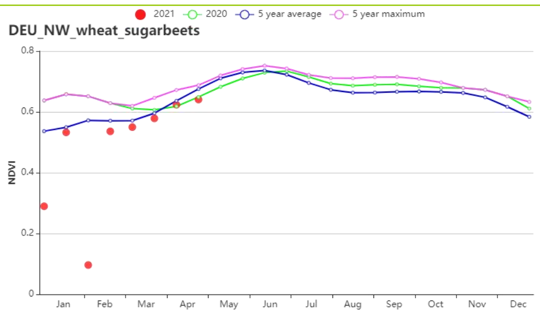




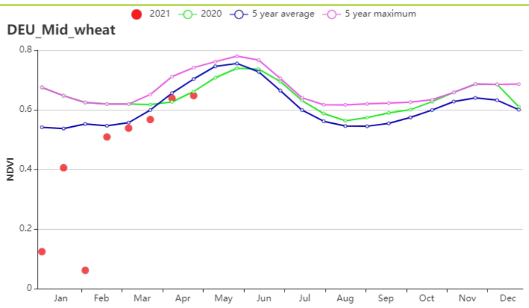
(f) Rainfall profiles

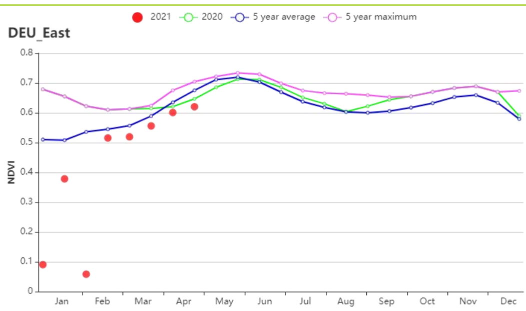
(g) Temperature profiles



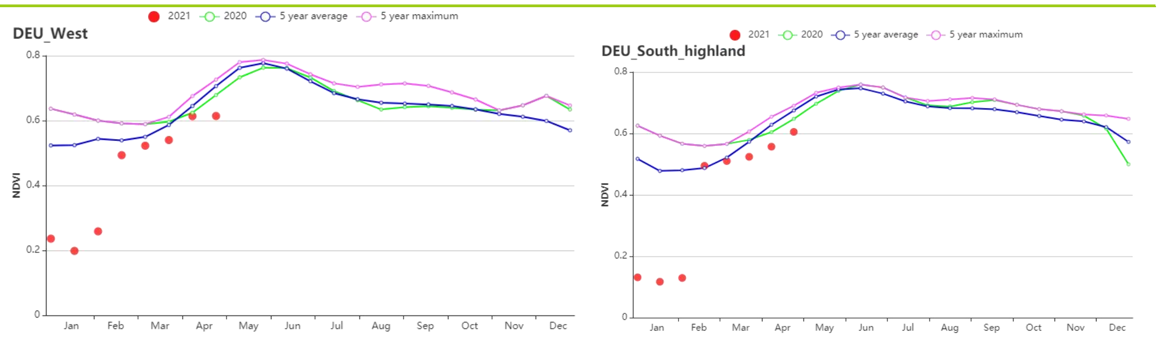


(h) Crop condition development graph based on NDVI (Wheat zone of Schleswig-Holstein and the Baltic coast (left) and Mixed wheat a sugar beets zone of the north-west(right))





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



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

Table 3.17 Germany agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 2021

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 (%)
Wheat zone of Schleswig-Holstein and the Baltic coast	234	-13	3.3	-0.6	458	-1	481	-6
Mixed wheat and sugarbeets zone of the north-west	298	5	3.5	-0.8	482	0	492	-7
Central wheat zone of Saxony and Thuringia	266	9	2.1	-1.2	501	-2	445	-8
East-German lake and Heathland sparse crop area	264	7	2.1	-1.2	474	-5	444	-10
Western sparse crop area of the Rhenish massif	294	6	2.9	-0.8	525	2	472	-6
Bavarian Plateau	348	-4	1.7	-0.9	597	5	436	-9

Table 3.18 Germany's agronomic indicators by sub-national regions, current season's value and departure from 5YA, January - April 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current
Wheat zone of Schleswig-Holstein and the Baltic coast	99	-1	0.86
Mixed wheat and sugarbeets zone of the north-west	99	0	0.88
Central wheat zone of Saxony and Thuringia	99	-1	0.85
East-German lake and Heathland sparse crop area	98	-1	0.82
Western sparse crop area of the Rhenish massif	99	-1	0.81
Bavarian Plateau	97	-2	0.82

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

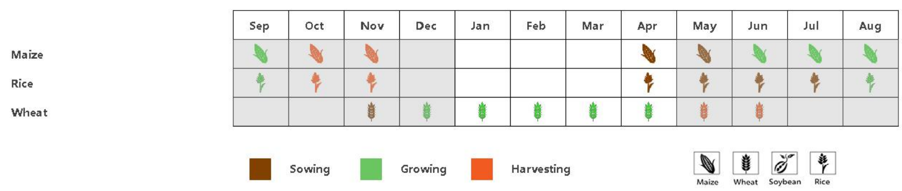
[EGY] Egypt

This report covers the main growing season of winter wheat and the sowing of maize and rice. The CropWatch agro-climatic indicators show that the recorded rainfall was 38 mm, which is 27% less than the average of the last 15-years (15YA). The rainfall index graph shows that most of the rainfall fell during January and February. The average temperature was at 15.8°C, 0.3 ℃ higher than the 15YA. It was warmer than usual in January and February. Both RADPAR and BIOMSS were lower than the 15YA, by 0.2% and 25%, respectively. The reduction in estimated BIOMSS was presumably due to a decrease in rainfall. The nationwide NDVI development graph shows that the crops conditions were initially above the 5-year average (5YA) and then dropped below the 5YA in March. The NDVI profile map indicates that about 8.8% of cultivated area was above the 5YA, 63.2% was above the 5YA during January and February and then dropped to near to the 5YA, 21.8% was below the 5YA except for the beginning of January, and 6.2% was below the 5YA throughout the reporting period. The VCIx map indicates that the crop conditions were generally favorable. This finding agrees with the country's VCIx value at 0.81, and the CALF exceeded the 5YA by 3%. Crop conditions for Egypt were average.

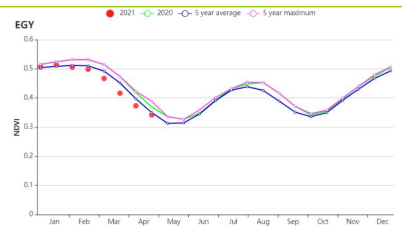
Regional Analysis

Based on the cropping systems, climatic zones, and topographic conditions, Egypt is subdivided into three agro-ecological zones (AEZ). Only two are relevant for crops: **the Nile Delta and the Mediterranean coastal strip**, and **the Nile Valley**. In the Nile Delta and Mediterranean coastal strip, the average rainfall was 40 mm, which was 25% below the average; in the Nile Valley zone, it was 6 mm only, which was 62% below the 15YA. The temperature for both zones was near the 15YA. In Egypt, most of the crops are irrigated, so rainfall has little impact on crop production. RADPAR deviated by only about -1% and +1% compared to the 15YA for the first and second zone, respectively. The NDVI-based crop condition development graphs show similar conditions for both zones following the national crop development NDVI graph. The CALF exceeded the 5YA by 3% for both zones; the VCIx was 0.84 and 0.86 for the first and second zone, respectively, indicating good crop conditions.

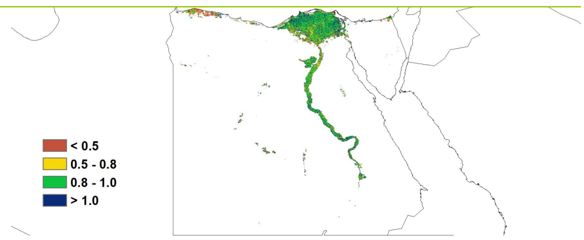
Figure 3.14 Egypt's crop condition, January-April 2021



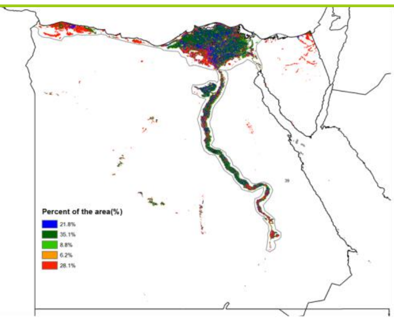
(a) Phenology of major crops

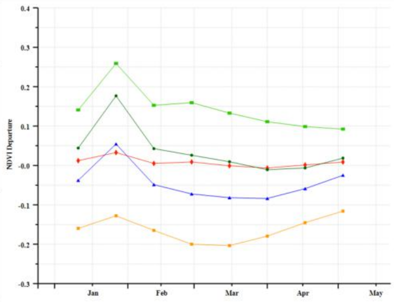


(b) Crop condition development graph based on NDVI

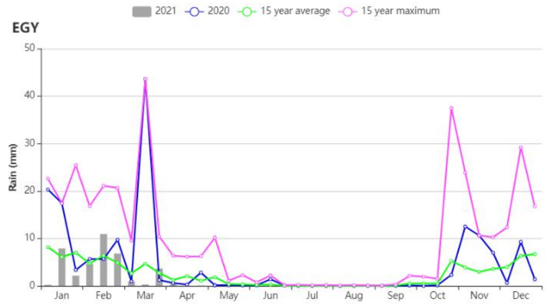


(c) Maximum VCI

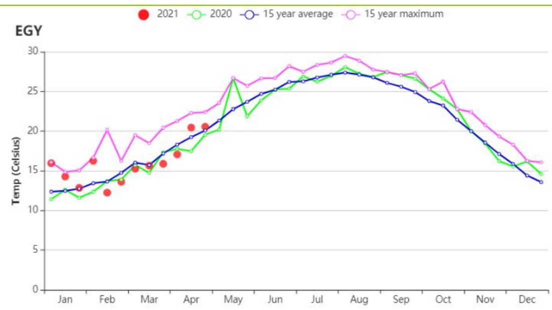




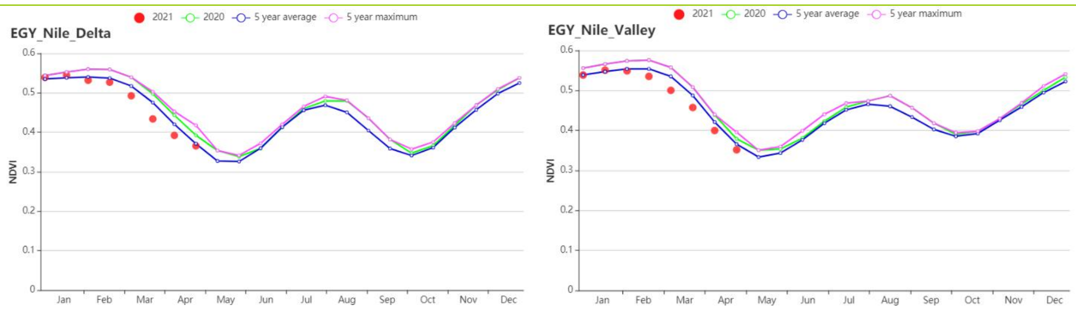
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



(f) Rainfall profiles



(g) Temperature profiles



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

Table 3.19 Egypt's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January-April 2021

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	40	-25	15.8	0.3	1000	-1	241	-18
Nile Valley	6	-62	16.5	0.3	1115	1	55	-48

Table 3.20 Egypt's agronomic indicators by sub-national regions, current season's values and departure from 5YA, January-April 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Nile Delta and Mediterranean coastal strip	71	3	0.84
Nile Valley	81	3	0.86

[ETH] Ethiopia

In January, the harvest of last year's crops was completed. The locust plague had negatively affected the last season crops as shown in figure (k). In March and April, the planting of maize started. However, significant rainfall started in late April only. Rainfall had dropped by 16% from 15YA, while temperature and solar radiation were slightly below the 15YA. They had decreased by 0.4 ℃ and 2%, respectively. Below-average rainfall resulted in a 20% reduction of potential biomass compared with the 15YA. The drought occurred mainly in the southern and Great Rift Valley regions: In the South-eastern mixed maize zone rainfall was 34% below average. Sufficient rainfall was observed for the northern and western regions. The increase in precipitation for the Western mixed maize zone was 12%.

The crop condition development graph based on NDVI for Ethiopia presented below-average values in March and April mainly because of dry weather in the southern and Great Rift Valley regions of Ethiopia, due to the late sowing of maize. The NDVI departure clustering maps showed a negative departure in the south, whereas conditions in the north were above average. The average Maximum VCI for Ethiopia was 0.67. The Maximum VCI graph showed the same pattern as the NDVI departure clustering map. The cropped arable land fraction decreased by 21% compared to the 5YA. This was due to poor soil moisture conditions. In brief, land preparation and the sowing of maize had been negatively affected by below average rainfall, especially in the south and east of the country.

Regional analysis

The main rain-fed cereal producing areas include the Southeastern mixed-maize zone, Western mixed maize zone, and the Central-northern maize-teff highlands zone, except **the Semi-arid pastoral areas**.

In **the Semi-arid pastoral areas**, a typical livestock production zone, the rainfall was below average (-9%). Temperature and solar radiation were close to the average (TEMP -0.2°C, RADPAR +1%), and the biomass dropped by 33%. At the same time, the NDVI values were below average in March and April. The VCIx was 0.43. Compared with the 5YA, the CALF had decreased by 35%. Overall, the prospects for livestock production were slightly unfavorable.

A similar pattern was observed for **the Southeastern Mendebo highlands zone**, which is a major maize and teff producing area. During the reporting period, the rainfall in the region was below average (-34%). Both the temperature and solar radiation were slightly lower than average (TEMP -0.4°C, RADPAR -3%). And the biomass was lower than the 15YA (-25%). The CALF decreased by 24%, and the VCIx was 0.59. The NDV-based crop condition development graph shows that NDVI was slightly below the 5YA. In general, the conditions for the sowing of maize in the Southeastern Mendebo highlands were unfavorable until mid-April.

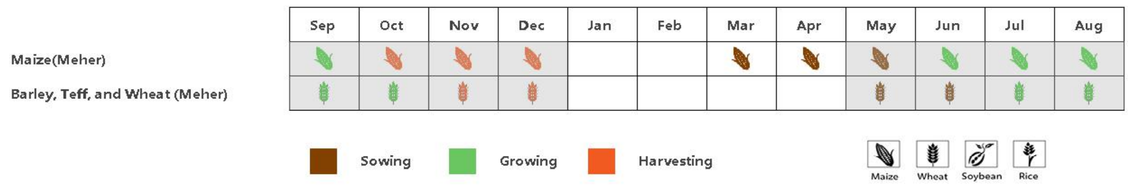
In **South-eastern mixed maize zone**, the average rainfall was 34% lower than the 15YA. The temperature and solar radiation were nearly constant. Because of lower precipitation, the biomass was below average (-34%). The NDVI-based crop condition development graph was below the 5-year average, the VCIx was 0.56, and the CALF had increased by 33%. The crop growing conditions in this area were not satisfactory.

In **the Western mixed maize zone**, maize is the most important crop grown during the Mether season. This region had received above-average rainfall (RAIN +12%). In combination with lower temperature (-0.4°C) and solar radiation (RADPAR -5%), the estimate for biomass decreased by 3% from the 15YA.

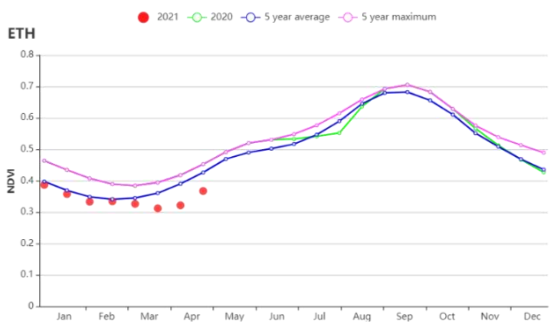
The VCIx was 0.80, and the CALF was kept unchanged. According to CropWatch indicators, crop conditions were favorable.

The Central-northern maize-teff highlands zone is an important maize and teff producing area in Ethiopia. Precipitation (-5%), temperature (-0.5°C) and RADPAR (-2%) were slightly below average. The estimated biomass decreased by 16%, and the VCIx was 0.67. CALF had a 32% reduction. All in all, the prospects for maize crops were normal for this region.

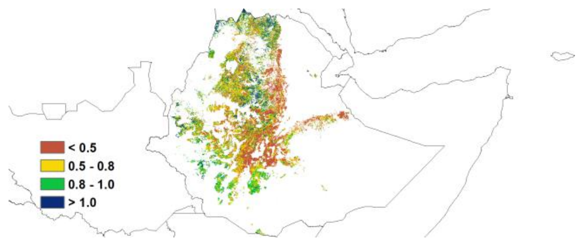
Figure 3.15 Ethiopia's crop condition, January - April 2021



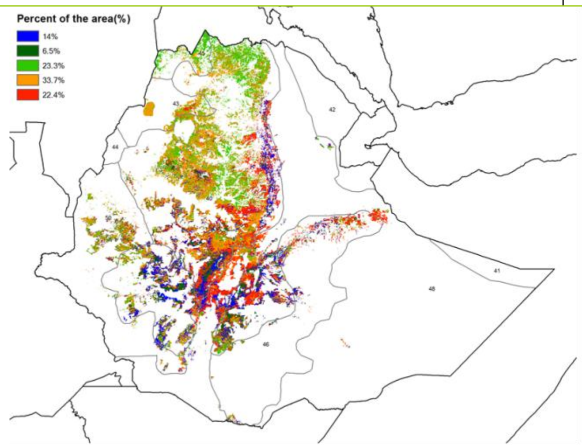
(a) Phenology of major crops

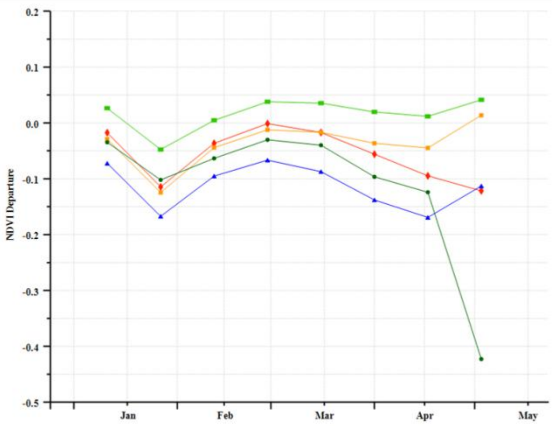


(b) Crop condition development graph based on NDVI



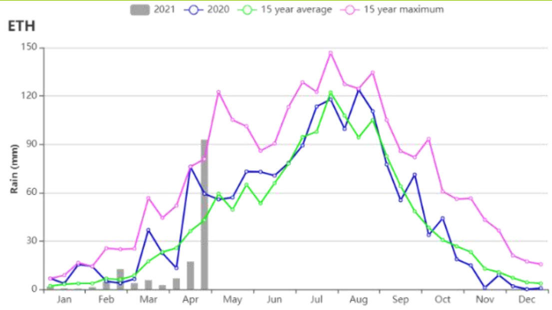
(c) Maximum VCI



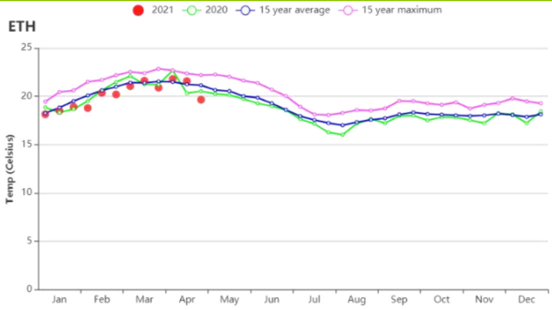


(d) Spatial NDVI patterns compared to 5YA

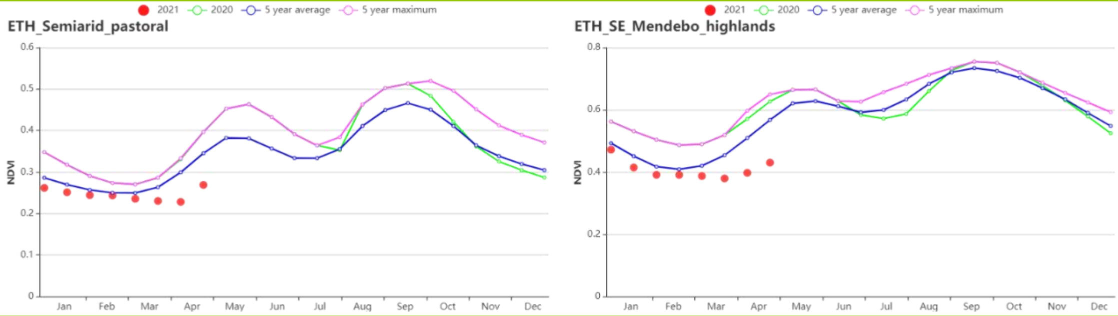
(e) NDVI profiles



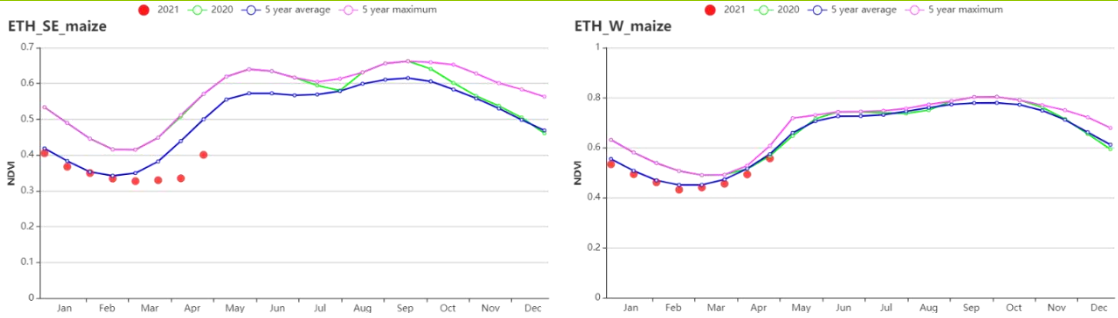
(f) Rainfall profiles



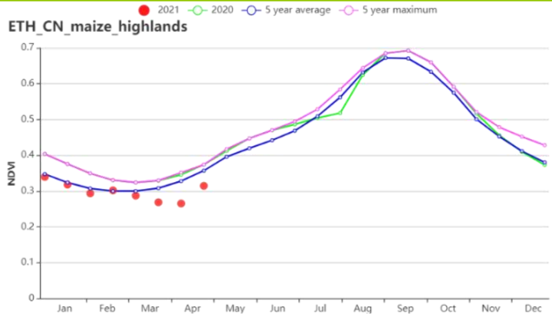
(g) Temperature profiles



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



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



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

(k)Cropped arable land after locust plague

Table 3.21 Ethiopia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m2)	Departure (%)	Current (gDM/m2)	Departure (%)
Semi-arid pastoral areas	140	-9	21.1	-0.2	1399	1	354	-33
South-eastern Mendebo highlands	145	-34	15.9	-0.4	1314	-3	374	-25
South-eastern mixed maize zone	161	-34	19.2	-0.1	1318	1	359	-34
Western mixed maize zone	213	12	24.2	-0.4	1239	-5	499	-3
Central-northern maize-teff highlands	114	-5	19.2	-0.5	1381	-2	332	-16

Table 3.22 Ethiopia's agronomic indicators by sub-national regions, current season's values and departure from 5YA, January - April 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Semi-arid pastoral areas	14	-35	0.43
South-eastern Mendebo highlands	58	-24	0.59
South-eastern mixed maize zone	46	-33	0.56
Western mixed maize zone	94	-1	0.80
Central-northern maize-teff highlands	22	-32	0.67

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

[FRA] France

This report covers the growing period of winter wheat, as well as the sowing of spring wheat and maize in France. CropWatch agro-climatic indicators show that the temperature was slightly below the average (TEMP, -0.1°C). RAIN was 19% lower than average and sunshine was above average (RADPAR, +6%). Due to unfavorable precipitation conditions but suitable temperature and sunshine, the biomass production potential (BIOMSS) is estimated to have decreased by 6% nationwide compared to the 15-year average. The national-scale NDVI development graph shows that the NDVI values were generally lower than in the 2019-2020 season and the 5YA. The crop conditions were close to the 5-year average in March only. This is also partly reflected by the spatial distribution of maximum VCI (VCIx) across the country, which reached an average of 0.81. Overall, below average rainfall starting in February caused slightly unfavorable growth conditions for most of France.

Regional analysis

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

In the Northern barley region, RAIN and TEMP were both below average (-12% and -0.6℃ respectively), while RADPAR was above average (+9%). The BIOMSS also decreased by 5% when compared to the past 15 YA. The CALF was lower than the average (-1%), and VCIx was 0.81. Crop condition development based on NDVI for this region was below the 5-year average.

In the Mixed maize/barley and rapeseed zone from the Center to the Atlantic Ocean, a cooler (TEMP -0.1°C) and drier (RAIN -28%) season was observed, with higher RADPAR (+7%). For the crops, BIOMSS was 14% lower than average, CALF was at the average level and VCIx was 0.82. The regional NDVI profile presented an overall lower but close-to-average trend, except for a drop in early February, which might have been due to snow.

In the Maize-barley and livestock zone along the English Channel, RAIN and TEMP were below average by 32% and 0.5°C. RADPAR was higher than the average (11%). BIOMSS decreased by 12%. CALF was average and VCIx was relatively high at 0.88. The regional NDVI profile also presented an overall lower-than-average trend and also a drop in early February.

In the Rapeseed zone of eastern France, the NDVI profile also indicated below-average conditions and a drop in late January and early February. Overall, RAIN in this period dropped by 9% from the average levels, while TEMP decreased by 0.2℃ and RADPAR increased by 8%. BIOMSS was about 2% lower than average while CALF was at the average level, and VCIx was 0.83.

In the Massif Central dry zone, TEMP and RADPAR were 0.1 ℃ and 6% higher than the average, respectively, while RAIN decreased by 17%. The VCIx was 0.84 and BIOMSS increased by 1% which indicated a below-average cropping season in the region. Crop conditions based on the NDVI profile were also showing below-average levels.

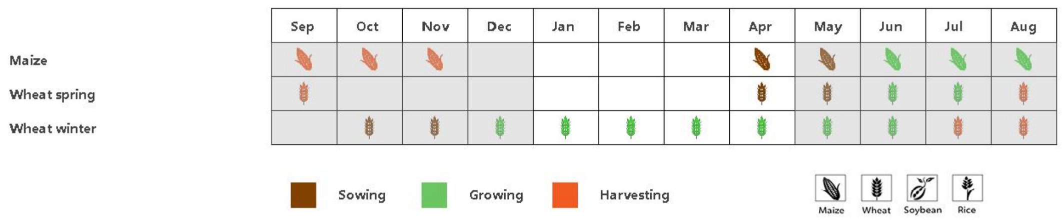
The Southwestern maize zone is one of the major irrigated regions in France. The regional NDVI profile presented an overall close-to-average trend. RAIN in the period was 23% lower than average, while

TEMP was 0.3 ℃ higher. RADPAR slightly increased by 3%. Neither BIOMSS (-6%) nor CALF showed significant changes. The VCIx was recorded at 0.79, all indicating average to slightly below-average crop conditions.

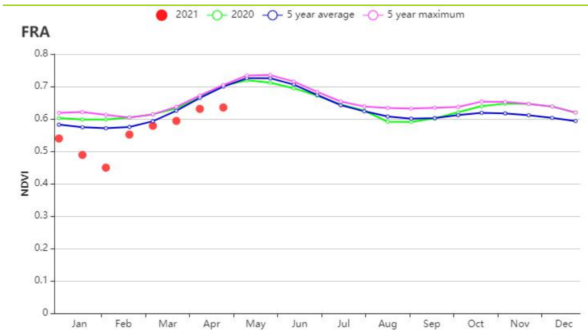
In the Eastern Alpes region, the NDVI profile presented an overall close-to-average trend, especially starting in late February. RAIN in the region was 9% lower than average, while TEMP was at the average level and RADPAR was 5% higher than the 15YA. BIOMSS was 2% lower than the fifteen-year average. VCIx for the region was recorded at 0.73 and CALF was slightly lower than average (-1%), indicating overall average crop conditions.

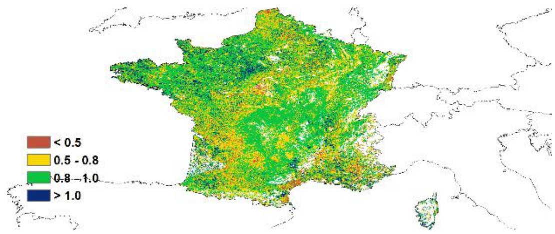
The Mediterranean zone also presented an overall lower NDVI profile especially in January and February. The region recorded a low VCIx (0.77). RAIN, TEMP, and RADPAR were all lower than average (-20%, -0.1 °C, and -1%, respectively). BIOMSS and CALF decreased by 6% and 2%. This region is showing below average crop conditions.

Figure 3.16 France's crop condition, January - April 2021

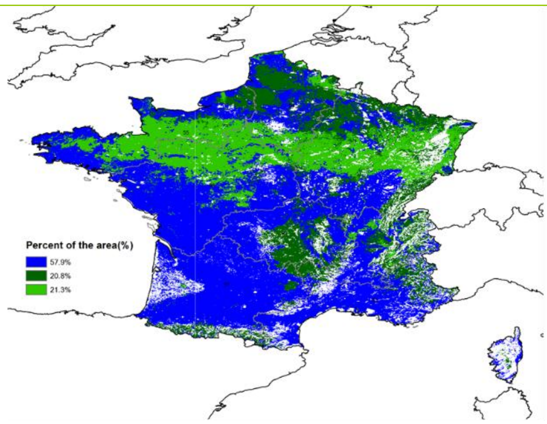


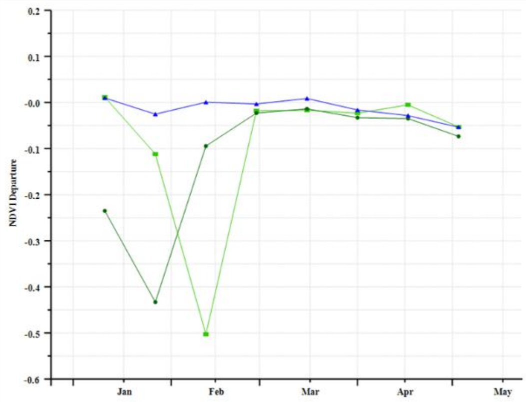
(a) Phenology of major crops



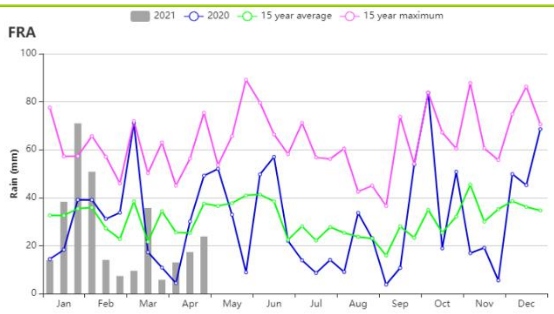


(b) Crop condition development graph based on NDVI (c) Maximum VCI



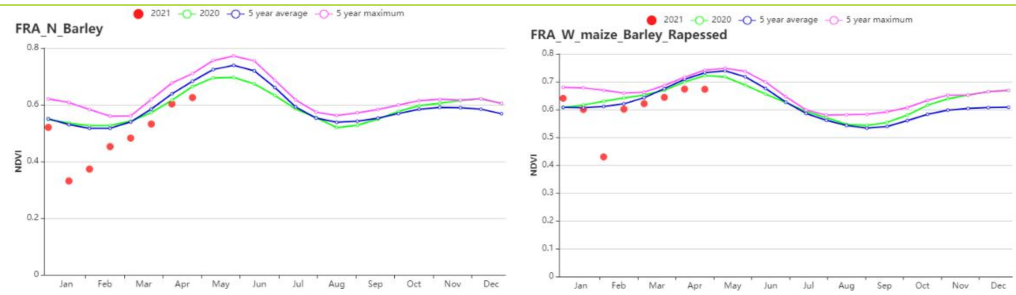


(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles

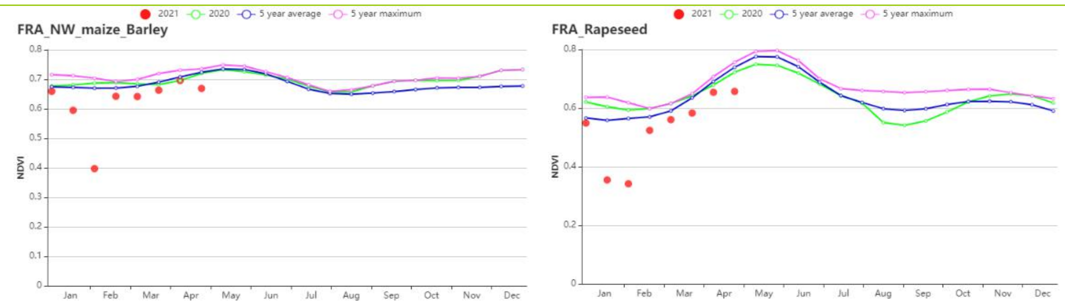


(f) Rainfall profiles

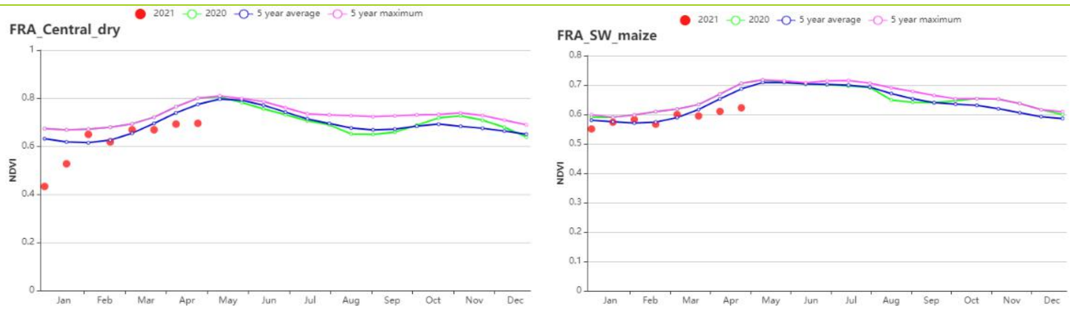
(g) Temperature profiles



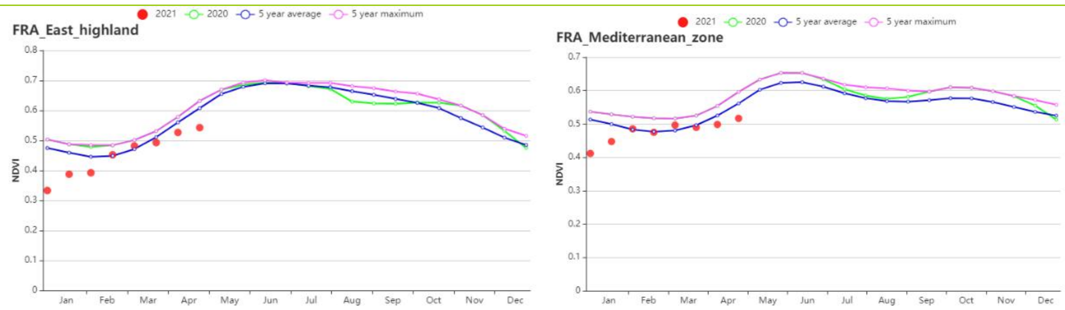
(h) Crop condition development graph based on NDVI (Northern barley region (left) and Mixed maize, Barley and Rapeseed zone (right



(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 2021

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	255	-12	5.3	-0.6	578	9	552	-5
Mixed maize/barley and rapessed zone from the Centre to the Atlantic Ocean	233	-28	6.9	-0.1	629	7	540	-14
Maize barley and livestock zone along the English Channel	227	-32	6.5	-0.5	608	11	549	-12
Rapeseed zone of eastern France	334	-9	4.5	-0.2	610	8	543	-2
Massif Central Dry zone	310	-17	4.9	0.1	651	6	560	1
Southwest maize zone	347	-23	6.8	0.3	672	3	584	-6
Alpes region	403	-9	3.2	0.0	697	5	478	-2
Mediterranean zone	285	-20	5.3	-0.1	721	-1	494	-6

Table 3.24 France's agronomic indicators by sub-national regions, current season's values and departure from 5YA, January - April 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Northern Barley zone	99	-1	0.81
Mixed maize/barley and rapessed zone from the Centre to the Atlantic Ocean	100	0	0.82
Maize barley and livestock zone along the English Channel	100	0	0.88
Rapeseed zone of eastern France	99	0	0.83
Massif Central Dry zone	100	0	0.84
Southwest maize zone	98	0	0.79
Alpes region	86	-1	0.73
Mediterranean zone	87	-2	0.77

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[GBR] 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. Rainfall (RAIN, -2%) was slightly below average, temperatures was below average (TEMP, -0.7°C), and radiation was above average (RADPAR, +8%). The comprehensive impact of agroclimatic conditions resulted in decreasedd biomass (BIOMSS, -3%). The seasonal RAIN profile presents that rainfall from mid-January to mid-February was above average, and exceeded the 15-year maximum in mid-January. However, rainfall in April was far below the 15YA. The temperature was below or close to average for most parts of the period.

The national average VCIx was 0.79. CALF (98%) was unchanged compared to its five-year average. The NDVI departure cluster profiles indicate that: (1) 50.9% of arable land, mainly in the south of the United Kingdom, experienced average or slightly below-average crop conditions. (2) 19.4% of arable land experienced significantly below-average crop conditions in early January and subsequently recovered to average crop conditions. It covered mainly Southeast England (West Sussex, East Sussex, Kent). (3) 29.8% of arable land experienced fluctuating below-average crop conditions before February, then recovered to average crop conditions in late February, mainly in East of England (Norfolk, Suffolk) and scattered around Scotland.

Altogether, the conditions for wheat in the UK are assessed to be slightly below average, mainly due to a rainfall deficit in April.

Regional analysis

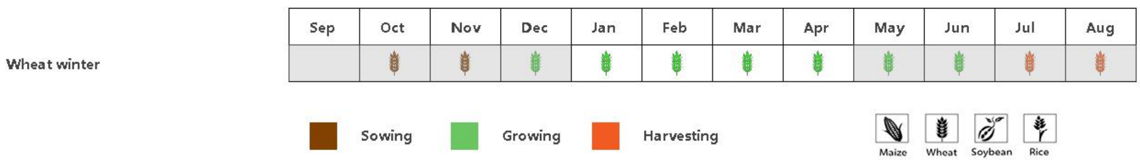
Based on cropping systems, climatic zones and topographic conditions, three sub-national regions can be distinguished: 1) **Central sparse crop region**, 2) **Northern barley region**, and 3) **Southern mixed wheat and barley region**. The fractions of cropped arable land (CALF) in all subregions are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

The **Central sparse crop region** is one of the major agricultural regions in terms of crop production. Radiation was significantly above average (RADPAR +9%), rainfall was slightly above average (RAIN +3%), and temperature was below average (TEMP -0.5°C). Above-average radiation resulted in below-average biomass （BIOMSS, -3%). NDVI values were below average according to the region's crop condition development graph in this reporting period. The VCIx was at 0.82. Altogether, the conditions for wheat are expected to be below average.

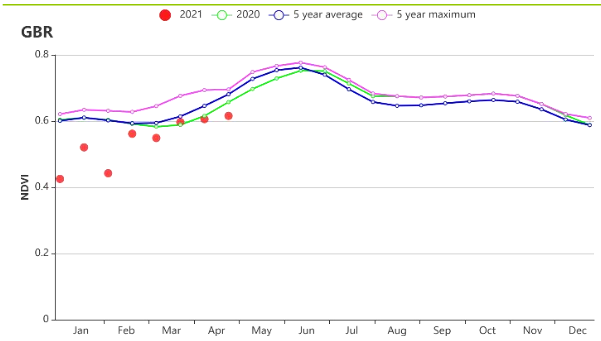
Northern barley region experienced below-average rain and temperature (RAIN -6%; TEMP, -0.7°C). Radiation was significantly above average (RADPAR, +8%). Biomass was below average (BIOMSS, -4%). NDVI was below or near average according to the crop condition graphs in this reporting period. The VCIx was 0.82. Altogether, the output of wheat is expected to be near average.

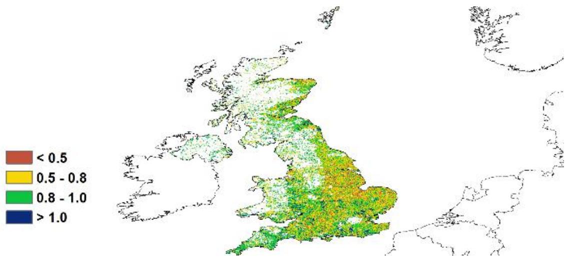
Southern mixed wheat and barley zone experienced significantly above-average radiation (RADPAR, +9%) and average rainfall (RAIN -1%). However, below-average temperature (TEMP, -0.8°C) resulted in biomass estimates that were below average (BIOMSS, -3%). NDVI was below or near average according to the crop condition graph in this reporting period. The VCIx was 0.77, slightly less than in the other regions. Altogether, the output of wheat is expected to be slightly below average.

Figure 3.17 United Kingdom's crop condition, January - April 2021

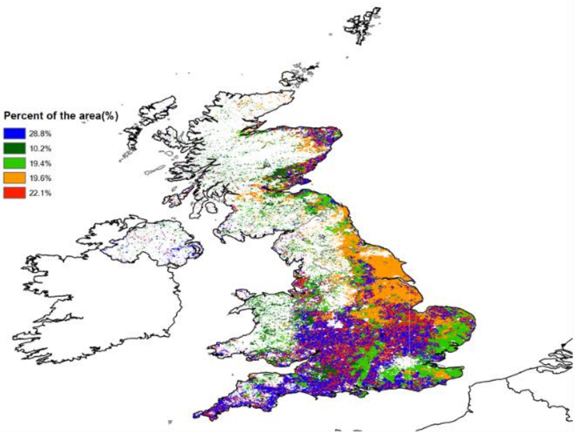


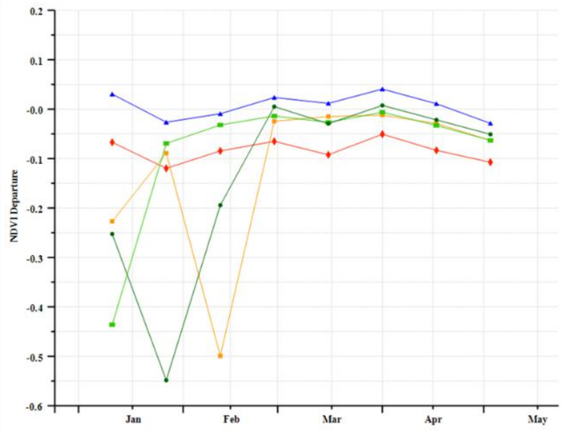
(a) Phenology of major crops



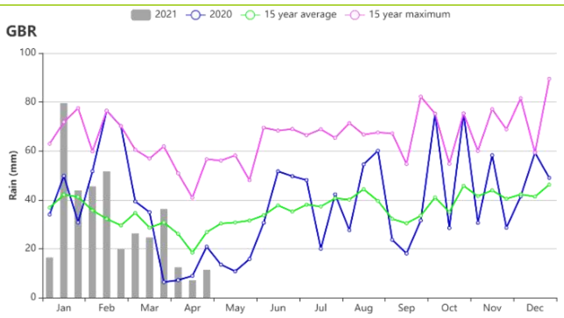


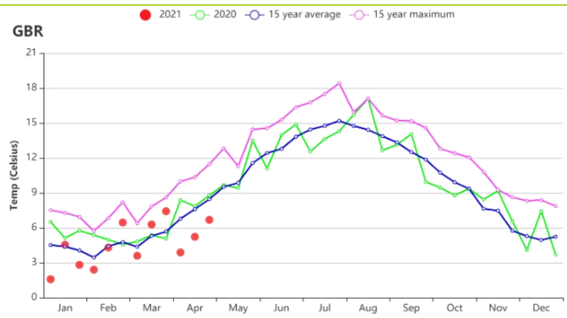
(b) Crop condition development graph based on NDVI (c) Maximum VCI



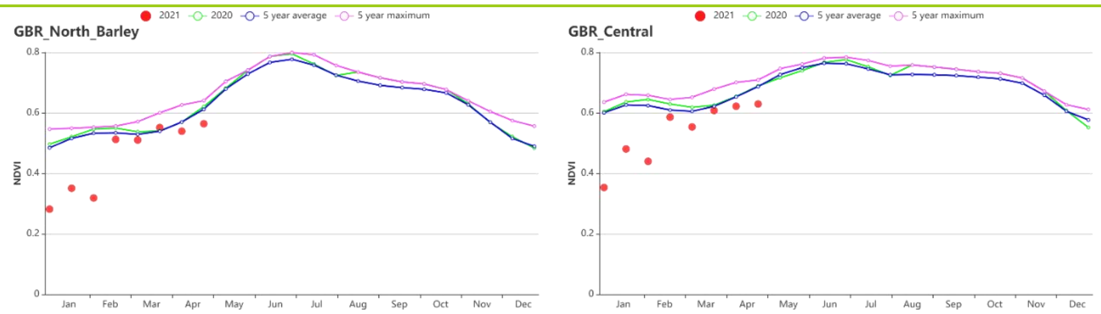


(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles

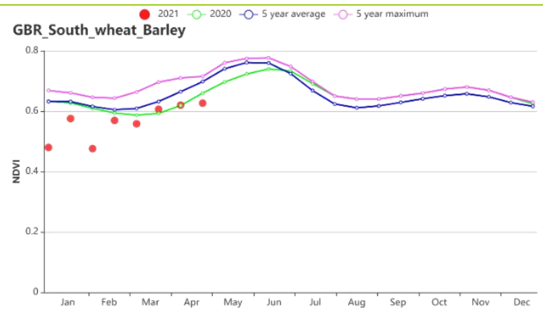




(f) Rainfall profiles (g) Temperature profiles



(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 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Northern Barley region (UK)	443	-6	3.6	-0.7	407	8	490	-4
Central sparse crop region (UK)	410	3	4.7	-0.5	455	9	536	-3
Southern mixed wheat and Barley zone (UK)	297	-1	5.1	-0.8	508	9	551	-3

Table 3.26 United Kingdom's agronomic indicators by sub-national regions, current season's values and departure from 5YA, January - April 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Northern Barley region (UK)	95	-1	0.82
Central sparse crop region (UK)	98	-1	0.82
Southern mixed wheat and Barley zone (UK)	99	0	0.77

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[HUN] Hungary

This reporting period covers the main growing season of winter wheat, sown in September and October. According to the crop condition development graph, NDVI values were above average in January, but below average from February to April due to below-average temperatures (TEMP -0.9°C). The overall rainfall in this period was below average (RAIN -11%), as well as solar radiation (RADPAR -1%) as compared to the 15YA. The low rainfall was mainly due to below-average rainfall starting mid-February, which delayed the growth of winter wheat, resulting in a -8% decrease of estimated biomass. The national CALF was 94%, which was -4% below the 5YA. Rainfall had recovered to average levels by late April and average winter wheat production can still be expected.

The national average VCIx was 0.81. The NDVI departure cluster profiles indicate that: 32% of arable land experienced above-average crop conditions, mainly distributed in the east Hungary and west Hungary. 41% of arable land experienced slightly below-average crop conditions, scattered over the whole Hungary. Most likely, the large drops can be attributed to cloud cover in the satellite images and snow, but with low precipitation since mid-February, 68% of the NDVI pixels were below average starting from mid-March.

Regional analysis

Based on cropping systems, climatic zones, and topographic conditions, four sub-national regions are described below: **Central Hungary**, **the Great Plain (Puszta), Northern Hungary** and **Transdanubia**. During this reporting period, CALF was below average for all the four subregions (-7%, -6%, -2% and -3%, respectively).

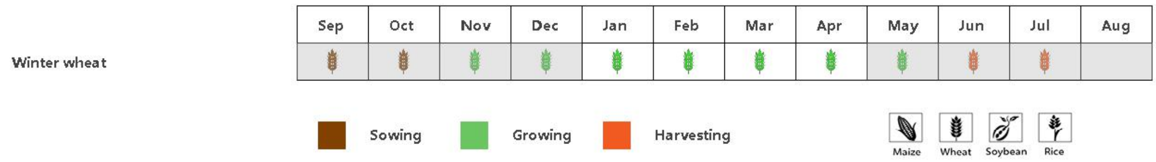
Central Hungary is one of the major agricultural regions in terms of crop production. A sizable share of winter wheat is planted in this region. According to the NDVI development graphs, the values were above average in January, but below average from February to April due to the low precipitation between mid-February and early April. Agro-climatic conditions include below-average rainfall (RAIN -13%) and temperature (TEMP -1.1°C), and above-average radiation (RADPAR 2%), which resulted in below-average biomass (BIOMSS -4%). The VCIx was 0.77. The crop conditions in this region are slightly below average.

The Puszta region mainly grows winter wheat, maize and sunflower, especially in the counties of Jaz-Nagykum-Szolnok and Bekes. According to the NDVI development graphs, the values were above average in January and February, but below average in March and April due to the low precipitation from mid-February to early April. Agro-climatic conditions include below-average rainfall (RAIN -2%) and temperature (TEMP -1.0°C), and radiation (RADPAR -2%), which resulted in a below-average biomass (BIOMSS -8%). The maximum VCI was 0.81. The crop conditions in this region are slightly below average.

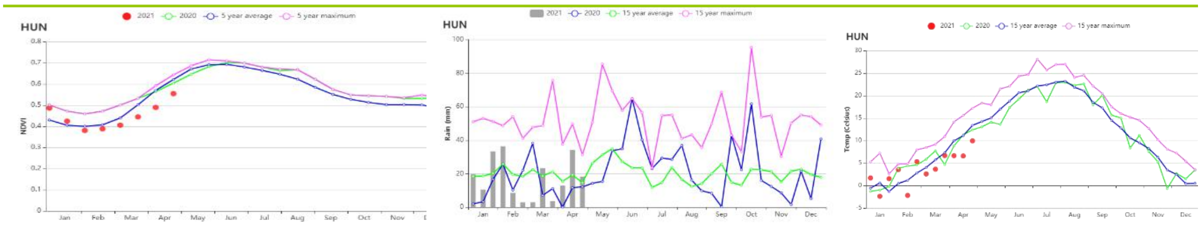
Northern Hungary is another important winter wheat region. According to the NDVI development graphs, the values were above average in January, but below average from February to April due to the low precipitation from mid-February to early April. The rainfall was above average (RAIN +3%). Temperature was slightly below average (TEMP -1.3°C), and radiation was below average (RADPAR -2%). Estimated biomass decreased (BIOMSS -5%). The maximum VCI was 0.80. The crop conditions in this region are slightly below average.

Southern Transdanubia cultivates winter wheat, maize, and sunflower, mostly in Somogy and Tolna counties. According to the NDVI development graphs, the values were above average in January, but below average from February to April due to the low precipitation from mid-February to early April. Agro-climatic conditions include below-average rainfall (RAIN -27%) and temperature (TEMP -0.7°C), which resulted in a below-average biomass (BIOMSS -10%). The maximum VCI was favorable at 0.83. The crop conditions in this region are slightly below average.

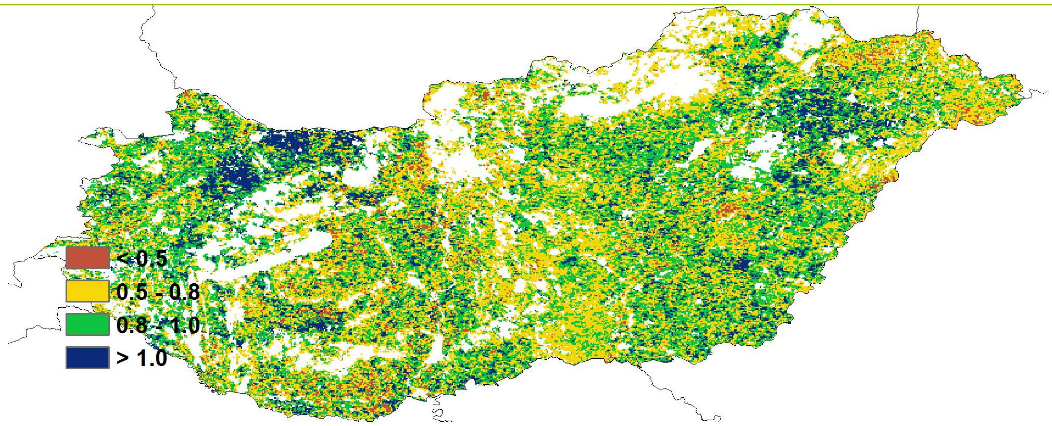
Figure 3.18 Hungary's crop condition, January-April 2021



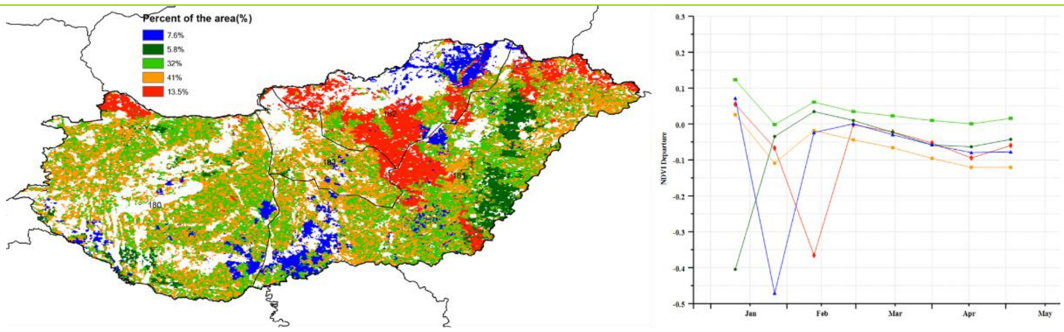
(a). Phenology of major crops



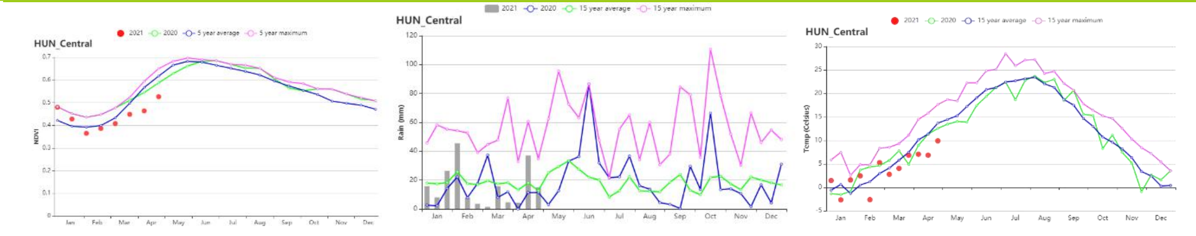
(b) Crop condition development graph based on NDVI, RAIN and TEMP



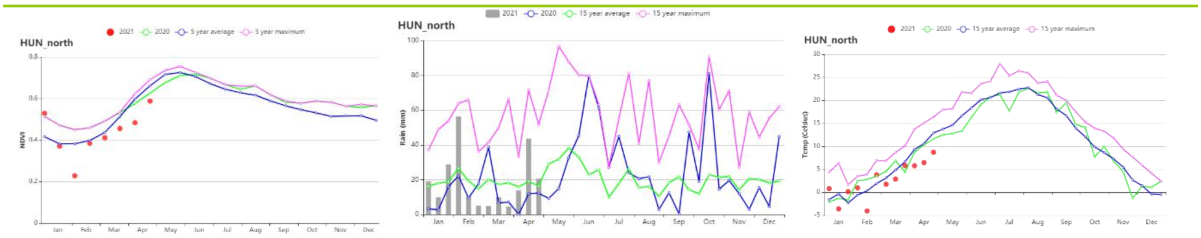
(c) Maximum VCI



(d) Spatial distribution of NDVI profiles.

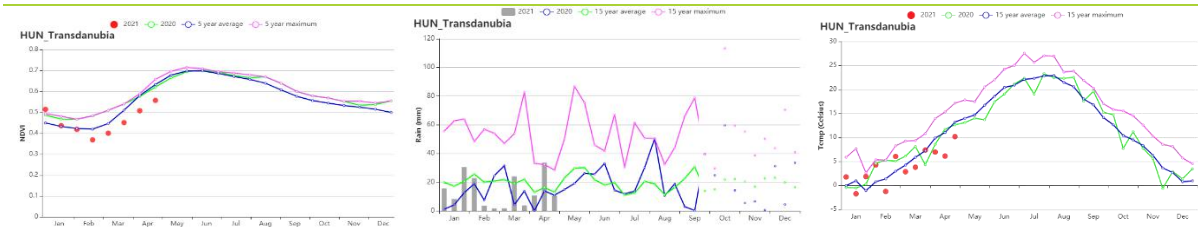


(e) Crop condition development graph based on NDVI, RAIN and TEMP



(f) Crop condition development graph based on NDVI, RAIN and TEMP

(g) Crop condition development graph based on NDVI, RAIN and TEMP



(h) Crop condition development graph based on NDVI, RAIN and TEMP

Table 3.27 Hungary's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Central Hungary	185	-13	3.6	-1.1	637	2	480	-4
The Puszta	235	-2	3.9	-1.0	609	-2	484	-8
North Hungary	227	3	2.4	-1.3	588	-2	464	-5
Transdanubia	168	-27	4.0	-0.7	650	0	460	-10

Table 3.28 Hungary's agronomic indicators by sub-national regions, current season's values and departure from 5YA, January - April 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current (%)

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current (%)
Central Hungary	91	-7	0.77
The Puszta	89	-6	0.81
North Hungary	97	-2	0.80
Transdanubia	93	-3	0.83

[IDN] Indonesia

During the monitoring period, the harvest of rainy season maize was completed in Java and Sumatra, while the harvest of main rice started in March.

At the national scale, radiation was above the 15YA (RADPAR +2%) while rainfall was below the 15YA (RAIN -11%), and temperature was near the 15YA, which led to a 2% decrease biomass production potential.

According to the national NDVI development graph, crop growth conditions were below the 5YA, but they improved slowly during the monitoring period and were close to the average in April. NDVI clusters and profiles show that 66.9% of the cropland was significantly below the 5YA in January-February, and began to recover to average levels in March. The crop condition for the 33.1% of arable land, distributed in the western and southern coastal areas, was close to average during the whole monitoring period.

Considering that the area of cropped arable land in the country was close to the 5YA (CALF 100%) and the VCIx value reached 0.95, the national production is anticipated to be average or slightly below. In conclusion, the reporting period has been a period of recovery for Indonesia. The yield of maize might be slightly below average, whereas main rice still depends on the weather in May and June.

Regional analysis

The analysis below focuses on four agro-ecological zones, namely **Sumatra** (92), **Java** (90), the main agricultural region in the country, **Kalimantan and Sulawesi** (91) and **West Papua** (93), among which the first three are relevant for crop production. The numbers correspond to the labels on the VCIx and NDVI profile maps. Java is the country's main agricultural region.

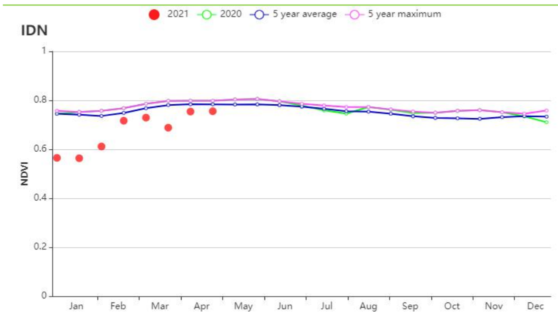
The weather over **Java** was relatively wet compared to other regions. Rainfall was above the 15YA (RAIN +1%), whereas radiation was near the 15YA and temperature was below the 15YA (TEMP -0.2°C), which may have resulted inaverage biomass production potential (BIOMSS 0%). The NDVI development graph shows that crop conditions reached the 5YA in April only. Considering the favorable VCIx value of 0.93, and CALF near the 5YA, overall crop conditions in Java were slightly below average.

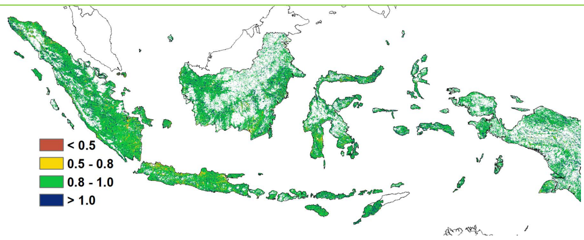
In **Kalimantan and Sulawesi**, rainfall was significantly below average (RAIN -16%) while temperature and radiation were both above the 15YA (TEMP +0.1°C, RADPAR +3%). Warmer temperatures and higher radiation promoted the growth of crops, which led to a slight decrease in biomass production potential (BIOMSS -3%). According to the NDVI development graph, crop conditions were close to the 5YA starting from the end of February. Overall, the crop yields were close to average.

In **Sumatra**, rainfall was significantly lower than the 15YA (RAIN -18%) while temperature and radiation were above average (TEMP +0.1°C, RADPAR +2%), which resulted in a below-average biomass production potential (BIOMSS -5%). According to NDVI development graph, crop conditions were below the 5YA except for the middle of April. Hence, yield might be slightly lower than average.

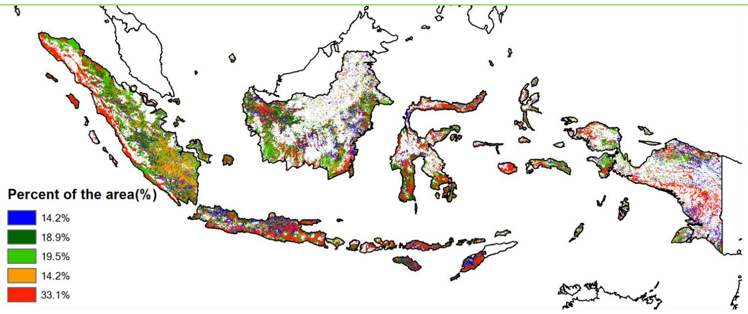
Figure 3.19 Indonesia's crop condition, January–April 2021

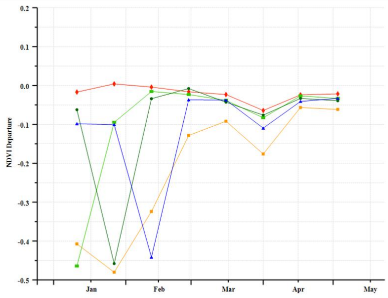
(a). Phenology of major crops



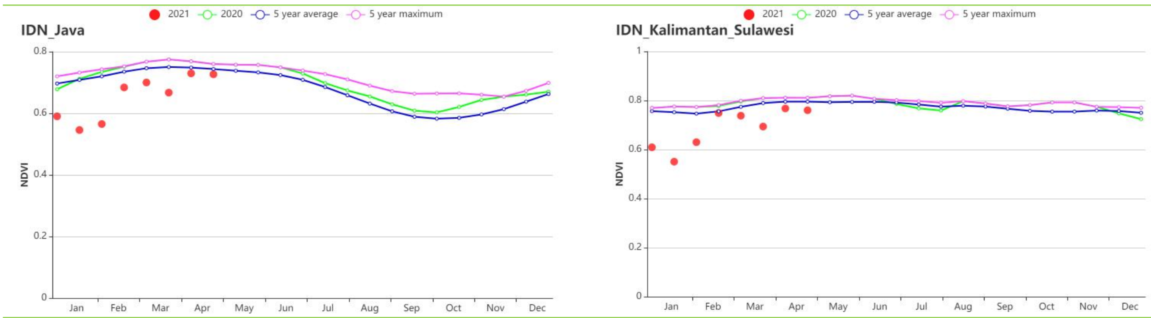


(b) Crop condition development graph based on NDVI (c) Maximum VCI

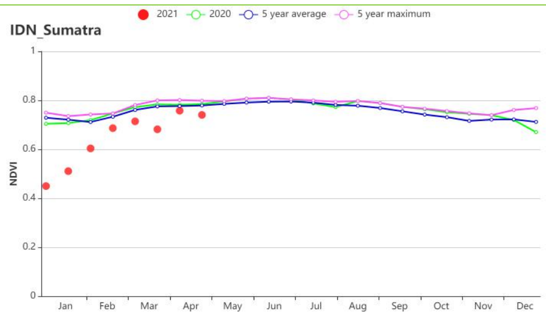




(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



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



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

Table 3.29 Indonesia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Java	1351	1	24.9	-0.2	1188	0	803	-1
Kalimantan and Sulawesi	1123	-16	24.6	0.1	1164	3	768	1
Sumatra	1094	-18	24.4	0.1	1137	2	749	0
West Papua	1694	-1	23.5	0.0	988	-1	643	-3

Table 3.30 Indonesia's agronomic indicators by sub-national regions, current season's values and departure from 5YA, January - April 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Java	99	0	0.93
Kalimantan and Sulawesi	100	0	0.96
Sumatra	100	0	0.94
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

The current 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, except for maize and summer (Kharif) rice harvest in January. The graph of NDVI development shows that the crop conditions were close to or above the average in general, except in March, indicating that the crop conditions for Rabi rice and wheat were favorable at the national level.

The CropWatch agroclimatic indicators show that nationwide TEMP (+0.3°C) and RADPAR was close to average, whereas RAIN was significantly below the 15YA (-45%). The low rainfall resulted in a BIOMSS decrease by 28% compared with the 15YA. However, the overall VCIx was high, with a value of 0.87. As can be seen from the spatial distribution, only the Northeast recorded values below 0.80. Most of India had high VCIx values. These spatial patterns of VCIx were thus generally consistent with those of NDVI. The western and southern regions showed above-average crop conditions and slightly below-average conditions in the northern and eastern regions. The spatial distribution of NDVI profiles shows that after December, 35.5% of the areas showed above-average crop conditions in the western and southern regions. CALF increased by 14% compared to the 5YA.

With the exception of a few areas, the crop conditions in all parts of India were favorable. In the Indo-Gangetic plain, the most important wheat production region, NDVI fell to below average in March, during the critical grainfilling period of wheat, presumeably due to warmer than usual temperatures, which might have caused a slight drop in production. Although the CALF was above average, it was still lower compared with the same period last year. Therefore, the wheat production might be reduced significantly. In general, crop production for this season is estimated to be unfavorable at the national level due to the lack of irrigation and other field management measures caused by the COVID-19.

Regional analysis

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

The two agro-ecological zones of the Deccan Plateau, the Agriculture areas in Rajastan and Gujarat region show similar trends in agricultural indices. Compared to the same period of previous 15 years, RAIN had decreased significantly, especially in the North-western dry region (minus over 60%). The TEMP was slightly above average but RADPAR was lower, the shortage in rainfall and lower radiation caused BIOMSS to be much lower than the 15-year average.

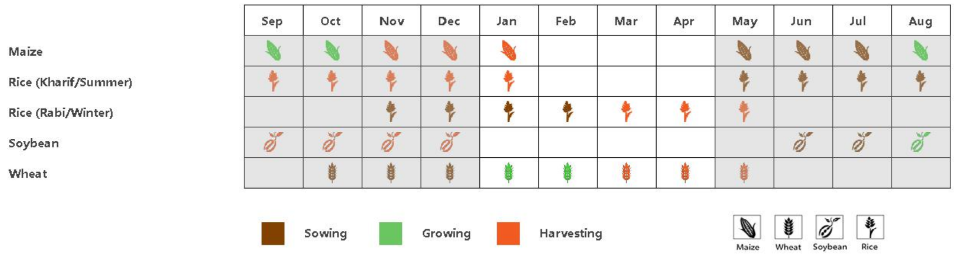
Additionally, CALF showed the same trends. The highest increases had been observed in Deccan Plateau (+74%). The graph of NDVI development shows that the crop growth of these two agro-ecological regions during this monitoring period exceeded the 5-year average in most months. Generally, the crop production is expected to be above average.

The Gangetic plain, Assam and north-eastern regions and Western Himalayan region recorded similar trends of agricultural indices in this monitoring period. Compared to the same period of the previous years, RAIN had decreased by more than 20%, even by 70% for the Gangetic plain, Assam and north-eastern regions. TEMP was slightly above average (+0.5°C). The RADPAR was above average for both regions but did not compensate for the rainfall effect and caused a decrease in BIOMSS. Both regions recorded increases of CALF (+10%). VCIx was above 0.82. The graph of NDVI development shows that the crop growth for the three regions was below the 5-year average. The crop production is expected to be below average.

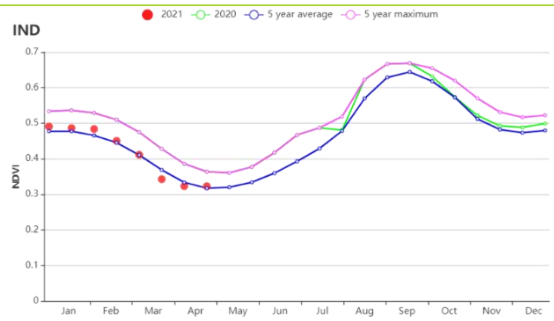
The Eastern coastal region recorded 87 mm of RAIN, which was 5% above average. TEMP was at 25.5 ℃ (-0.3°C), and RADPAR was slightly above the 15YA at 1294 MJ/m² (+0.3%). BIOMSS was below the 15YA (-17%). CALF reached 81% which was an increase by 18% over the 5-year average, and VCIx was 0.94. The graph of NDVI development shows that the crop growth of this region during the monitoring period exceeded the 5-year average in most months. Generally, the crop production is expected to be above average.

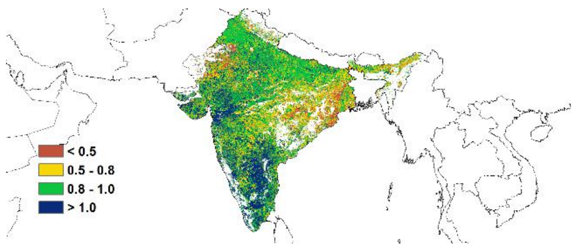
The Western coastal region recorded 143 mm of RAIN, which was significantly above average (+80%). TEMP was at 26.3 ℃ (+0.2°C) and RADPAR was at 1296 MJ/m² (-4%). BIOMSS was above the 15YA (+25%) due to abundant rainfall. CALF reached 72% which was significantly above average (+43%), and VCIx was 1.01. The graph of NDVI development shows that the crop growth of the region during the monitoring period exceeded the 5-year maximum in most months. The outlook of crop production in this region is favorable due to the abundant rainfall.

Figure 3.20 India's crop condition, January - April 2021

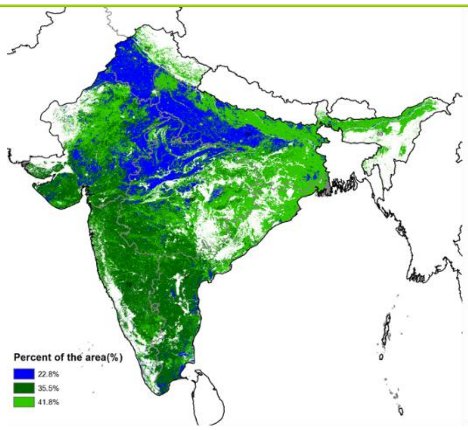


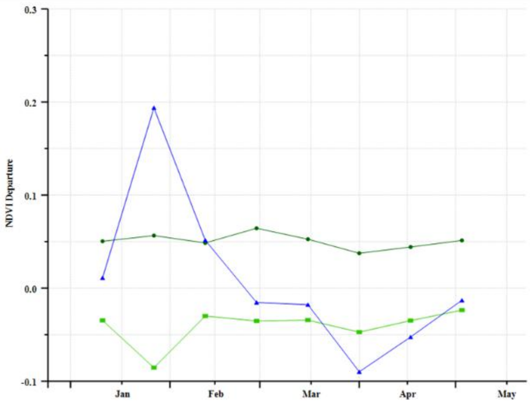
(a) Phenology of major crops



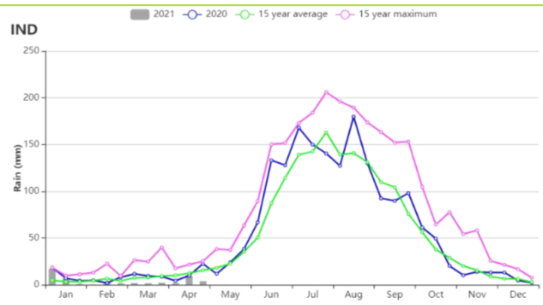


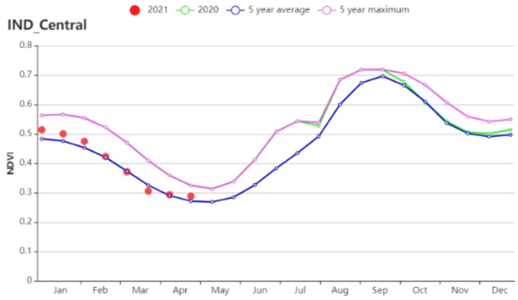
(b) Crop condition development graph based on NDVI (c) Maximum VCI



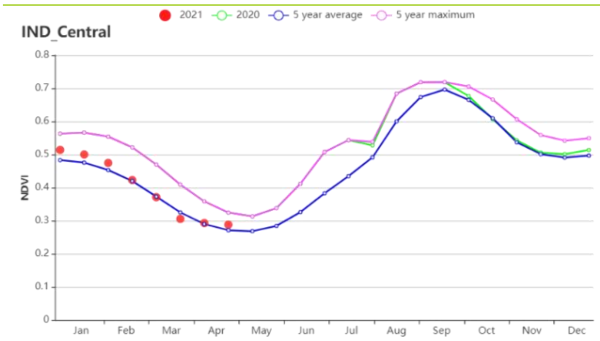


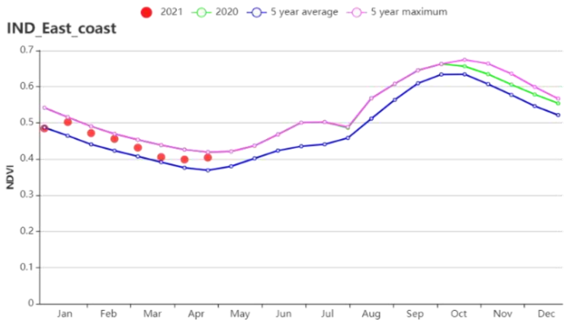
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



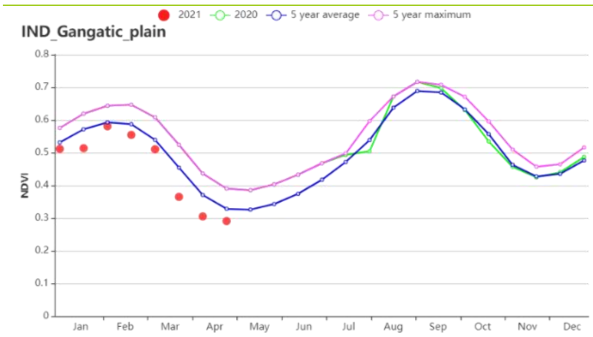


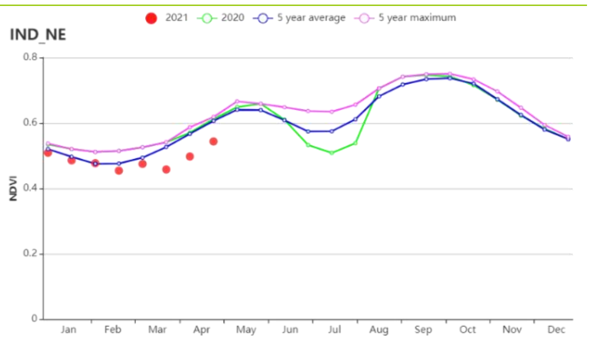
(f) Rainfall profiles (g) Temperature profiles



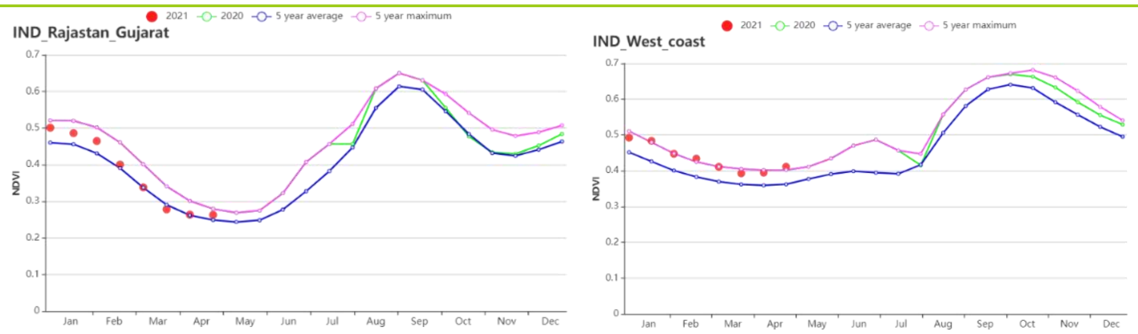


(h) Crop condition development graph based on NDVI (Deccan Plateau (left) and Eastern Coastal Region (right))

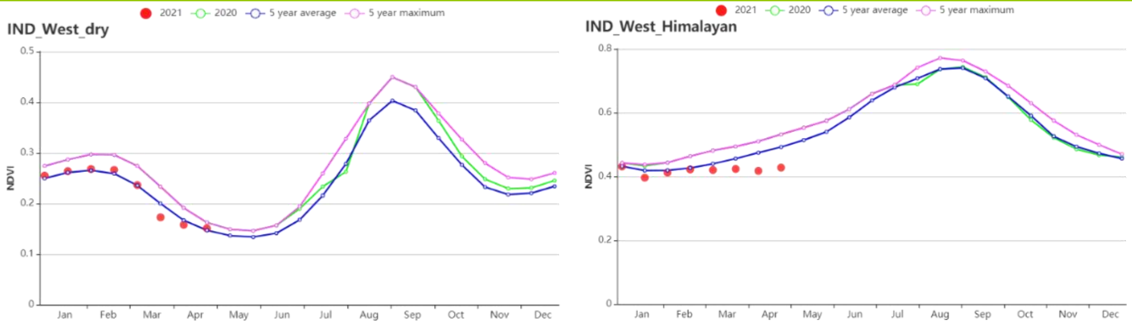




(i) Crop condition development graph based on NDVI (Gangetic Plains (left) and Assam and north-eastern regions (right))



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



(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 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Deccan Plateau	10	-59	25.2	0.2	1258	-1	148	-34
Eastern coastal region	87	5	25.5	-0.3	1294	0	300	-17
Gangatic plain	16	-74	22.6	0.5	1193	2	160	-50
Assam and north-eastern regions	44	-87	18.8	0.6	1158	6	297	-52
Agriculture areas in Rajastan and Gujarat	5	-59	25.6	1.0	1240	-2	103	-28
Western coastal region	144	81	26.3	0.2	1296	-4	380	25
North-western dry region	5	-68	24.3	1.0	1222	0	121	-26
Western Himalayan region	269	-23	9.7	0.0	1063	2	355	-15

Table 3.32 India's agronomic indicators by sub-national regions, current season's values and departure from 5YA, January - April 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Deccan Plateau	74	20	0.82
Eastern coastal region	82	19	0.94
Gangatic plain	86	0	0.83
Assam and north-eastern regions	88	-5	0.73
Agriculture areas in Rajastan and Gujarat	67	25	0.92
Western coastal region	72	44	1.01
North-western dry region	16	13	0.69
Western Himalayan region	84	-3	0.77

[IRN] IRAN

This monitoring period covers the vegetative and early reproductive phases of winter wheat. Rice planting started in April. Nationwide, the accumulated rainfall was significantly below average (RAIN -49%), while temperature and radiation were above average (TEMP +1.7°C, RADPAR +5%). The BIOMSS index was 27% below average. The national average of maximum VCI index was 0.67, and the Cropped Arable Land Fraction (CALF) decreased by 22% 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 12% of the cropland, mainly in the provinces of Khuzestan and Bushehr in the west and south-western regions, while crop conditions were below average throughout the monitoring period on about 14.3% of the cropland, mainly located in some parts of Ardebil, East Azarbaijan and Golestan in the north and north-western regions. 44.4% of the cropland showed close-to-average crop conditions. The remaining croplands experienced below-average crop conditions in late January and then recovered to average or above average levels (marked in Blue and dark green). They included the provinces of East Azarbaijan, West Azaibaijan, Zanjan, Gilan, Mazadaran, Semnan, Kordestan and Esfahan.

Overall, the conditions for the winter crops were not favorable due to below average rainfall.

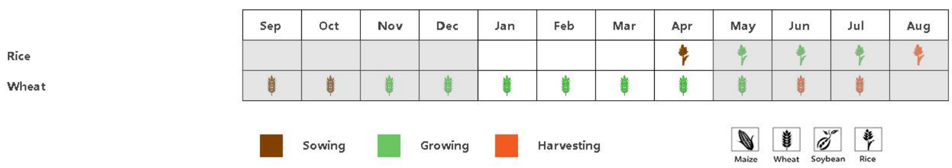
Regional analysis

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).

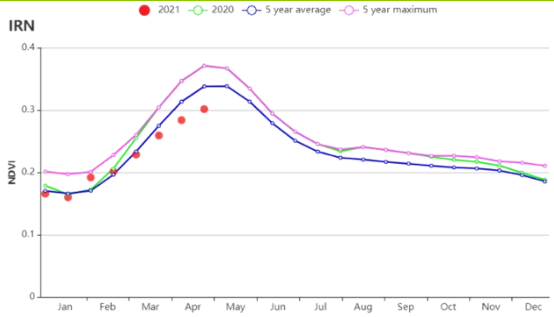
In the **Semi-arid to sub-tropical hills of the west and north** region, NDVI profiles show a similar change of patterns as for the whole country. The accumulated rainfall was 130 mm (47% below average), while temperature and radiation were above average (TEMP +1.7°C, RADPAR +6%). The influence of radiation and temperature less than that of rainfall, which resulted in a decrease of BIOMSS by 21%. CALF declined by 26%. The average VCIx (0.69) indicates unfavourable crop conditions for winter wheat.

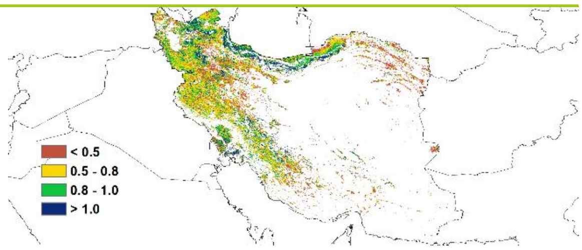
Crop conditions in the **Arid Red Sea coastal low hills and plains** region were above the five-year average until late March. This region experienced a serious deficit of rainfall (RAIN, -68%), but received more sunshine (RADPAR, +4%). The temperature was above average (TEMP +1.6°C). BIOMSS decreased by 39%, for the influence of rainfall deficit exceeded that of radiation and temperature. The CALF increased by 18% compared to the five-year average, and the national VCIx (0.71) was also quite low, indicating the unfavorable outlook for winter crops in this region.

Figure 3.21 Iran's crop condition, January-April 2021

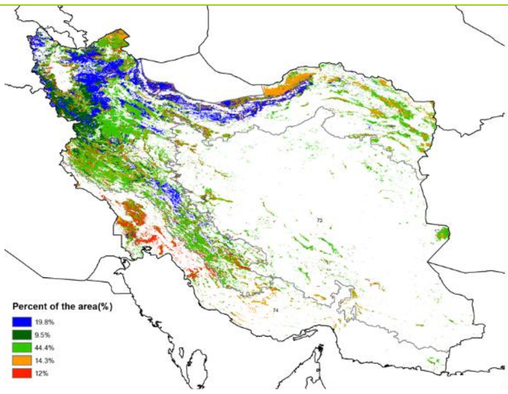


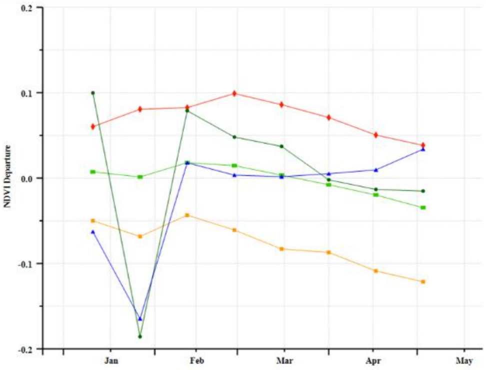
(a) Phenology of major crops



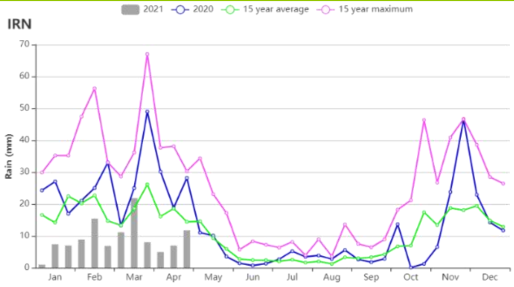


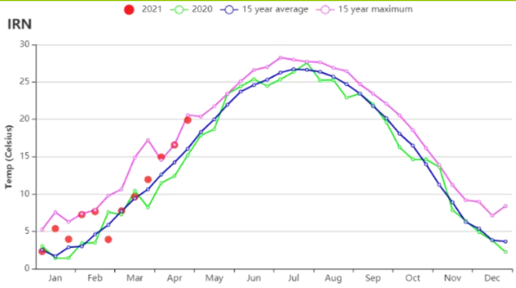
(b) Crop condition development graph based on NDVI (c) Maximum VCI



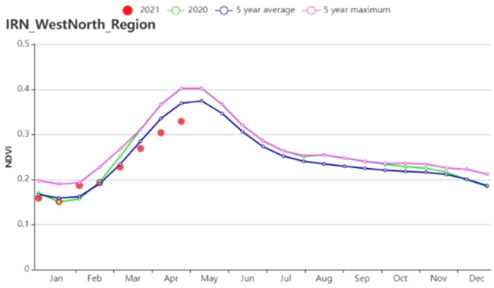


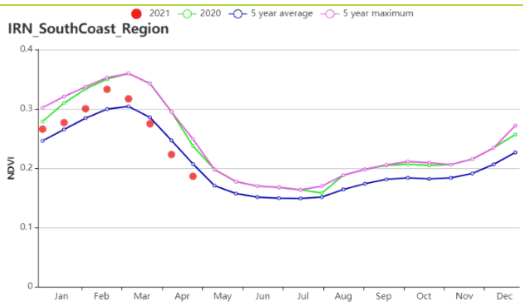
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles





(f) Rainfall profiles (g) Temperature profiles





(h) Crop condition development graph based on NDVI (Semi-arid to sub-tropical hills of the west and north region (left) and Arid Red S
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 2021

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	130	-47	7.5	1.7	1021	6	378	−21
Arid Red Sea coastal low hills and plains	50	-68	18.9	1.6	1099	4	275	-39

Table 3.34 Iran's agronomic indicators by sub-national regions, current season's values and departure from 5YA, January - April 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Semi-arid to sub-tropical hills of the west and north	22	-26	0.69
Arid Red Sea coastal low hills and plains	33	18	0.71

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

[ITA] Italy

This reporting period covers the main growing season of winter wheat which was sown between October and December. According to the crop condition development graph, NDVI values were close to the average of the past five years from January to early March, but below average from mid-March to mid-April due to the low precipitation from mid-February to late March. By late April, conditions had generally improved to average levels.

The total rainfall in this period was below average (RAIN -17%), the temperature was 0.6℃ below the 15YA and RADPAR was 1% above the 15YA. The lower rainfall was mainly due to below-average rainfall from mid-February to late March, which delayed the growth of winter wheat, resulting in a 7% decrease of BIOMSS as compared to the 15YA. But CALF at the national level was 96%, close to the average. Except for a few areas in the north and central part of the country (Piemonte, Lombardia, Veneto and Lazio), the VCIx was above 0.80 for most of the cultivated land.

The national average VCIx was 0.86. The NDVI departure cluster profiles indicate that 26.3% of arable land experienced above-average crop conditions, mainly located in Piemonte, Lombardia, Veneto, Sardegna and Sicilia. 22.6% of arable land experienced slightly below-average crop conditions, scattered in Puglia, Marche, Abruzzi, Piemonte, Lombardia and Veneto. As shown in the NDVI cluster map, the crop condition trailed slightly below average during the whole monitoring period for 22.6% of the total cultivated cropland. Due to the rainfall deficit starting in mid-February, 73.7% of the NDVI pixels were below average in late March. Winter wheat developed more slowly than usual due to the colder temperatures. Overall, prospects for winter wheat are close to normal.

Regional analysis

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

Eastern Italy (mainly in Puglia, Marche and Abruzzi) experienced below-average rainfall (RAIN -20%), temperature (TEMP -0.8°C) and slightly above-average solar radiation (RADPAR +1%). The shortage in precipitation resulted in a decreased potential production (BIOMSS -11%). VCIx was 0.93. The crop condition development graph indicates that NDVI was close to the average of the past five years from January to early March, below but close to the average from mid-March to mid-April and above average in late April. Close to average rainfall in March and April helped sustain crop growth and average production is expected.

Crop production in **Po Valley** (mainly in Piemonte, Lombardia and Veneto) was affected by low rainfall (RAIN -28%), below-average temperature (TEMP -0.7°C) and above-average solar radiation (RADPAR+3%). BIOMSS was below the 15YA by 9% and VCIx reached 0.82. The crop condition development graph indicates that the crop conditions were above average from January to early March, but slightly below average from mid-March to April and near average in late April. According to the agro-climatic indicators, near average output is expected.

The Islands recorded a below-average precipitation (RAIN -22%) with average temperature. RADPARwas slightly above average (+1%). BIOMSS decreased by 8% compared with the 15YA. VCIx was 0.93. NDVI was close to average throughout the monitoring period. The crop production in this region is expected to be close to average.

In **Western Italy**, rainfall was below average (RAIN -5%). RADPAR was near average and TEMP was below average (-0.7°C), which resulted in a biomass production potential decrease in this region (BIOMSS -3%). The NDVI reached average levels from January to mid-March, but it was below average from late March to April. VCIx reached 0.83. CropWatch expects a below-average production.

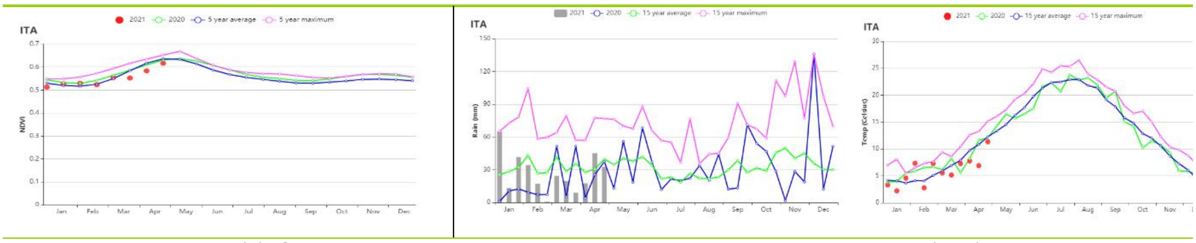
Figure 3.22 Italy's crop condition, January-April 2021

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

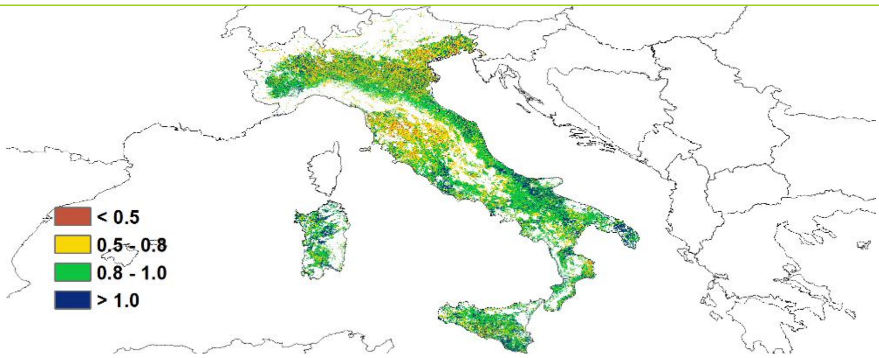
Sowing Growing Harvesting

Maize Wheat Soybean Rice

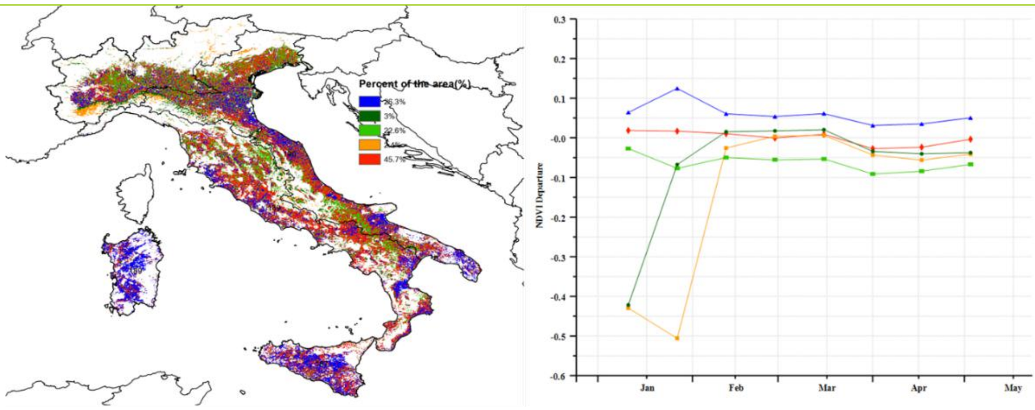
(a). Phenology of major crops



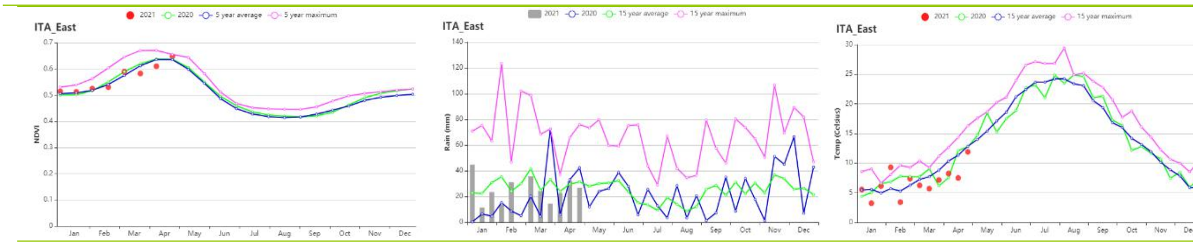
(b) Crop condition development graph based on NDVI, RAIN and TEMP (Italy).



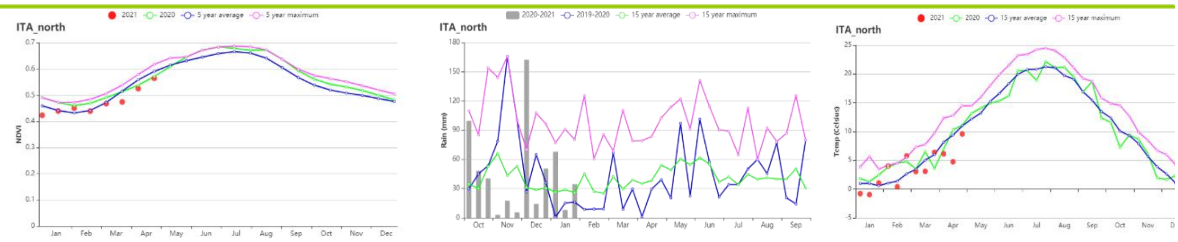
(c) Maximum VCI



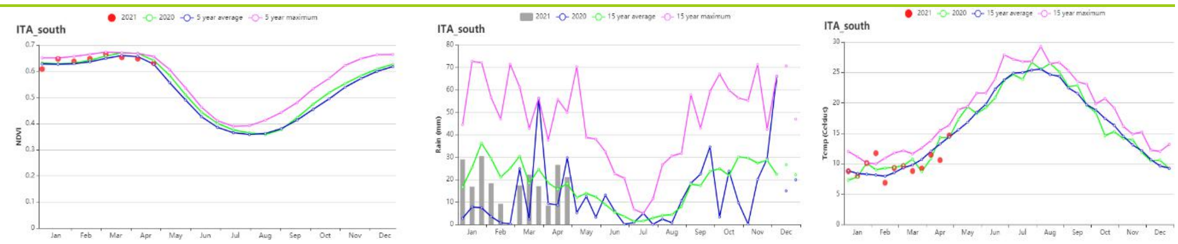
(d)Spatial distribution of NDVI profiles



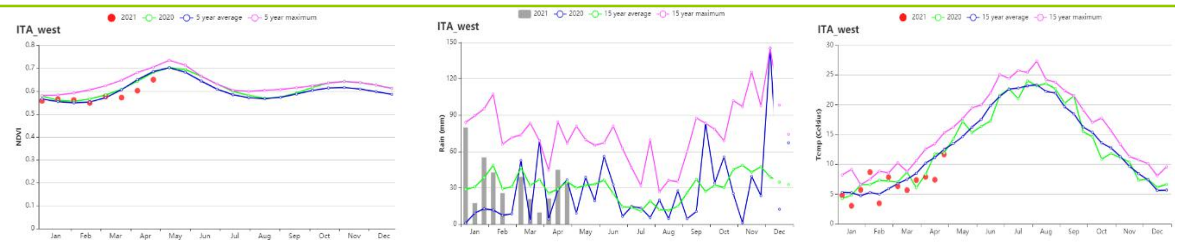
(e) Crop condition development graph based on NDVI, RAIN and TEMP (East Italy).



(f) Crop condition development graph based on NDVI, RAIN and TEMP (Po Valley).



(g) Crop condition development graph based on NDVI, RAIN and TEMP (Islands).



(h) Crop condition development graph based on NDVI, RAIN and TEMP (West Italy).

Table 3.35 Italy's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
East Coast	281	-20	6.8	-0.8	751	1	560	-11
Po Valley	299	-28	3.6	-0.7	689	3	448	-9
Islands	217	-22	9.9	0.0	853	1	571	-8
Western Italy	390	-5	6.7	-0.7	729	0	620	-3

Table 3.36 Italy's agronomic indicators by sub-national regions, current season's values and departure from 5YA, January - April 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
East Coast	100	0	0.93
Po Valley	90	-1	0.82
Islands	100	0	0.93
Western Italy	99	0	0.83

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

[KAZ] Kazakhstan

No crops were cultivated in most of the country during this monitoring period, except for some minor winter crops grown in the southern regions. Compared to the 15-year average, accumulated rainfall was above average (RAIN +13%), and temperature was close to average, while radiation was below average (RADPAR -4%). Furthermore, the dekadal precipitation was close to the fifteen year maximum in early February and early March. The temperatures warmed up to above 0℃ in early April and stayed slightly below average in April. The agro-climatic conditions resulted in a decrease in estimated BIOMSS by 4%. According to the NDVI profiles, the national average NDVI values were still lower than 0.3 because of freezing conditions.

Overall, the improvement of soil moisture due to good rainfall conditions during this monitoring period will be favorable for the sowing of spring wheat in May.

Regional analysis

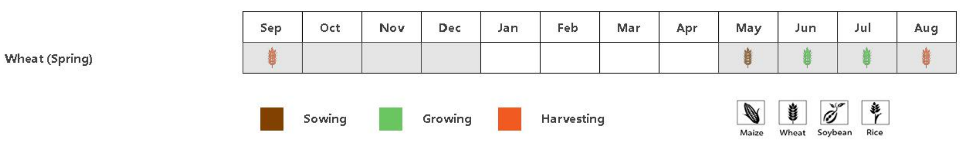
Based on cropping systems, climatic zones and topographic conditions, four sub-national agro-ecological regions can be distinguished for Kazakhstan, among which three are relevant for crop cultivation: The Northern region (112), the Eastern plateau and southeastern region (111) and the South region (110).

In the **Northern region**, the accumulated precipitation and temperature were above average (RAIN +12%, TEMP +0.2°C), while RADPAR was below average (-6%). The cloudy weather resulted in a decrease of BIOMSS by 6%.

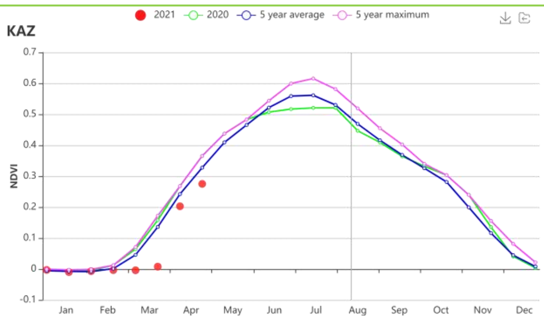
Agro-climatic conditions in the **Eastern plateau and southeastern region** were normal. The average rainfall was above average (RAIN +14%). Temperature and RADPAR were close to average (RADPAR - 1%).

The **South region** had the largest precipitation departure (RAIN +16%) among the 3 regions. The temperature and solar radiation were below average (TEMP -0.9°C, RADPAR -2%). The combination of agro-climatic indicators resulted in a increase of the BIOMSS index by 7%. The rainy and cloudy weather conditions in this region could have a negative impact on winter crops, which was confirmed by the unfavorable crop condition shown in the crop condition development graph based on NDVI.

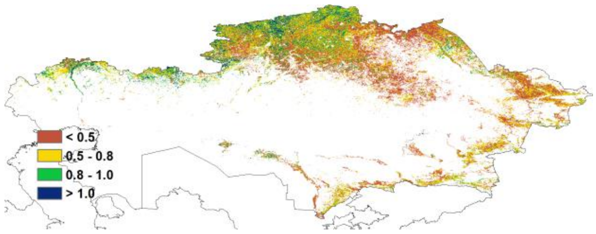
Figure 3.23 Kazakhstan's crop condition, January - April 2021



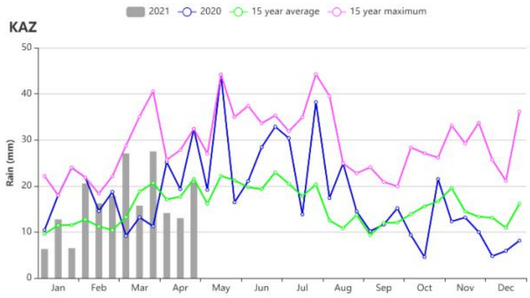
(a). Phenology of major crops



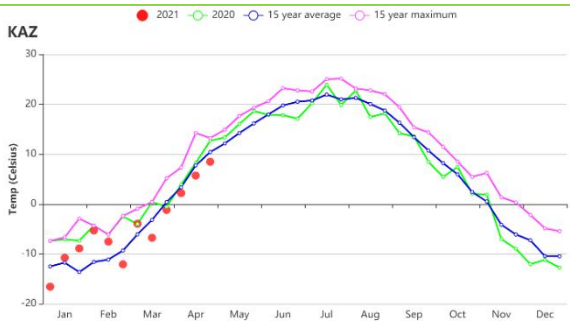
(b) Crop condition development graph based on NDVI



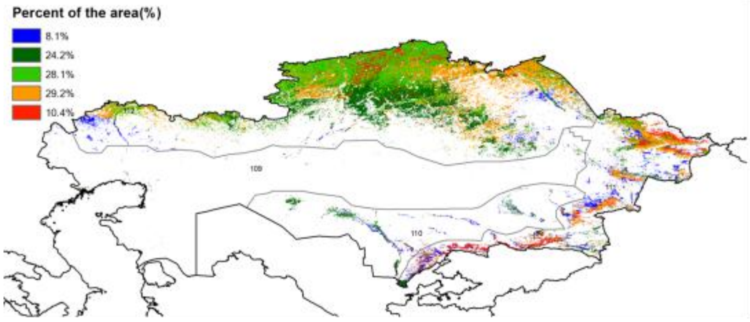
(c) Maximum VCI



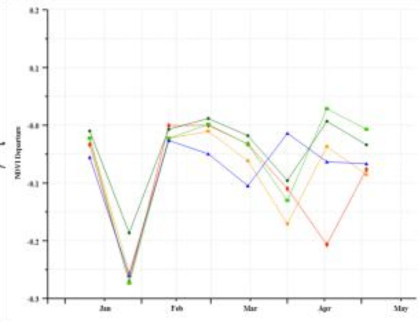
(d) Rainfall Index



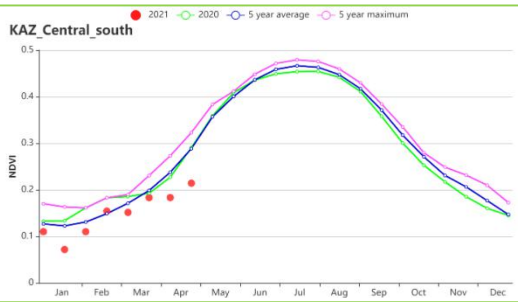
(e) Temperature Index



(f) Spatial NDVI patterns compared to 5YA



(g) NDVI profiles



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

Table 3.37 Kazakhstan agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Northern region	171	12	-6.0	0.2	553	-6	265	-6
Eastern plateau and southeastern region	268	14	-3.1	0.0	751	-1	314	-2
South region	190	16	1.9	-0.9	747	-2	430	7

Table 3.38 Kazakhstan, agronomic indicators by sub-national regions, current season's values and departure from 5YA, January - April 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Northern region	4	-47	0.63
Eastern plateau and southeastern region	14	-69	0.51
South region	2	-76	0.54

[KEN] Kenya

Kenya experiences two rainy seasons: The long rains last from March to May and the short rains from October to December. Maize can be grown during the long and short rains, whereas wheat is grown during the long rains only. In the monitoring period from January to April 2021, the short rain maize had been harvested and the sowing of long rain maize began, while the planting of wheat will start in May only.

At the national scale, precipitation was 362 mm, 20% below average. The weather was slightly cooler (TEMP -0.4°C) and RADPAR was slightly below the 15YA (-3%). As a result, the BIOMSS was 12% lower than average. According to the national rainfall profiles, the 10-day accumulations of rainfall presented conditions that were close to the 5YA in the first two months and clearly below the average in the following two months. When looking into sub-national level, almost all regions received less rainfall and the northern region had the largest percentage decrease in rainfall compared with the 15YA (RAIN -36%).

The NDVI development graph at the national level hovered along the 5YA trends in January and February but the NDVI values were below average in March and April. This is mainly due to the below-average rainfall in March according to the rainfall profiles. Therefore, conditions for the short rains maize were more favorable than for the long rains maize. The planting and emergence of long rains maize were hampered in March due to lack of rainfall. According to the NDVI clusters and the map of NDVI profiles, the national NDVI values were almost at average levels except for a small part of southern and central Kenya (16.3%). This was in agreement with the maximum VCI graph which shows that the yellow spots representing VCI between 0.5 and 0.8 were equally distributed in the central and southern regions. The national average VCI value reached 0.79 and the cropped arable land fraction increased by 1% as compared to the 5YA. In brief, the national crop condition is assessed as average, though the planting of long rains maize suffered from drier-than-normal conditions in March.

Regional analysis

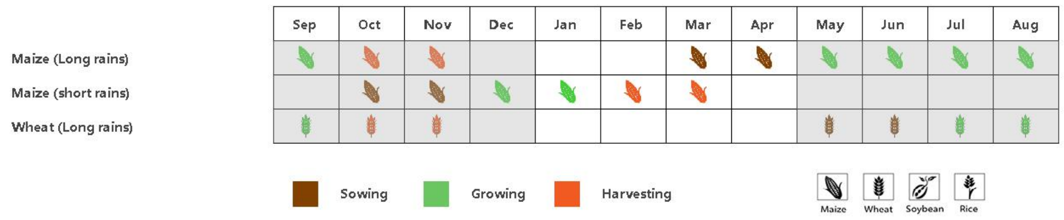
In the Eastern coastal region, the rainfall was greatly below average (-27%), which resulted in a decreased estimate for biomass (-13%) while the temperatures and sunshine were moderately below average (-0.1℃ and -3%, respectively). The NDVI values stayed below the 5YA from March. The CALF increased by 3% to 94%, while the maximum VCI was 0.69. Crop conditions were normal for both livestock and crops in the coastal areas, although the seeding of maize may have been delayed due to lack of rainfall.

The Highland agriculture zone recorded 394 mm of rain, which was below the 15YA (-17%). In combination with lower temperatures (TEMP -0.3°C) and RADPAR (-3%), a lower estimate for biomass resulted (-11%). The NDVI profile was near average during the the first half of the monitoring period, but was below average in the second half. The maximum VCIx value was recorded at 0.78. In this area, cropped arable land fraction kept unchanged. In general, the crop conditions were normal.

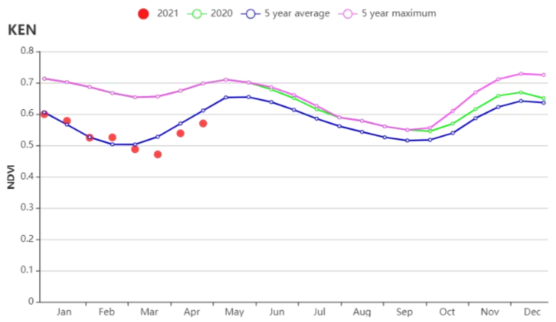
Agro-climatic indicators in the Northern region with sparse vegetation were similar to those in the Eastern coastal region. Precipitation was significantly below average at 210 mm, a decrease by 36%. Temperature was close to the 15YA, whereas RADPAR and BIOMSS were below average (-2% and -18% respectively). The NDVI profile also reflected that the adverse conditions in March and April had affected the sowing of maize. The maximum VCI was normal at 0.70 with a comparatively slight increase in CALF (+2%). Overall, the CropWatch indicators point to normal conditions.

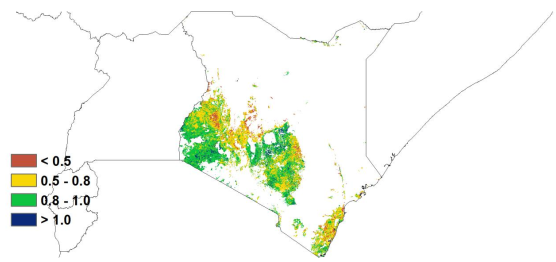
South-west of Kenya includes the districts Narok, Kajiado, Kisumu, Nakuru, and Embu which are major producers of long rain wheat and maize. The following indicator values were observed: RAIN 425 mm (-26%); TEMP 19.8 ℃ (-1.0°C); RADPAR 1290 MJ/m^2 (-2%). BIOMSS was 810 gDM/m^2 (-12%), CALF was unchanged and VCIx was 0.88. The crop conditions were normal.

Figure 3.24 Kenya's crop condition, January - April 2021

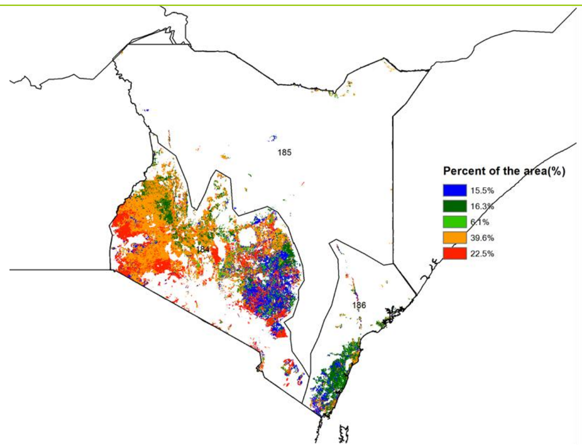


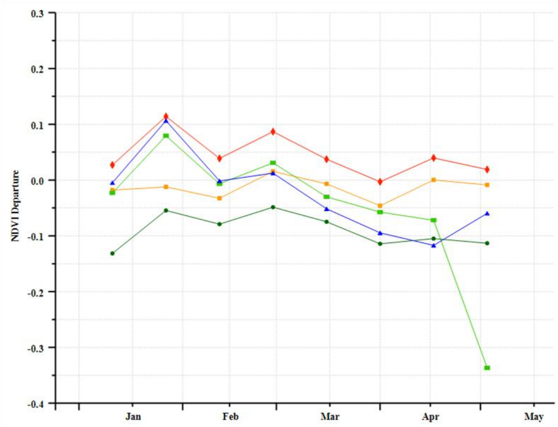
(a) Phenology of major crops



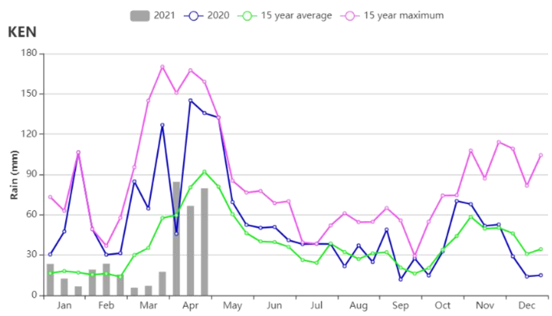


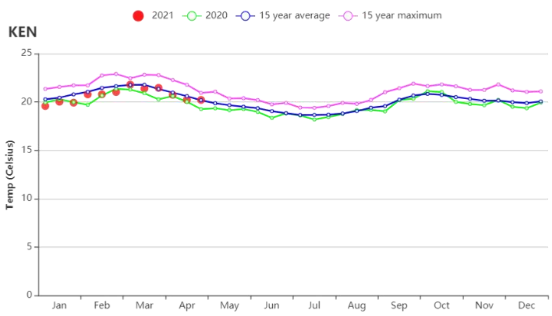
(b) Crop condition development graph based on NDVI (c) Maximum VCI



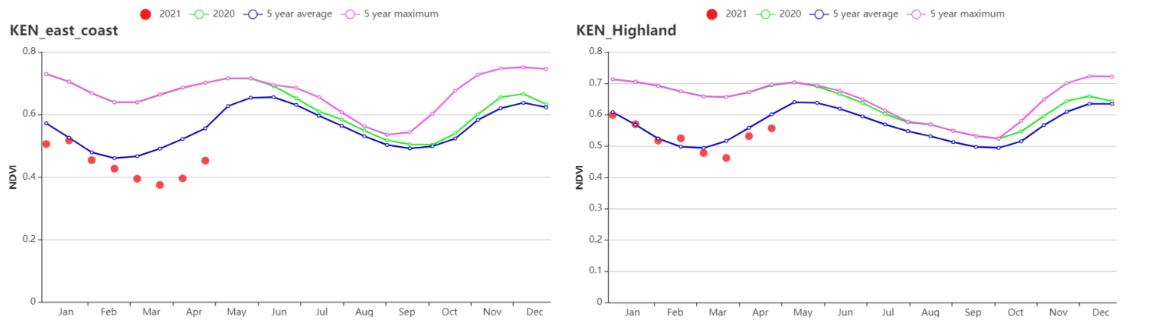


(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles

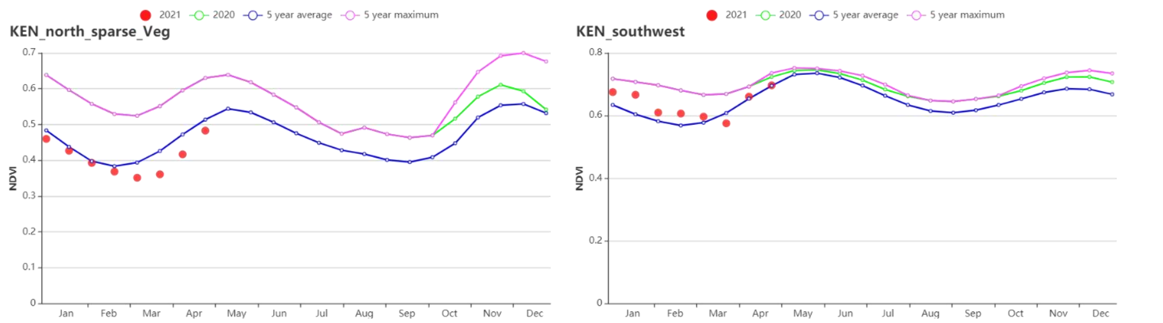




(f) Rainfall profiles (g) Temperature profiles



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



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

Table 3.39 Kenya's agro-climatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Coast	274	-27	26.7	-0.1	1310	-3	930	-13
Highland agriculture zone	394	-17	19.2	-0.3	1277	-3	740	-11
Nothern rangelands	210	-36	24.0	0.0	1319	-2	655	-18
South-west	425	-26	19.8	-1.0	1290	-2	810	-12

Table 3.40 Kenya's agronomic indicators by sub-national regions, current season's values and departure, January - April 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Coast	94	3	0.69
Highland agriculture zone	95	0	0.78
Nothern rangelands	79	2	0.70
South-west	100	0	0.88

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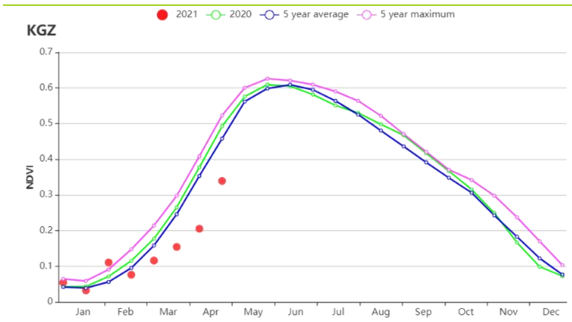
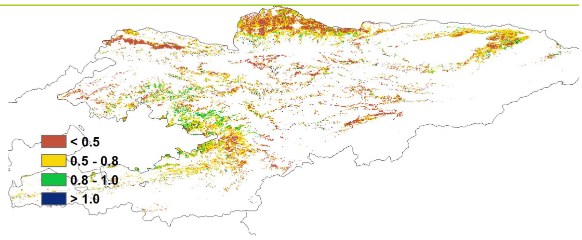
[KGZ] Kyrgyzstan

Only a small area of winter wheat is grown in Kyrgyzstan. Spring crops were planted in April in the southern part. In May, planting will start in the Naryn Region. Among the CropWatch agro-climatic indicators, RADPAR was slightly above average (+2%), RAIN was slightly below average (-1%), while TEMP was near average. The combination of the factors resulted in below-average BIOMSS (-3%) compared to the recent fifteen-year average. As shown by the NDVI development graph, the winter vegetation conditions were generally below average except for early January and early February. The spatial NDVI clustering profile shows that the same trends could be observed for all regions. From mid February to the end of the monitoring period, only 39.4% of the cropped areas had near-average crop conditions, mainly including the middle parts of Issyk-Kul and Naryn regions, southern parts of Jalal-Abad and northern parts of Osh regions. The rest of the regions all had below-average crop conditions till the end of the monitoring period. This situation is confirmed by the VCIx map which shows relative low values (<0.8) distributed across the whole country. The national average VCIx was 0.50, indicating unfavorable crop conditions. The cropped arable land fraction decreased by 55%. However, crop production is dominated by the summer crops in this country and conditions in general are assessed as close to normal due to average rainfall levels.

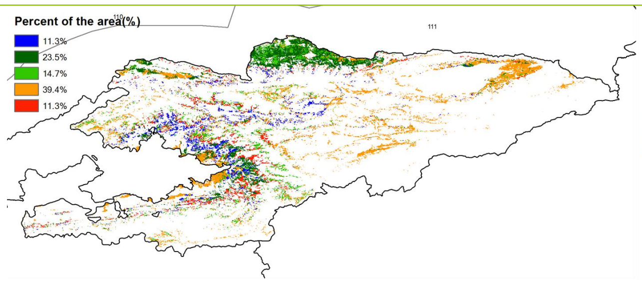
Figure 3.25 Kyrgyzstan's crop condition, January - April 2021

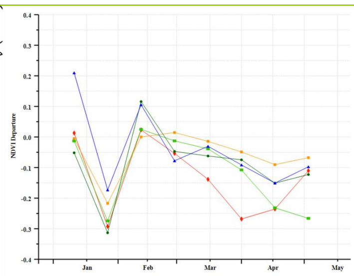
(a) Phenology of major crops



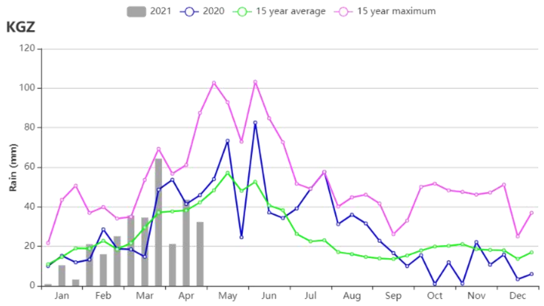


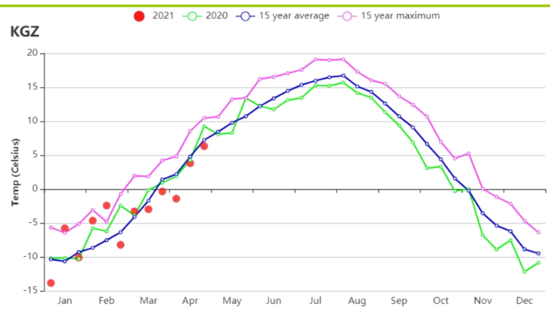
(b) Crop condition development graph based on NDVI (c) Maximum VCI





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





(f) Rainfall profiles

(g) Temperature profiles

Table 3.41 Kyrgyzstan's agroclimatic indicators, current season's values and departure from 15YA, January - April 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Kyrgyzstan	308	-1	-3.6	0.0	854	2	303	-3

Table 3.42 Kyrgyzstan's agronomic indicators, current season's values and departure from 5YA, January - April 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Kyrgyzstan	25	-55	0.50

[KHM] Cambodia

The reporting period covers the harvesting stages of wet-season early rice, medium rice, late rice and floating rice. The sowing of dry-season early rice was completed by the end of January, and the harvest was accomplished by the end of April, when the harvest of dry-season maize was concluded as well. Soybean had been planted in December and will be harvested in June/July.

Rainfall was generally below average (RAIN, -29%). It reached average levels by mid April only. Temperature was below average as well (TEMP -0.2ºC). The radiation was higher than the average (RADPAR +4%). As a consequence, the potential biomass was below average (BIOMSS -19%). At the same time, the cropped arable land fraction (CALF) was at 75%, with a 3% decrease. The national maximum VCI value was at 0.80.

According to the NDVI profile for the country, the NDVI values were below average in January, which was caused by the colder weather as shown in the temperature profile. Warmer temperatures in February helped increase NDVI. However, the deficit in precipitation, especially in the late March and early April, seems to have negatively influenced crop conditions. With the start of above-average rainfall in mid April, the NDVI values improved to average levels by the end of this reporting period. The spatial patterns of the NDVI profiles show that for 15.8% of crop land, mainly located in central Kampong Cham, NDVI departure values reached -0.2. These were the largest departures among all regions. Above-average NDVI was observed for 8.5% of the crop land mainly located in the lower reaches of Mekong River and the entrance of the tributaries of Tonle-Sap. All in all, the conditions for crop production in Cambodia were slightly unfavorable.

Regional analysis

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

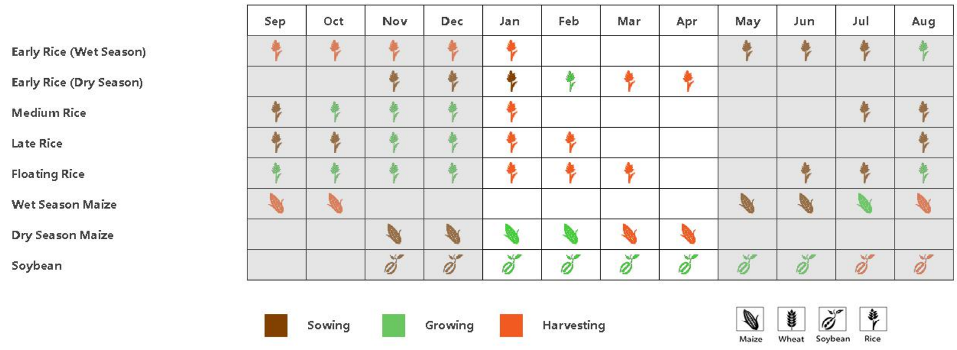
In the **Tonle Sap lake area**, rainfall was 31% below average and the temperature was slightly below average as well (TEMP, -0.1℃), which resulted in an lower biomass compared with the 15YA (BIOMSS, -21%). Additionally, both the NDVI values in January and in the middle of March and early April were lower than average. The former resulted from the cold weather in January and the latter was the consequence of a lack of water.

In the **Mekong valley**, the NDVI values trended below the 5YA until late April. Rainfall was below average by 32% and the temperature was 0.2 ℃ below average. Although the radiation was higher (RADPAR, +3%), the potential biomass was 18% slightly below average. Additionally, the cropped arable land fraction (CALF) in this region was at 78%, with a 6% decrease, which means the production conditions in this region were unfavorable.

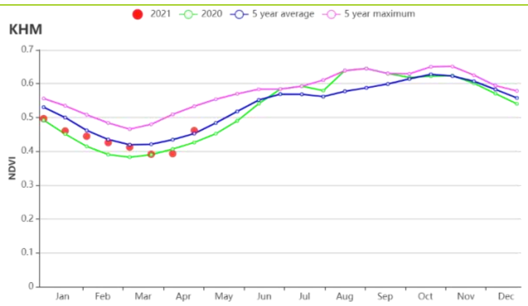
In the **Northern plain and northeast**, this season's NDVI values were always lower than the corresponding averages as well. As for the agro-climate indicators, the precipitation was below average (RAIN -21%) and the temperature was lower (TEMP -0.2℃). Although the radiation was 6% higher than average, the potential biomass was less than average (BIOMSS -19%). The cropped arable land fraction (CALF) was 91% and the maximum VCI value was at 0.75.

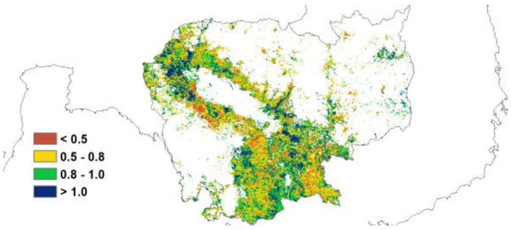
In the **Southwest Hilly region**, rainfall was below average (RAIN -39%) and the temperature was 0.1℃ lower. The resulting biomass was 21% lower than the average although solar radiation was higher (RADPAR +3%). The maximum VCI value was at 0.82. The NDVI for the region was always lower than average as well, which indicates unfavorable conditions.

Figure 3.26 Cambodia's crop condition, January - April 2021

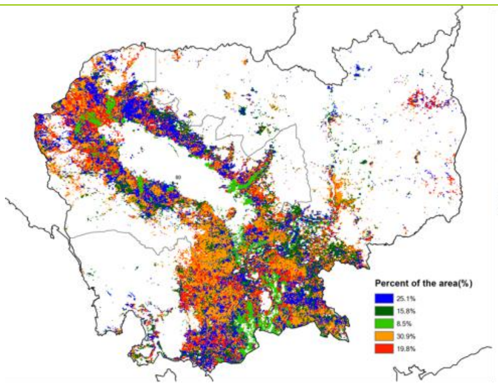


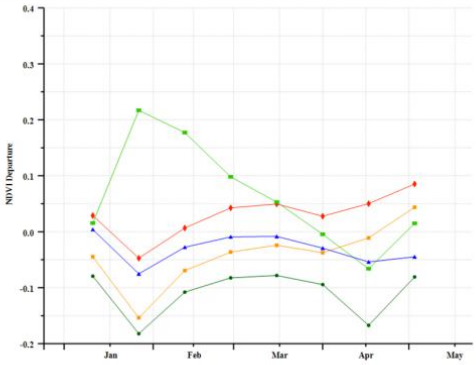
(a) Phenology of major crops



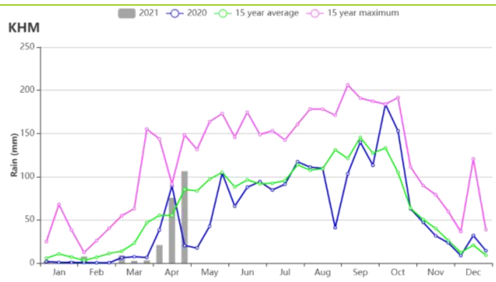


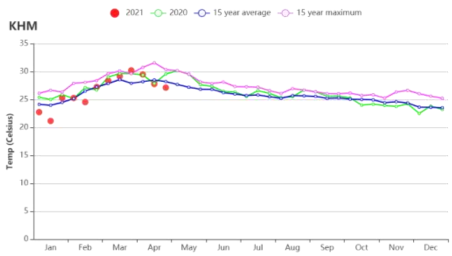
(b) Crop condition development graph based on NDVI (c) Maximum VCI



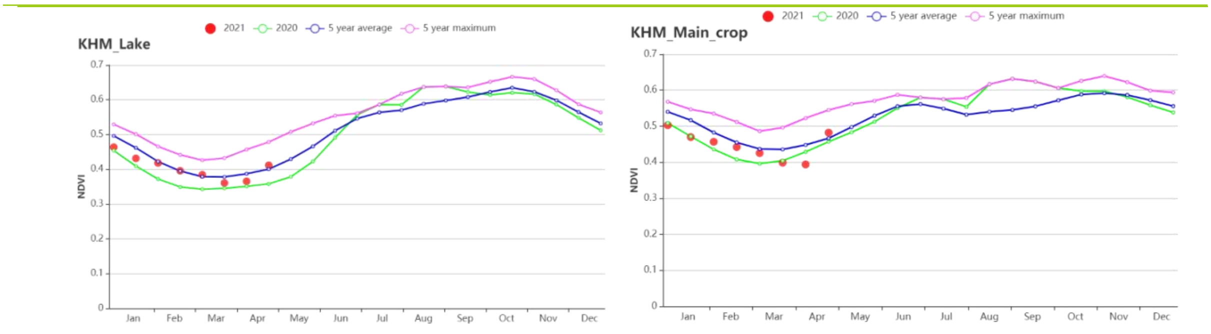


(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles

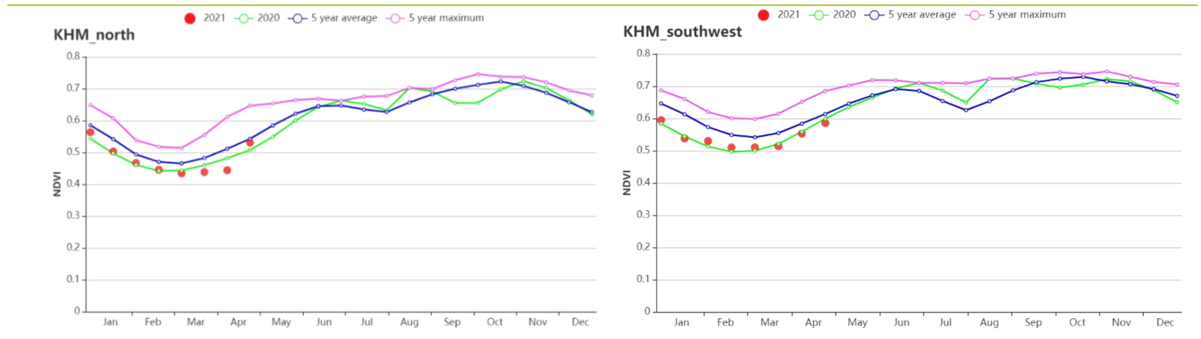




(f) Rainfall profiles (g) Temperature profiles



(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 3.43 Cambodia's agro-climatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Tonle-sap	223	-31	26.8	-0.1	1212	4	644	-21
Mekong valley	235	-32	27.2	-0.2	1207	3	683	-18
Northern plain and northeast	221	-21	26.4	-0.2	1242	6	571	-19
Southwest Hilly region	265	-39	24.8	-0.1	1212	3	768	-21

Table 3.44 Cambodia's agronomic indicators by sub-national regions, current season's values and departure from 5YA, January - April 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Tonle-sap	67	-1	0.81
Mekong valley	78	-6	0.81
Northern plain and northeast	91	0	0.75
Southwest Hilly region	97	0	0.82

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[LKA] Sri Lanka

This report covers the main growing season (Maha) and the harvesting of rice and maize from January to March, as well as the second season (Yala) early sowing of the crops in April. According to the CropWatch monitoring results, crop conditions were generally close to average for the monitoring period.

During this period, the country experienced the northeastern monsoon from January to February with cold and dry weather, as well as the first inter-monsoon rains from March to April with warm and wet conditions. At the national level, precipitation was significantly above the 15YA (RAIN +26%), temperature was average while radiation experienced a minor decrease (RADPAR -2%). The increase of rainfall mainly occurred in January, which ensured sufficient water supply for the crops and further contributed to the good crop condition. All of these indicators lead to an increase of BIOMSS (BIOMSS, 13%). The fraction of cropped arable land (CALF) was comparable to the 5YA. As shown in NDVI development graph, NDVI was generally close to average during the period, but was slightly below average in March. According to the last bulletin, the abnormal low values in January are outliers that resulted from cloud cover. The maximum VCI for the whole country was 0.97.

As shown by the NDVI clusters map and profiles, nearly 90% of country's cropland showed near-zero NDVI departures during the whole period except for January, suggesting a favorable situation of crop conditions. 10.3% of cropland showed marked negative NDVI departures from February to early April. These croplands were mainly distributed along the east coast of the country, including most of Eastern Province and the areas around Polonnaruwa.

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.

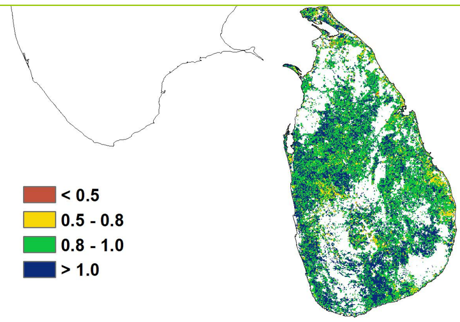
In the Dry zone, the recorded RAIN (581 mm) was 30% above average. TEMP was on average and RADPAR was down by 2%, while BIOMSS increased by 15% as compared to the 15YA. CALF was near the 5YA level with 99% of cropland utilized. NDVI followed a similar trend as the whole county. The VCIx for the zone was 0.96. Overall, crop conditions were near average for this zone.

For the Wet zone, RAIN (936 mm) was 20% above average as compared to the 15YA. TEMP was average and RADPAR dropped by 3%. BIOMSS was 8% above the 15YA and cropland was fully utilized. Apart from the outliers in January, NDVI values were close to average for the whole period. The VCIx value for the zone was 1.00. Crop conditions were favorable for this zone.

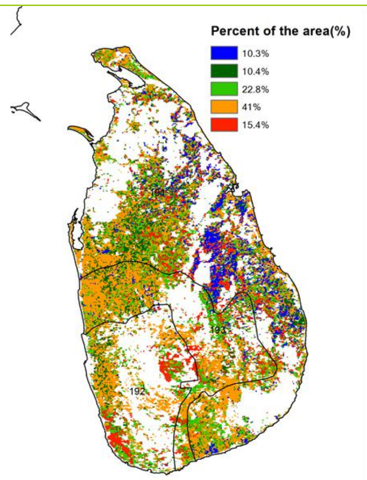
The Intermediate zone also experienced sufficient rain (842 mm) with a 28% increase from the 15YA. TEMP was 0.1℃ slightly below average and RADPAR down by 4% compared to the 15YA. With full use of cropland, BIOMSS was 8% above average. The NDVI values were similar to the Wet zone and the VCIx value for this zone was 0.98. Conditions of crops were assessed as average.

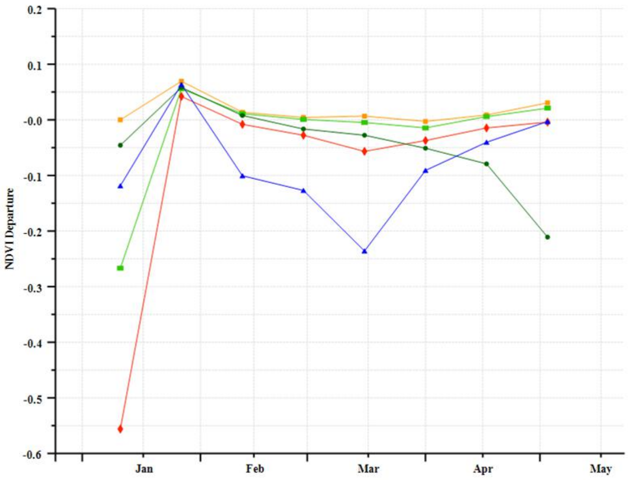
Figure 3.27 Sri Lanka's crop condition, January - April 2021

(a) Phenology of major crops

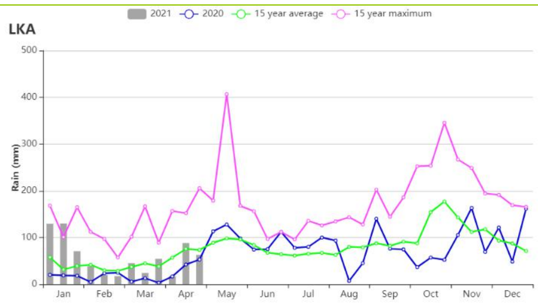


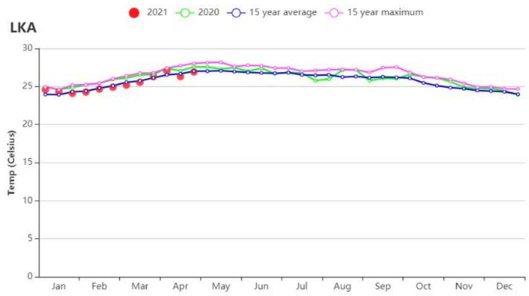
(b) Crop condition development graph based on NDVI (c) Maximum VCI



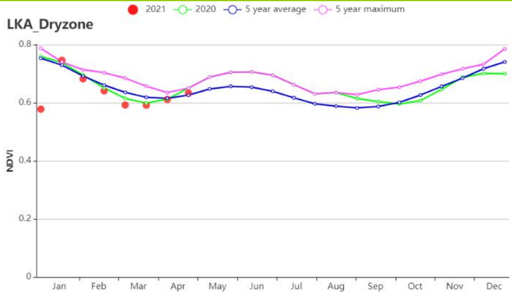


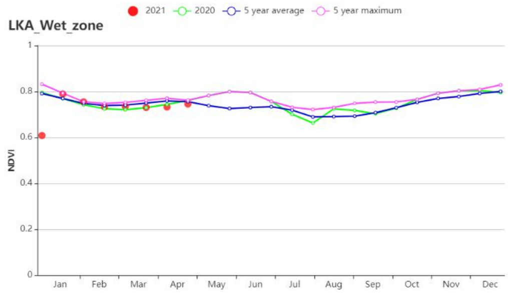
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



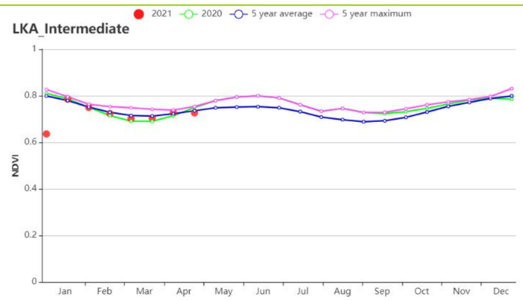


(f) Rainfall profiles (g) Temperature profiles





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



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

Table 3.45 Sri Lanka's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Dry zone	581	30	25.7	0.0	1251	-2	1208	15
Wet zone	936	20	24.7	0.0	1150	-3	1246	8
Intermediate zone	842	28	23.9	-0.1	1130	-4	1334	8

Table 3.46 Sri Lanka's agronomic indicators by sub-national regions, current season's values and departure from 5YA, January - April 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Dry zone	99	0	0.96
Wet zone	100	0	1.00
Intermediate zone	100	0	0.98

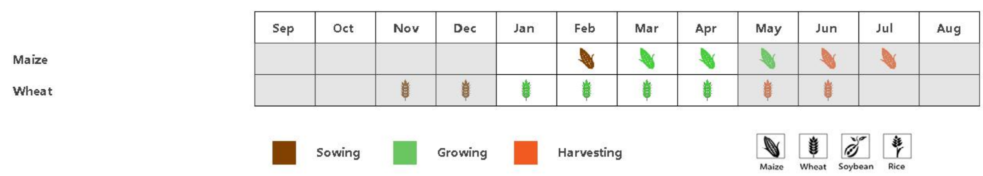
[MAR] Morocco

This reporting period covers the main growing stage of wheat. Maize planting started in February. The CropWatch agro-climatic indicators show that the recorded rainfall was 292 mm, 36% above the last 15-year average (15YA). The rainfall index graph shows that the rainfall was well distributed across the reporting period. The average temperature was near the 15YA. RADPAR was slightly lower than the 15YA by 3.8%. All of these indicators lead to incease of BIOMSS by 11%. The nationwide NDVI crop development graph shows that the crop conditions were initially around the 5-year average (5YA) and then improved to above-average conditions in March and then declined to 5YA conditions in April. The NDVI profile map indicates that about 57.4% of cultivated areas were above the 5YA, 31% fluctuated around the 5YA, and 11.2% were below the 5YA. The VCIx was at 0.88, and the CALF exceeded the 5YA by 19%. Conditions for wheat production were favorable.

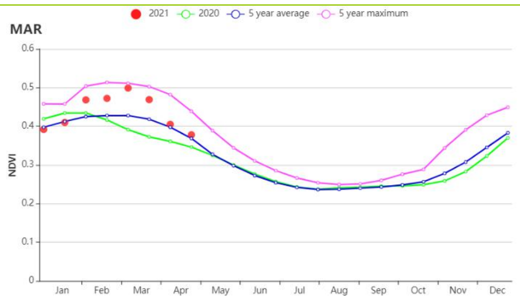
Regional analysis

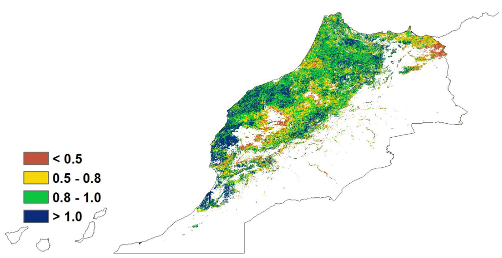
Based on the cropping system, climatic zones and topographic conditions, Morocco is subdivided into four agro-ecological zones (AEZ). Only three are relevant for crops: Sub-humid northern highlands including central Centre-Nord Region and northern Centre-Sud, Warm semiarid zone covering the regions of 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 an increase in rainfall (43%, 22% and 41%, respectively) while the temperature was close to the 15YA. RADPAR was were slightly below the 15YA (RADPAR: -5%, -3% and -5%) in the three zones.All of these indicators lead to an above-average BIOMSS(BIOMSS: 16%, 9% and 16%). The NDVI-based crop condition development graphs show similar conditions for the three zones following the national crop development NDVI graph. The CALF was above the 5YA (17%, 33% and 9%, respectively) with good VCIx (0.90, 0.87 and 0.88, respectively) in the three zones, implying favourable crop conditions.

Figure 3.28 Morocco's crop condition, January - April 2021

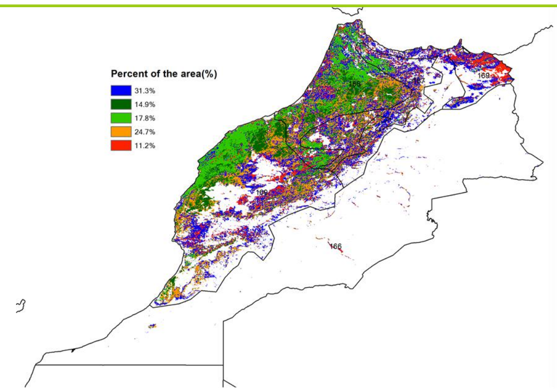


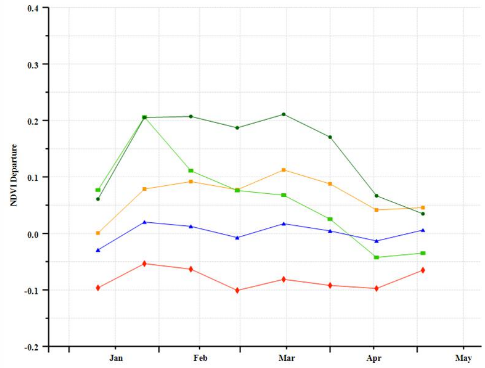
(a) Phenology of major crops





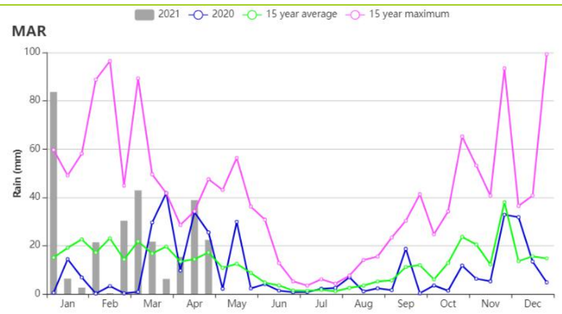
(b) Crop condition development graph based on NDVI (c) Maximum VCI





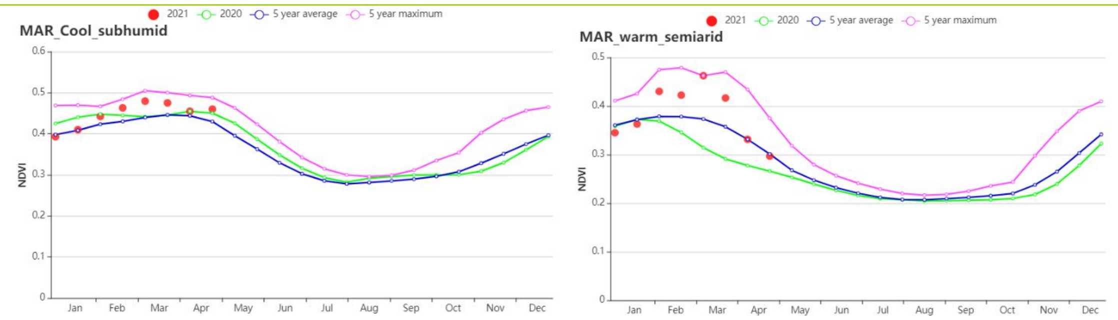
(d) Spatial NDVI patterns compared to 5YA

(e) NDVI profiles

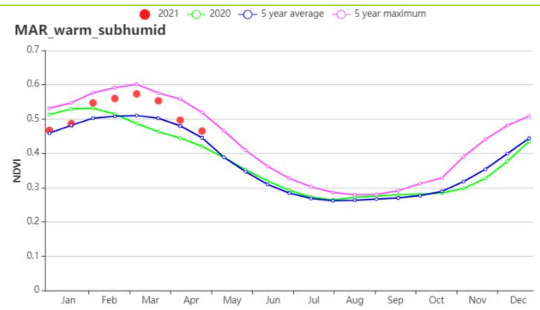


(f) Rainfall profiles

(g) Temperature profiles



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



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

Table 3.47 Morocco's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Sub-humid	432	43	9	0	909	-5	690	16

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
northern highlands								
Warm semiarid zones	169	22	12	0	1037	-3	453	9
Warm sub-humid zones	386	41	10	0	920	-5	687	16

Table 3.48 Morocco's agronomic indicators by sub-national regions, current season's values and departure from 5YA, January - April 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Sub-humid northern highlands	75	17	0.90
Warm semiarid zones	56	33	0.87
Warm sub-humid zones	83	9	0.88

[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.

The CropWatch agroclimatic indicators show that TEMP and RADPAR were close to average and RAIN was below average (-29%), which was unfavorable to crop growth. Accordingly, BIOMSS decreased by 19% as comparted to the 15YA. However, VCIx was relatively low (0.64) and CALF decreased by 16%. According to the National Weather Service of Mexico, since January, the national rainfall has decreased by about one third compared with the average level of the same period in previous years, resulting in the worst drought in 30 years in some parts of Mexico. According to satellite data, the drought was more severe in the north than in the south. It was relatively mild in Yucatán, Chiapas and Campeche.

At the national scale, the NDVI development graph trailed below average between January and April. But the conditions varied greatly across the country. According to its spatial pattern, the VCIx in the south was higher than in the north. Very high values (greater than 1.0) occurred mainly in the north of the Yucatán provinces, whereas extremely low values (less than 0.5) occurred in the drier north-east and center of the country. The VCIx in other regions of Mexico was moderate, with values between 0.5 and 1.0. As shown in the spatial NDVI profiles and distribution map, about 85.9% of the total cropped areas were below average during the entire monitoring period, mainly distributed in the coastal areas of Mexico. Out of all the agricultural production areas in Mexico, Tamaulipas had seen the worst negative departure in crop growth. The Yucatán provinces were the only region for which a positive departure was observed.

Although wheat and maize production are irrigated during the winter months, crop conditions were unfavorable for Mexico due to a severe drought.

Regional analysis

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

The Arid and semi-arid region, located in northern and central Mexico, accounts for about half of planted areas in the country. According to the NDVI development graph, crop condition in this region was below average during the reporting period. VCIx was relatively low with a value of 0.50 and CALF decreased by 44% compared with the 5YA. RAIN decreased by 45%, and TEMP and RADPAR were close to average. The decrease of RAIN and CALF resulted in a decrease of BIOMSS (-24%) and a low VCIx. The Arid and semi-arid region was also the one which was most affected by drought conditions.

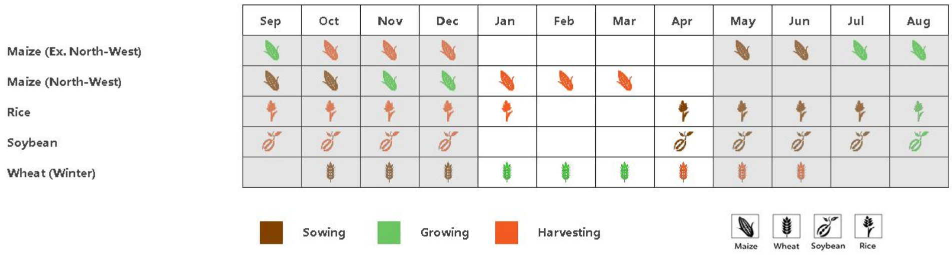
The region of Humid tropics with summer rainfall is located in southeastern Mexico. RAIN was significantly below average (-19%), TEMP was 0.3℃ warmer and RADPAR was near the 15YA, which resulted in a decrease of BIOMSS (-9%). As shown in the NDVI development graph, crop conditions were slightly above average in February and March. The drought in this area was mild and the VCIx (0.92) confirmed favorable crop conditions in this region.

The Sub-humid temperate region with summer rains is situated in central Mexico. According to the

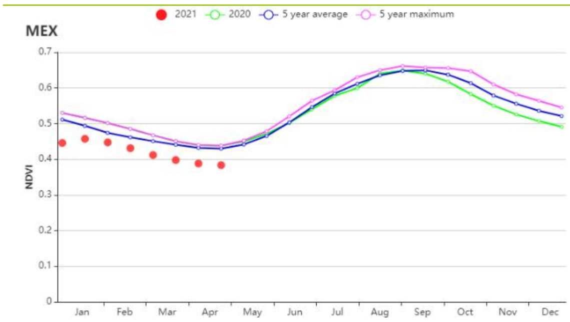
NDVI development graph, crop conditions were below average in this region. The agro-climatic condition showed that RAIN decreased by 27%, TEMP increased by 0.3°C, and RADPAR increased by 2% compared to the 15YA. BIOMSS also decreased by 13% and CALF was 41%. The VCIx in these region was low, only 0.60.

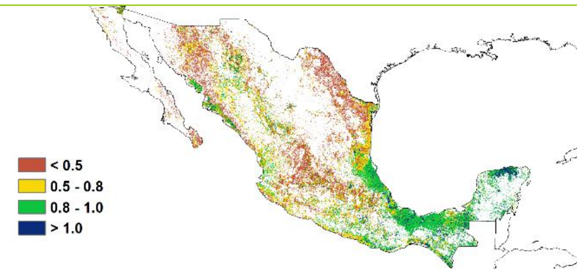
The region called Sub-humid hot tropics with summer rains is located in southern Mexico. During the monitoring period, crop conditions were below average since January, as shown by the NDVI time profiles. Agro-climatic conditions showed that RAIN was slightly below average (-23%) while TEMP and RADPAR were near average (+0.1℃ and 1% respectively). The VCIx in these areas was 0.73 and BIOMSS was below average by 18%.

Figure 3.29 Mexico's crop condition, January - April 2021

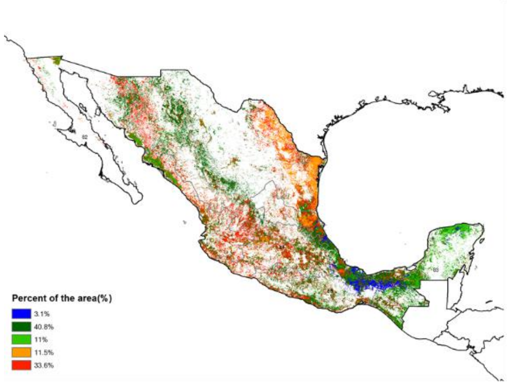


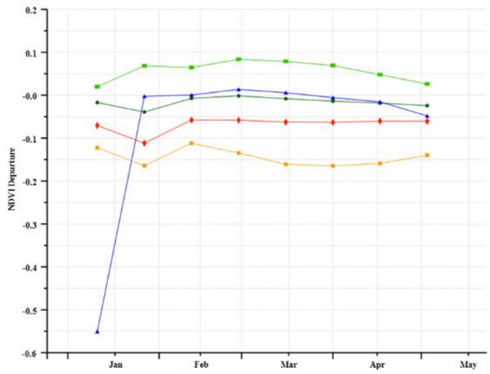
(a) Phenology of major crops



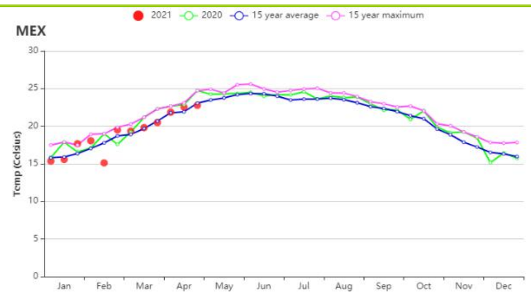


(b) Crop condition development graph based on NDVI (c) Maximum VCI



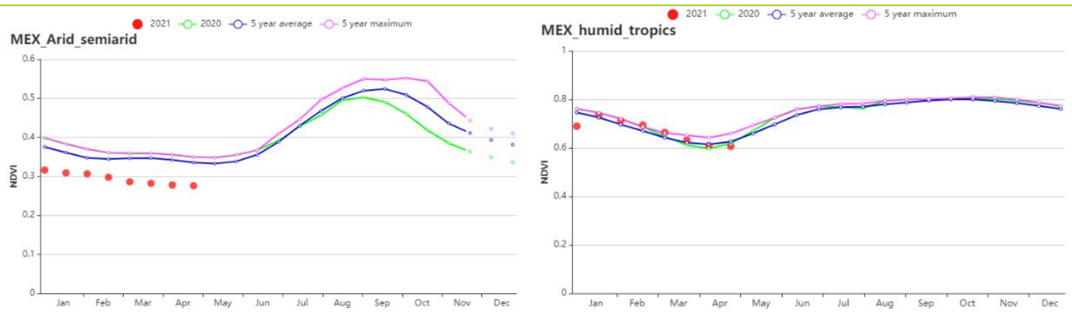


(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles

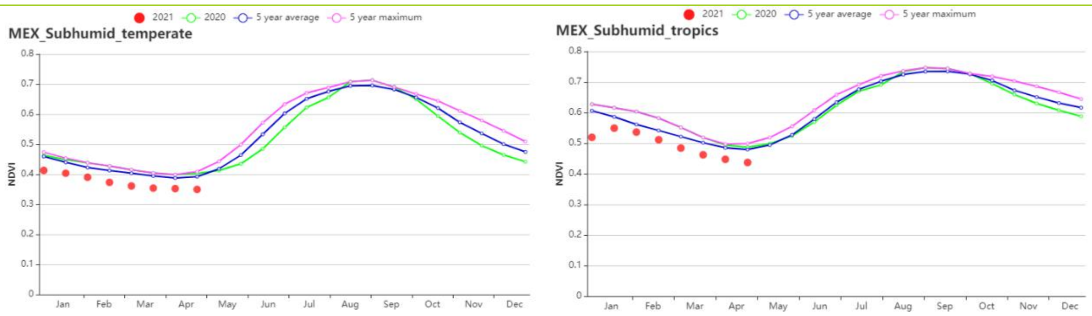


(f) Rainfall profiles

(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 tropic with summer rains (right))

Table 3.49 Mexico's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Central region	38	-45	15.8	-0.2	1232	0	228	-24
Dry region	192	-19	23.5	0.3	1156	-1	677	-9
Dry and irrigated cultivation region	55	-49	18.3	0.3	1333	2	287	-27
Dry and grazing region	92	-23	20.4	0.1	1263	1	326	-18

Table 3.50 Mexico's agronomic indicators by sub-national regions, current season's values and departure from 5YA, January - April 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Central region	22	-44	0.50
Dry region	99	0	0.92
Dry and irrigated cultivation region	41	-15	0.60
Dry and grazing region	76	-7	0.73

[MMR] Myanmar

This monitoring period covers the main growth periods and the harvest of maize, rice (second) and wheat. Compared to the 15YA, RAIN and RADPAR decreased (-30% and -3% respectively), while TEMP was average (+0.3°C). As a result, potential cumulative biomass (BIOMSS) was 11% below average because of insufficient precipitation. CALF decreased compared with the 5YA (-23%). NDVI also showed a slight decrease compared with the 5-year average during the entire period except for April, when it started to improve to average levels, aided by close-to-normal rains that month. According to VCIx, the southern region was doing better than the northern one. As to the spatial distribution of NDVI profiles, crop conditions for about 30.5% were above average and over half (56.0%) of the area was below the average during the whole monitoring period. The overall crop conditions in this monitoring period were unsatisfactory for the Central Plains and the Hills region, but normal in the Delta and Southern Coast region.

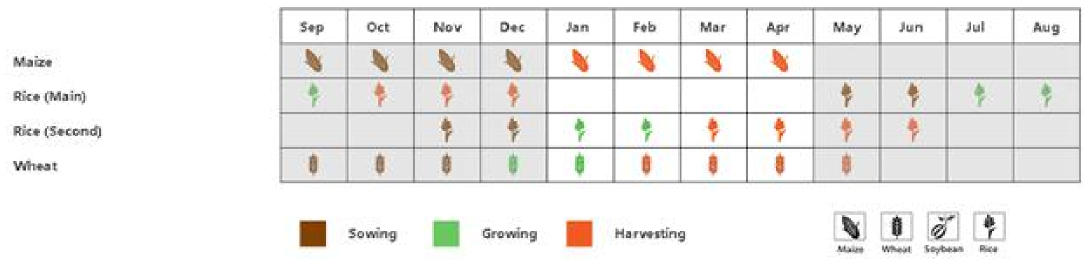
Regional analysis

The Central Plain had a marked rainfall deficit (RAIN, -33%), with RADPAR decreased by 3% and TEMP increased by 0.6℃ compared to the 15YA. BIOMSS was 16% lower than the 15YA, the sharpest drop among the three sub-national regions. CALF was 56%. It had decreased by 23% compared with the 5YA and the VCIx was 0.65. According to the NDVI profile, NDVI was below the 5YA during the whole monitoring. Crop conditions in this region were unsatisfactory.

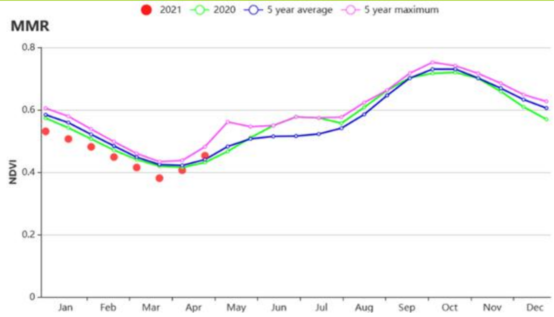
The Hills region had below-average RAIN (102 mm, -33%). RADPAR was 1% below the 15YA while TEMP increased by 0.2°C. BIOMSS was 16% below the 15YA caused by the insufficient precipitation. CALF showed that 90% of the crop land was utilized. This was 2% below the 5YA. The VCIx was 0.82. The NDVI values were close to the 5YA during the whole period. Crop conditions are assessed as below the average.

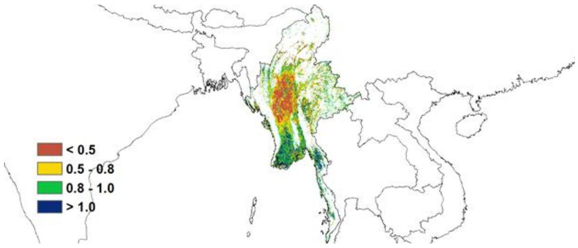
The Delta and Southern Coast region had the highest RAIN (172 mm) compared with the other two sub-national regions, but it was still 25% below the 15YA. TEMP increased by 0.1 ℃ and RADPAR decreased by 4%. BIOMSS was 11% above the 15YA. CALF showed that 89% of the crop land was utilized, a 2% increase above the 5YA. The NDVI values were above the 5YA during the whole period. The VCIx was 0.94. Crop conditions in this region were above average.

Figure 3.30 Myanmar's crop condition, January - April 2021

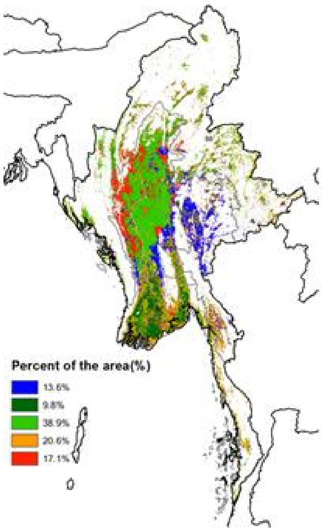


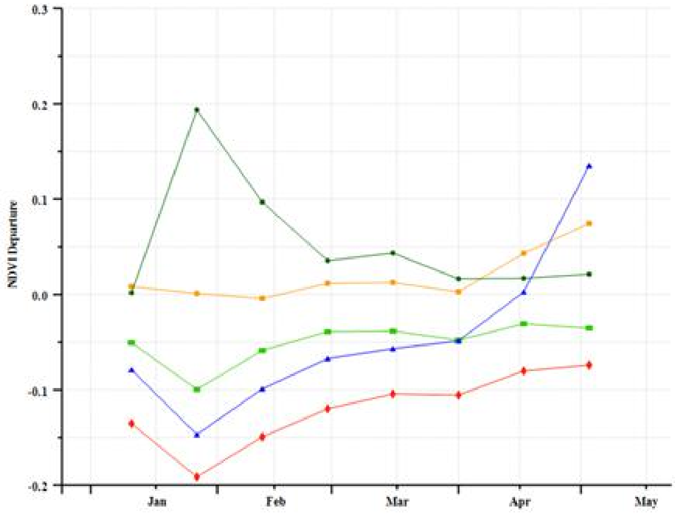
(a) Phenology of major crops



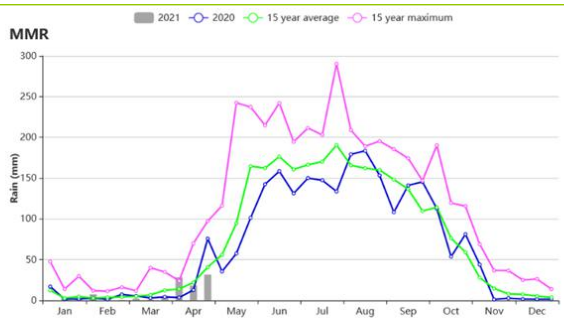


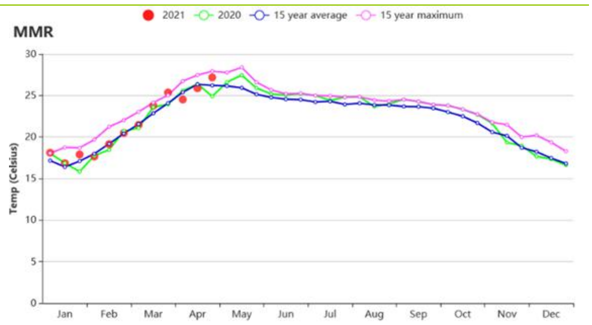
(b) Crop condition development graph based on NDVI (c) Maximum VCI



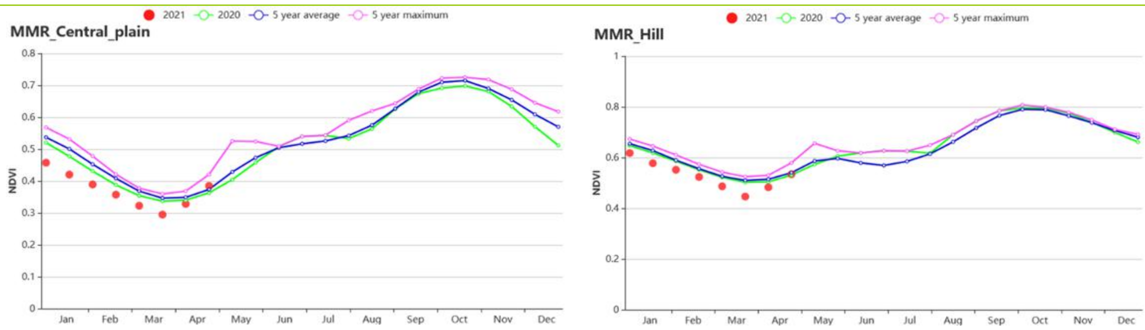


(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles





(f) Rainfall profiles (g) Temperature profiles



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

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

Table 3.51 Myanmar's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Central Plain	49	-33	22.6	0.6	1233	-3	267	-16
Hills region	102	-33	19.1	0.2	1211	-1	366	-16
Delta and Southern-coast	172	-25	26.2	0.1	1239	-4	486	11

Table 3.52 Myanmar's agronomic indicators by sub-national regions, current season's values and departure from 5YA, January - April 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Central Plain	56	-23	0.65
Hills region	90	-2	0.82
Delta and Southern-coast	89	2	0.94

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

[MNG] Mongolia

During this monitoring period, no crops were grown in Mongolia due to cold winter weather. Mongolia's climate is harsh, with farming only possible during the warm season between May and October, with temperatures approaching 0ºC in late April. Spring wheat and potatoes are the main crops in Mongolia. Planting starts in May. Among the CropWatch agroclimatic indicators, RAIN and TEMP were above average (+83% and +1.4°C), while RADPAR was below average (-6%). The combination of the factors resulted in a high BIOMSS (10%) compared to the fifteen-year average. The above-average rainfall helped establish favorable soil moisture conditions for the summer crops.

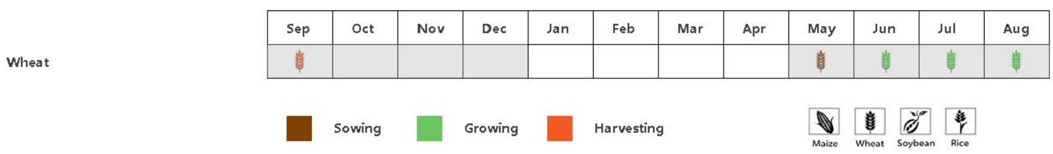
Regional analysis

Khangai Khuvsgul region: NDVI was above the five-year average from February to March and close to the average in January and early April. RAIN and TEMP were above average (+94% and +1.5°C), while RADPAR was below average (-6%). The BIOMSS index decreased by -3% compared to the five-year average. The maximum VCI index was 0.83. Overall crop prospects are normal.

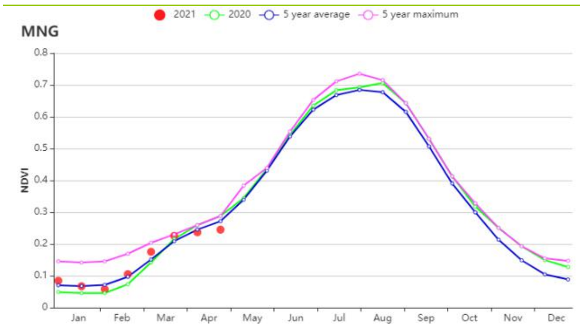
Selenge-Onon region: Crop condition was above the five-year average in early January and March and below the five-year average in early February and April in this region. Accumulated rainfall and temperature were above average (RAIN +86% and TEMP +1.3°C) and RADPAR was below average (-6%). The BIOMSS index increased by 10% compared to the five-year average. The maximum VCI index was 0.95. Overall crop prospects are favorable.

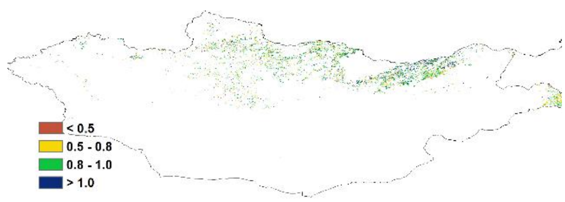
Central and Eastern Steppe Region: According to the NDVI development graph, crop condition in this region was above the five-year average in early January and March and below the five-year average in February and April. RAIN and TEMP were above average (+76% and +1.3°C), while BIOMSS index increased by 2% and RADPAR was below the five-year average (-5%) in this region. The maximum VCI index was 0.82. In general, the overall outcome for the crops is favorable.

Figure 3.31 Mongolia's crop condition, January - April 2021



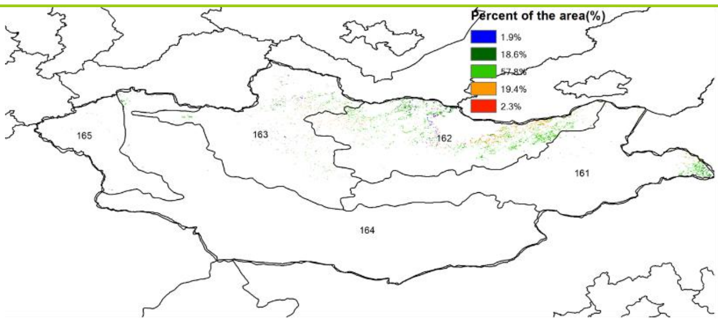
(a) Phenology of major crops

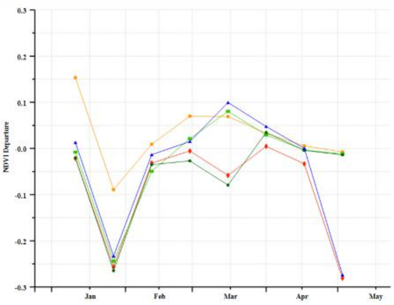




(b) Crop condition development graph based on NDVI

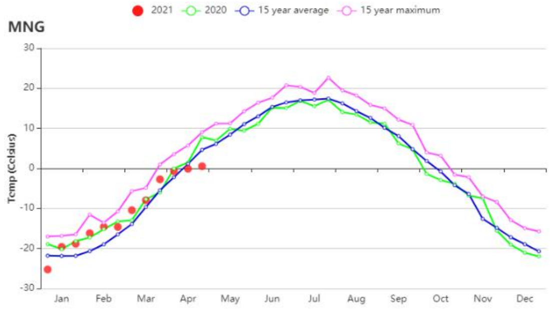
(c) Maximum VCI





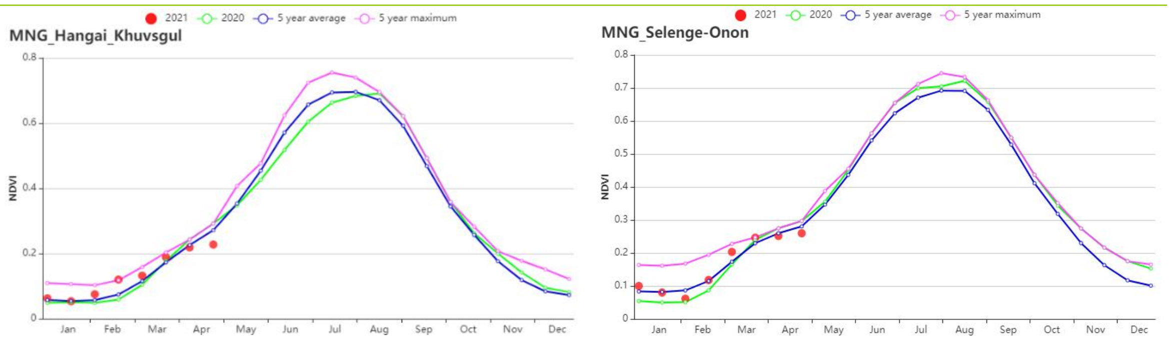
(d) Spatial NDVI patterns compared to 5YA

(e) NDVI profiles

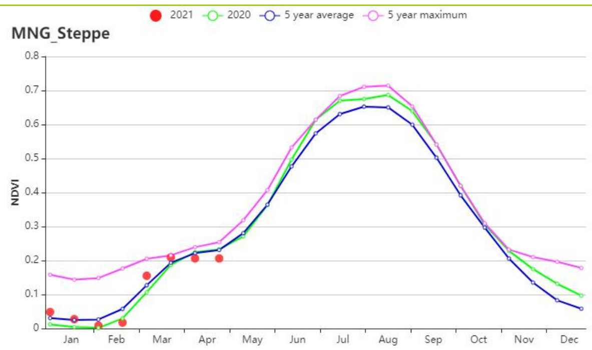


(f) Rainfall profiles

(g) Temperature profiles



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



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

Table 3.553 Mongolia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Hangai Khuvsgul	122	94	-12.1	1.5	758	-6	150	-3

Region								
Selenge-Onon Region	123	86	-10.2	1.3	738	-6	150	10
Central and Eastern Steppe Region	113	76	-10.5	1.3	777	-5	153	2
Altai Region	147	24	-11.3	0.9	721	-3	198	11
Gobi Desert Region	77	25	-10.2	1.6	727	-3	215	23

Table 3.554 Mongolia's agronomic indicators by sub-national regions, current season's values and departure from 5YA, January - April 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Hangai Khuvsgul Region	2	107	0.83
Selenge-Onon Region	4	251	0.95
Central and Eastern Steppe Region	0	-58	0.82
Altai Region	0	67	0.61
Gobi Desert Region	1	400	0.82

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[MOZ] Mozambique

The period from January to April 2021 corresponds to the main production season of rice and maize in the central and northern provinces. In the south, maize and rice harvest had started already in February, whereas in the north, it will be completed in May. According to CropWatch agroclimatic indicators, Mozambique recorded near-average rainfall, temperatures and solar radiation when compared to the 15YA (RAIN -3%; TEMP -0.1°C; RADPAR, +1%). Together, these conditions led to a decrease in the total potential biomass production (BIOMSS -1%).

According to the development graph based on NDVI, crop conditions at the country level were below the 5YA from the beginning of the monitoring period until mid-March when crop conditions began to improve. Even with a considerable amount of rainfall, only 31% (mostly the provinces of Gaza and Northern Sofala) of the cropped area presented favourable crop conditions, as shown by the NDVI profiles. Subsequently, the remaining regions improved to close to, but still below average levels in early April. A major section of the country recorded low VCIx values (less than 0.8). However, better VCIx values (close to 1) were observed in some regions of Inhambane, Gaza and Sofala provinces. Even though the recorded CALF was near the average and a better overall VCIx (0.93) was observed, the combined effects of the tropical cyclones and storms (i.e., Eloise, Chalane and Guambe) that hit the country's coastal regions of Sofala, Inhambane and Gaza provinces contributed to the poor crop conditions recorded during the monitoring period. Overall, crop conditions were average in the south and centre of the country, but below average in the north.

Regional analysis

CropWatch subdivided Mozambique into five agroecological zones including the Buzi Basin, Northern High-altitude Areas, Low Zambezi River Basin, Northern Coast, and Southern Region. This subdivision was based on the cropping system, topography and climate.

The **Buzi basin** experienced above-average rainfall (RAIN +11%) and radiation (RADPAR +1%) and below-average temperatures (TEMP -0.6°C). In this region, the effects of the tropical storm Chalane and tropical cyclone Eloise contributed to the reduction in the total potential biomass production (BIOMSS -5%) compared with the 15YA. In this region, the VCIx was 0.91 and CALF was near average. The crop condition development graph based on NDVI shows that crop conditions were near average at the beginning of the monitoring period and subsequently declined to levels below the 5YA.

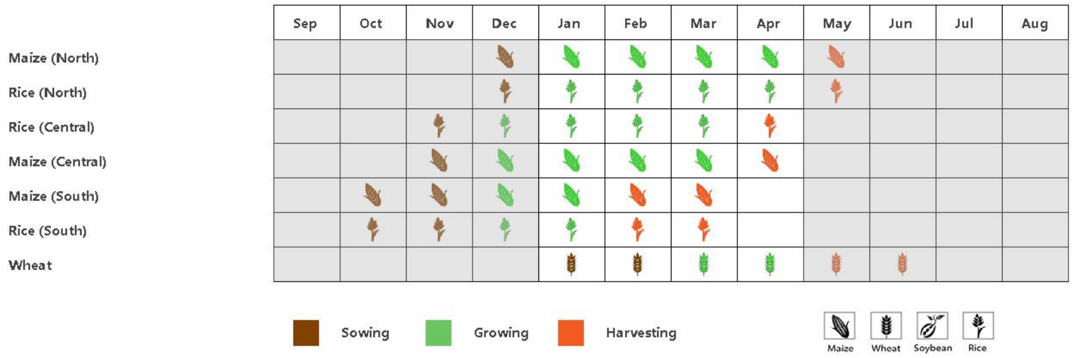
In the **Northern high-altitude areas,** the recorded rainfall was below the 15YA (RAIN -5%), the temperature was near average and the radiation increased by about 3%. Influenced mostly by the decrease in rainfall, BIOMSS also close to average. In this region, CALF was near average and a maximum VCIx of 0.95 was observed. The crop condition development graph indicates that the crop conditions were below the 5YA during the entire monitoring period. However, the crop conditions started to improve in early March, resulting in normal prospects.

With both rainfall and radiation increasing (RAIN +9% and RADPAR +2%) and slightly below-average temperatures (TEMP -0.3ºC), the resulting biomass estimate was 1% above the 15YA in the **Lower Zambezi River basin**. In this region, CALF was also near the average and the recorded maximum VCIx was 0.96. Furthermore, the crop condition development graph indicates favourable crop conditions for almost the entire monitoring period.

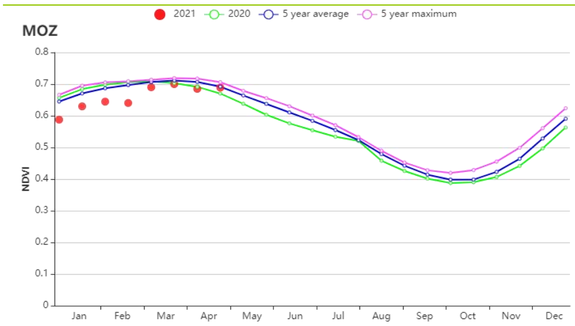
The **Northern coast** region recorded below-average precipitation (RAIN -18%). The temperatures increased by about 0.4 ℃ and the radiation was near average. The agroclimatic indicators show that CALF was near average and the total VCIx was 0.92. In this region, crop conditions were below the 5YA from the beginning of the monitoring period till late April, when the crop conditions improved to be near average, showing a slight recovery.

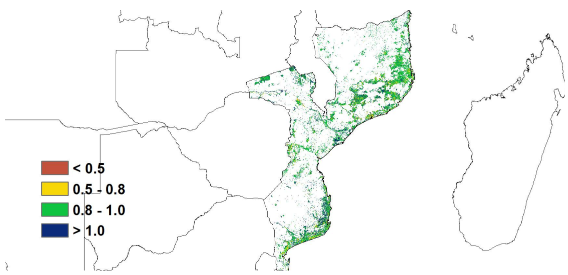
In the **Southern region,** rainfall increased by 14% while the temperature decreased by about 0.2°C. The radiation was near average. Even with favourable rainfall conditions, the total biomass production recorded a decrease of 2%. With CALF increasing by about 1%, this region recorded a VCIx of 0.95. In contrast to the other agroecological regions, the South region showed favourable crop conditions throughout the monitoring period.

Figure 3.32 Mozambique's crop condition, January - April 2021

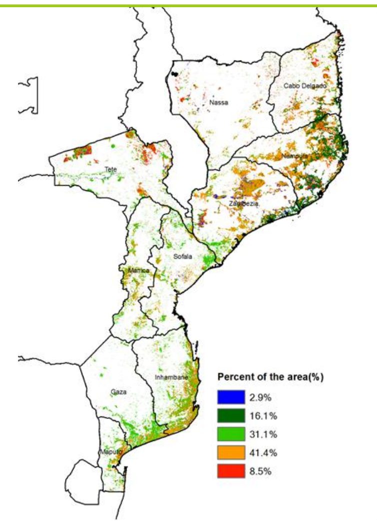


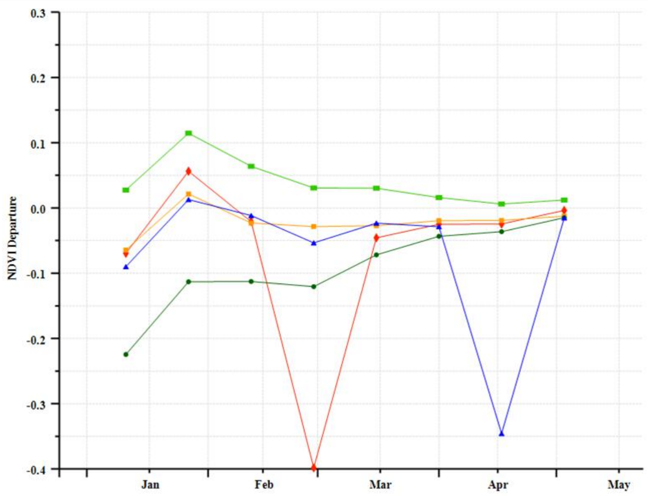
(a) Phenology of major crops





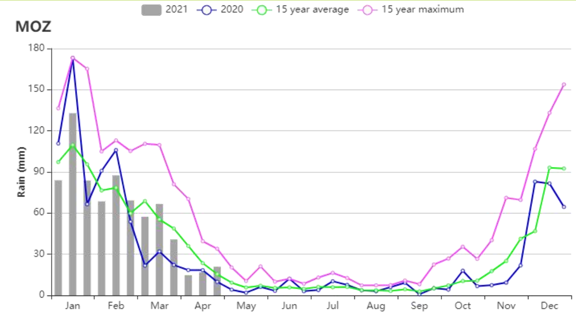
(b) Crop condition development graph based on NDVI (c) Maximum VCI

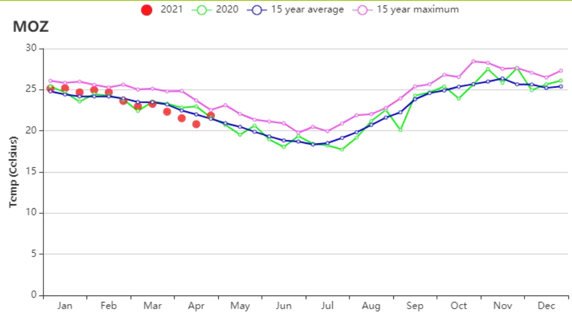




(d) Spatial NDVI patterns compared to 5YA

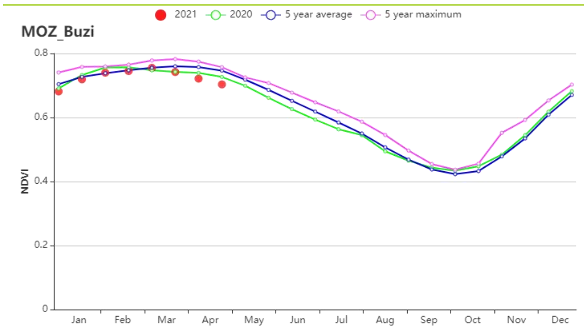
(e) NDVI profiles

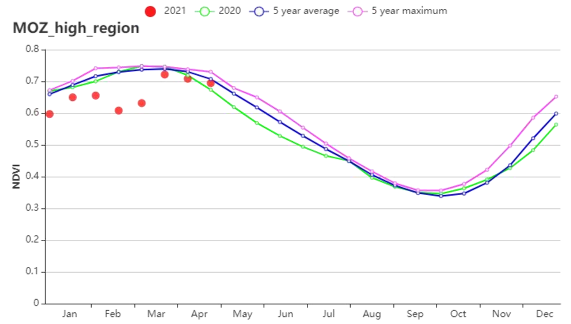




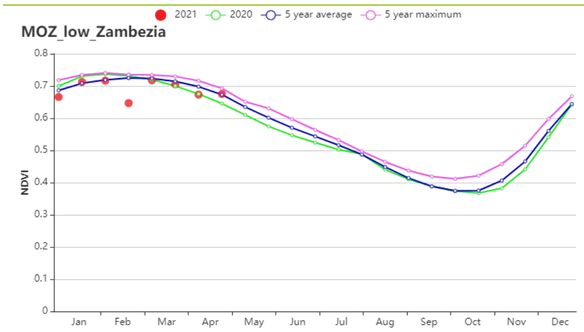
(f) Rainfall profiles

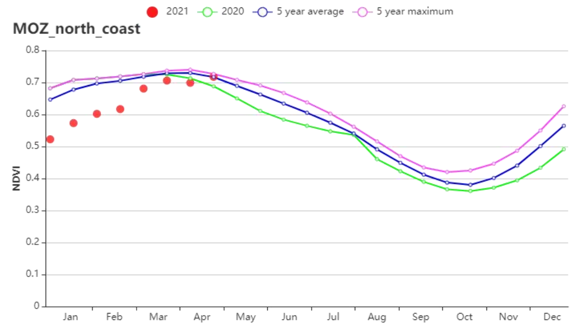
(g) Temperature profiles



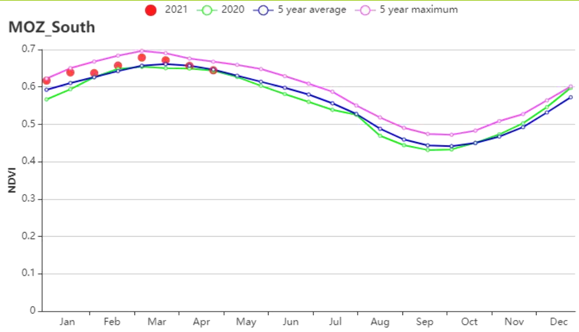


(h) Crop condition development graph based on NDVI-Buzi basin (left), and Northern high-altitude areas (right)





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



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

Table 3.55 Mozambique's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Buzi basin	763	11	21.1	-0.6	1248	1	1127	-5
Northern high-altitude areas	945	-5	21.9	0.0	1168	3	1379	0
Low Zambezia River basin	837	9	23.1	-0.3	1215	2	1270	1
Northern coast	703	-18	24.2	0.4	1208	0	1432	0
Southern region	542	14	24.5	-0.2	1209	0	1061	-2

Table 3.56 Mozambique's agronomic indicators by sub-national regions, current season's values and departure from 5YA, January - April 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Buzi basin	100	0	0.91
Northern high-altitude areas	100	0	0.95
Low Zambezia River basin	100	0	0.96
Northern coast	100	0	0.92
Southern region	99	1	0.95

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[NGA] Nigeria

This reporting period falls between the end of harvest of irrigated cereals and the onset of the rainy season. High levels of conflict in Northeast Nigeria limited the dry season harvest and agricultural activities.

The country received 64 mm of rainfall (-51%), average temperature was 26.9ºC (-0.1ºC) and the recorded radiation was 1342 MJ/m2 (+1%). The observed maximum vegetation condition index (VCIx) was 0.87. Due to a decline in precipitation, the biomass production potential was reduced to 265 gDM/m2 (-27%). The drier-than-normal conditions had limited impact on crop production, as no crops were grown during this monitoring period.

Regional analysis

The analysis focused on four major agroecological zones in the country, i.e., Sudan-Sahel savanna region across the northern region, Guinea and Derived savanna within the central region and Humid forest situated towards the southern region.

The Sudan-Sahel savanna zone recorded no rainfall (0 mm) and an overall temperature of 26.5 ºC (-0.1 ºC). The radiation was near average (-1%) at 1376 MJ/m2. CALF stood at 3% (+72%).

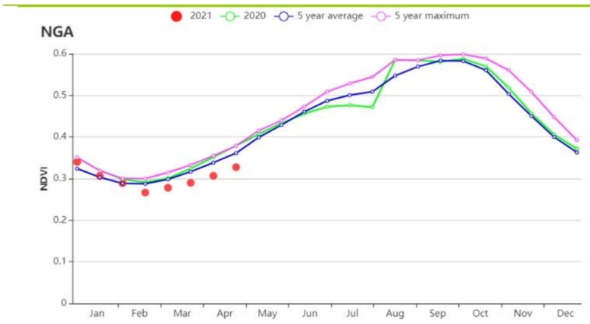
The Guinea savanna region is predominantly occupying the central region of the country. Observed rainfall was 93% below the 15YA. The temperature was 26.3 ºC (-0.2 ºC) and the radiation slightly increased to 1384MJ/m2. During this period, only irrigated crops were grown in this region. The CALF was 7%, which was a decrease by 33% from 15YA. Maximum VCI was 0.77.

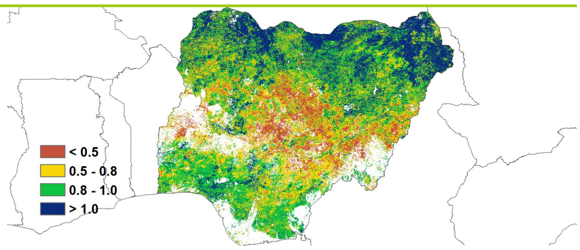
The Derived savanna region is a transition zone between the Guinea savanna and Humid forest zones. Rainfall was 29 mm (-75%), temperature 27.6 ºC (-0.1 ºC) and radiation 1322 MJ/m2 (+1%). The defict of rainfall during this period contributed to a reduction in estimated biomass by 40% as compared to the 15YA. Likewise, the arable crop land was reduced by 19% and the maximum VCI stood at 0.71. NDVI was below average in February but gradually picked up with the onset of rains at the beginning of April.

In the Humid forest zone precipitation is quite high as compared to other regions. The precipitation was 285 mm (-37%) and average temperature was 27.5 ºC (+0.3 ºC), while the radiation was reduced by 1% (1271 MJ/m2) from 15YA. Biomass production was reduced by 16%. CALF was 95% and maximum VCI was 0.87. NDVI started to gradually increase in the month of April.

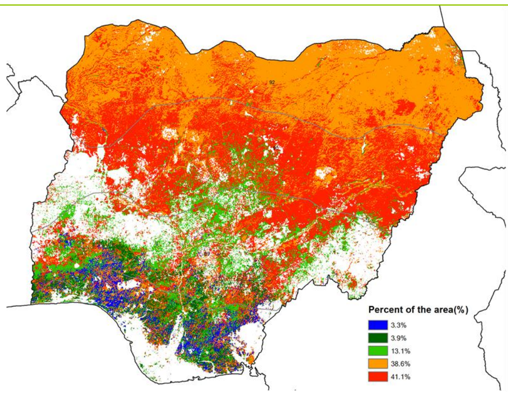
Figure 3.33 Nigeria's crop condition, January - April 2021

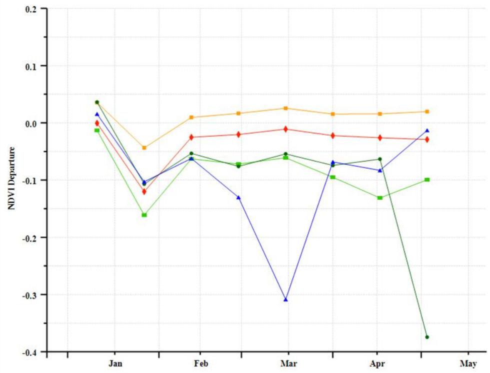
(a) Phenology of major crops



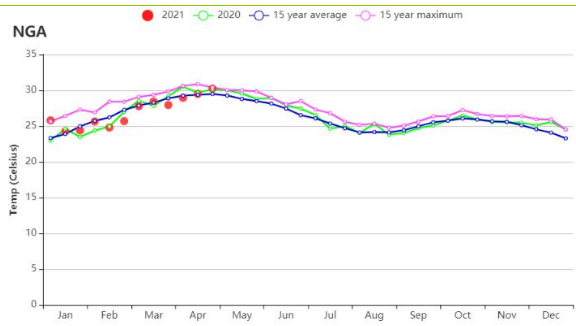


(b) Crop condition development graph based on NDVI (c) Maximum VCI

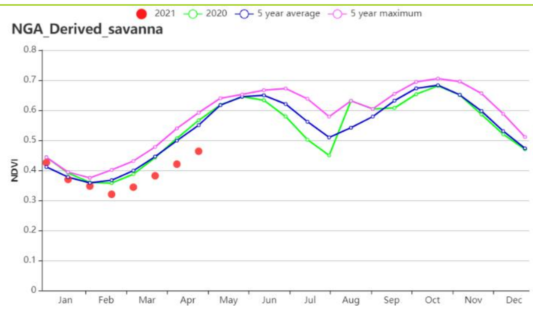


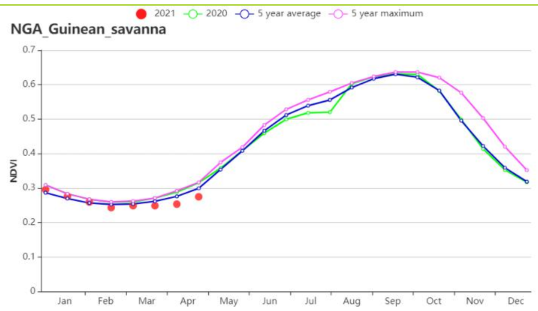


(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles

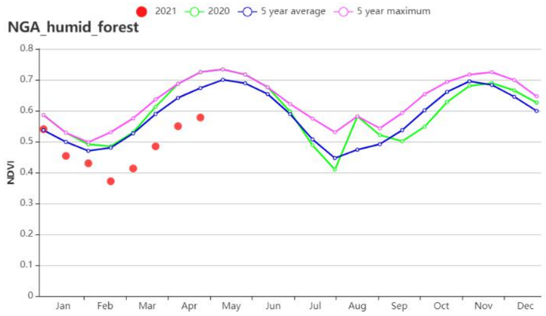


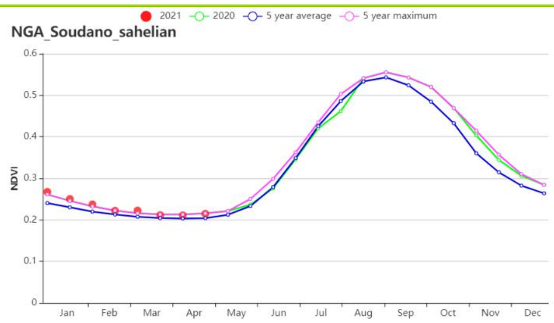
(f) Rainfall profiles (g) Temperature profiles





(h) Crop condition development graph based on NDVI (Derived savanna (left) and Guinea savanna (right))





(i) Crop condition development graph based on NDVI (Humid forest (left) and Sudan-Sahel savanna (right))

Table 3.57 Nigeria's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Derived savanna	29	-75	27.6	-0.1	1322	1	291	-40
Guinean savanna	2	-93	26.3	-0.2	1384	0	66	-64
Humid forest	285	-37	27.5	0.3	1271	1	870	-16
Sudan Sahel savanna	0	-100	26.5	-0.1	1376	-1	4	-92

Table 3.58 Nigeria's agronomic indicators by sub-national regions, current season's values and departure from 5YA, January - April 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Derived savanna	59	-19	0.71
Guinean savanna	7	-33	0.77
Humid forest	95	-3	0.87
Sudan Sahel savanna	3	72	1.06

[PAK] Pakistan

This reporting period includes most of the winter wheat cycle from the vegetative stage to harvest. It also covers the field preparation and sowing of maize. Crop condition were generally unfavorable from January to April compared to the average of the previous fifteen years.

Rainfall was below average. The drought prone areas of Sindh and Balochistan received almost no rainfall from January to early March. Compared the 15YA, RAIN was 22% below, while air temperature(TEMP) and photosynthetically active radiation (RADPAR) were above average (+0.6℃ and +2% respectively). The combination of all the agro-climatic indicators resulted in a below-average BIOMSS (-26%). At the national level, the dekad rainfall was continuously below average from the middle of January to early March. Subsequently, it was close to or above average. At the sub-national level, three regions all experienced warmer and drier weather including North highlands (TEMP +0.3°C; RAIN -16%), Northern Punjab (TEMP +0.6°C; RAIN -34%) and the Lower Indus river basin in south Punjab and Sindh (TEMP +1.2°C; RAIN -40%). Prolonged drought and hot weather resulted in below-average estimates of BIOMSS. In the Northern highlands the decrease was 4% and in the Lower Indus river basin of south Punjab and Sindh the decrease was 17%.

The crop condition development graph based on NDVI for Pakistan presented below-average conditions over this reporting period mainly due to drier and warmer weather. The spatial NDVI patterns and profiles showed that 35.1% of the cropped areas were below average, mainly distributed in North highlands, Balochistan and Sindh in late January. The maximum VCI was 57.7%. The fraction of cropped arable land (CALF) decreased by 1%. Since most of the wheat is irrigated, the drier-than-usual weather had a limited impact on wheat production.

Regional analysis

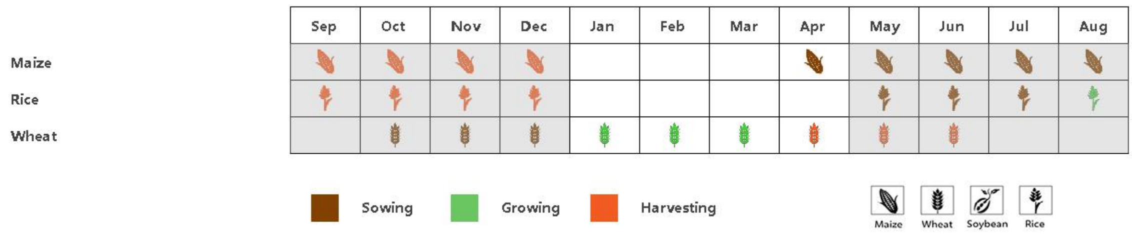
For a more detailed spatial analysis, CropWatch subdivides Pakistan into three agro-ecological regions based essentially on geography and agro-climatic conditions: the Northern highlands, Northern Punjab region and the Lower Indus river basin in South Punjab and Sindh.

In the **Northern highlands,** RAIN was 16% below average. RADPAR and TEMP were both above average (+2% and +0.3℃ respectively). The region revealed the lowest CALF of 47% among the three AEZs. The NDVI development graph shows below average crop conditions from February to April, especially in the north.

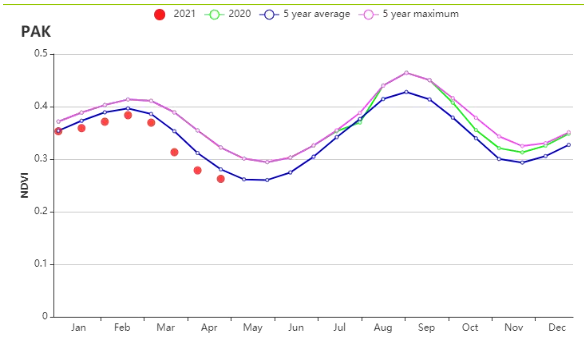
Northern Punjab is the main agricultural region in Pakistan. It recorded low RAIN (34% below average). TEMP and RADPAR were above average by 0.6℃ and 1% respectively. The resulting BIOMSS was below the recent fifteen-year average by 11%.The region had a CALF of 86%, which was below the 5YA by 1%. NDVI trended below average.

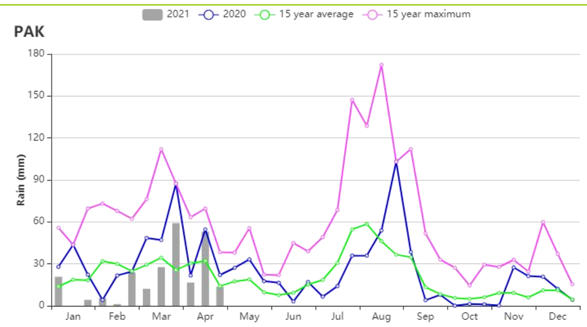
In t**he Lower Indus river basin in south Punjab and Sindh**, RAIN was below average by 40%, while TEMP and RADPAR were above average (by 1.2 ℃ and 1% respectively).The estimated BIOMSS departure was -11%. Crop condition based on NDVI was always below average, indicating unfavorable conditions. The CALF of 65% was close to the average. Overall, prospects were below average.

Figure 3.34 Pakistan crop condition, January- April 2021



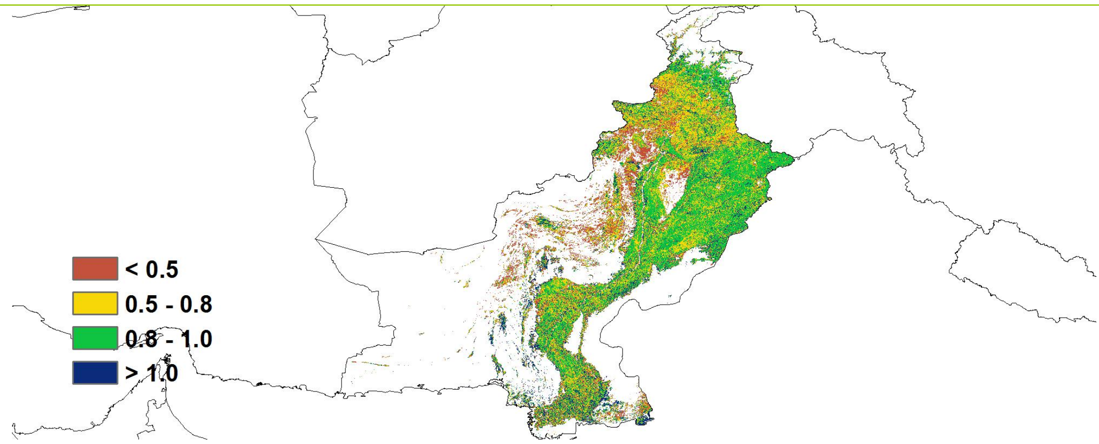
(a). Phenology of major crops



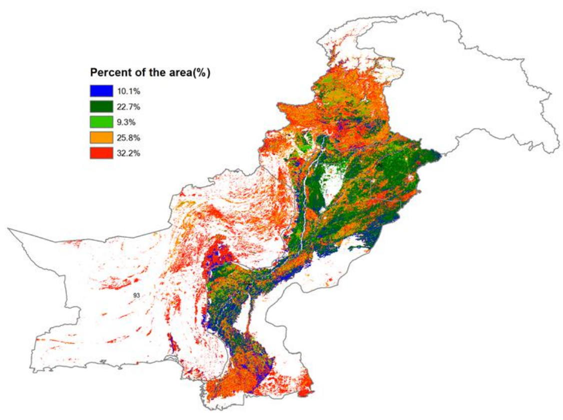


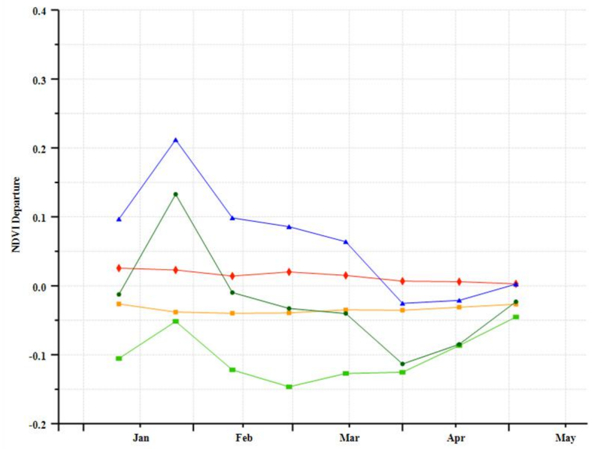
(b) Crop condition development graph based on NDVI

(c) Time series precipitation profile



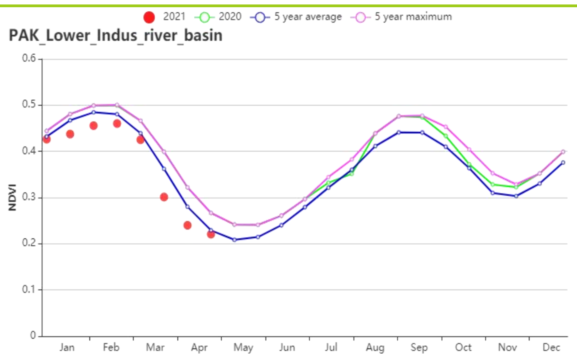
(d) Maximum VCI

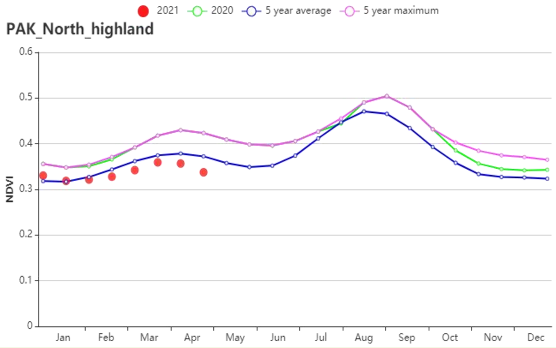




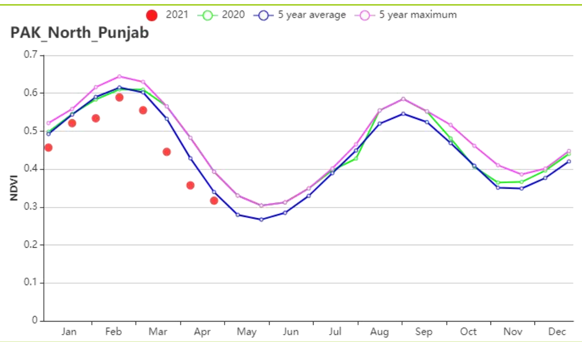
(e) Spatial NDVI patterns compared to 5YA

(f) NDVI profiles





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



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

Table 3.59 Pakistan agroclimatic indicators by agro-ecological region, current season's value and departure, January - April 2021

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	30	-40	23.4	1.2	1179	1	188	-26
Northern highland	374	-16	8.3	0.3	967	2	462	-11
Northern Punjab	132	-34	19.0	0.6	1025	1	484	-11

Table 3.60 Pakistan agronomic indicators by agro-ecological region, current season's value and departure, January - April 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Lower Indus river basin in south Punjab and Sind	65	0	0.80
Northern highland	47	-4	0.69
Northern Punjab	86	-1	0.82

[PHL] Philippines

This reporting period covers the grainfilling and harvest periods of the second rice and maize crops (January to April). The planting of main maize and rice started in April. The country experienced wetter conditions (RAIN, +32%) as compared to the 15YA. Temperature was almost unchanged (TEMP -0.1℃). The radiation was below average (RADPAR -2%). the potential biomass was also higher than average (BIOMSS 13%).

According to the NDVI profile for the country, the national NDVI values were far below average in January until mid February and then followed the average trend. The below-average NDVI values in January indicate below average conditions for the growth of second maize and rice. However, the cropped arable land fraction value was almost 100% and the maximum VCI value was at 0.98, which means that the prospective production was roughly normal.

Regional analysis

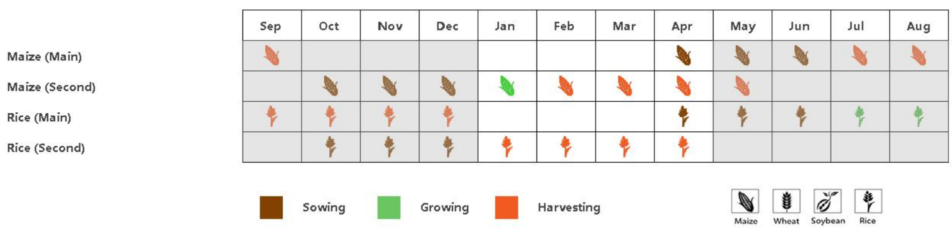
Based on the cropping systems, climatic zones and topographic conditions, three main agro-ecological regions can be distinguished for the Philippines. They are **the Lowlands region** (northern islands), **the Hilly region** (Island of Bohol, Sebu and Negros), and **the Forest region** (mostly southern and western islands). All the regions are characterized by the below-average NDVI values before mid-February and the close-to-average NDVI values until the end of this monitoring period. However, the high CALFs and high maximum VCIs indicate that the production was slightly below or close to average.

The Lowland region experienced a sharp increase in precipitation (RAIN +33%) and slightly cooler temperatures (TEMP -0.2 ℃). The radiation for the region was 2% lower than the 15YA and the consequential biomass was above average (BIOMSS 15%). The CALF was 100% and the maximum VCI value for the region was at 0.97.

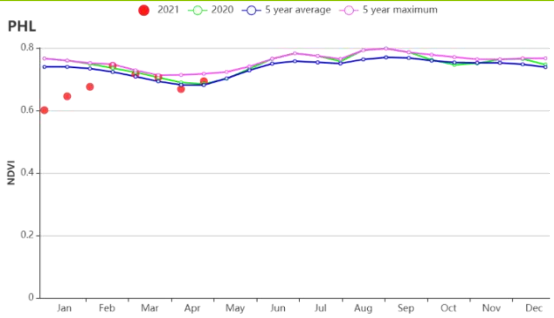
Compared to the 15YA, **the Hilly region** went through a wetter period. The rainfall for the region was higher than the average (RAIN +62%) and the temperature was almost unchanged (TEMP +0.1℃). The radiation decreased by 2%, while the biomass was 23% upper than average due to increased rainfall. The maximum VCI value for the region was at 0.97.

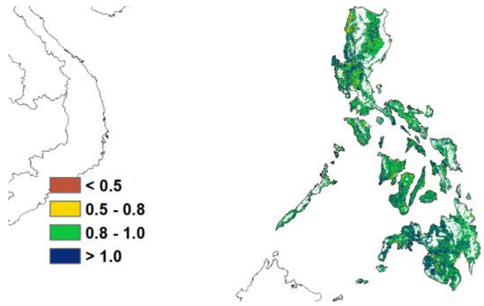
In **the Forest region,** the rainfall was above average (RAIN +28%) and the temperature was near average. The radiation for the region was 3% lower than average, while the potential biomass increased by 10%. In the meanwhile, the maximum VCI value for the region was at 0.99.

Figure 3.35 Philippines' crop condition, January - April 2021

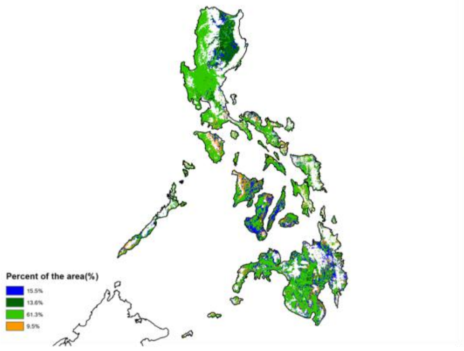


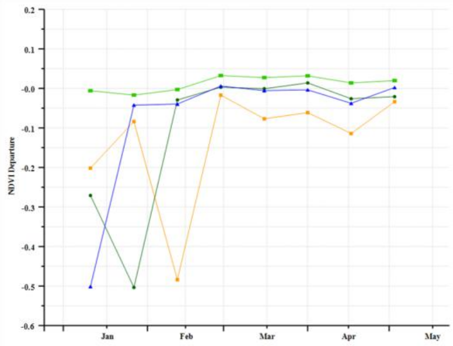
(a) Phenology of major crops



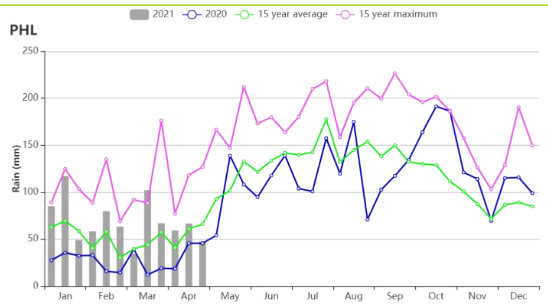


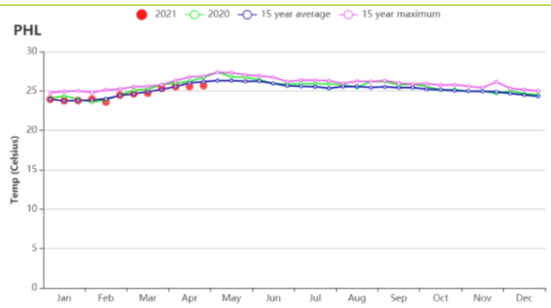
(b) Crop condition development graph based on NDVI (c) Maximum VCI



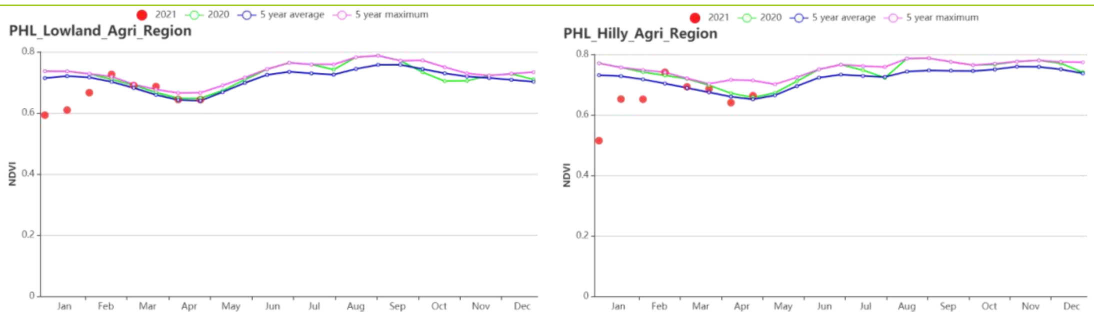


(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles

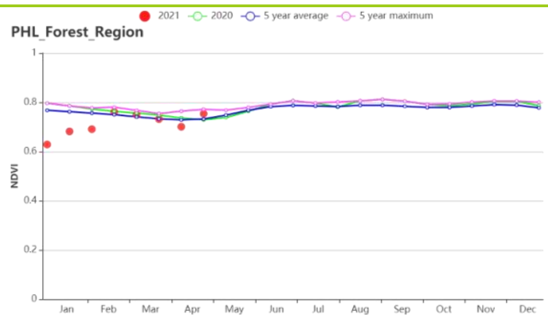




(f) Rainfall profiles (g) Temperature profiles



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



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

Table 3.61 Philippines' agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Forest region	1076	28	24.7	0.0	1146	-3	1394	10
Hilly region	955	62	26.5	0.1	1222	-2	1444	23
Lowlands region	555	33	24.2	-0.2	1090	-2	1081	15

Table 3.62 Philippines' agronomic indicators by sub-national regions, current season's values and departure from 5YA, January - April 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Forest region	100	0	0.99
Hilly region	100	0	0.97
Lowlands region	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

[POL] Poland

This report covers the growing period of winter wheat. Compared to the average of the last 15 years, precipitation was 4% higher. But February was drier than normal. Average temperature was 1.1 ℃ lower. Except for January and late February and March, the temperatures were lower than the average of the same period. The photosynthetically active radiation level was 7% lower, and the potential biomass level was lower by 11%. As can be seen from the crop growth graph, the NDVI levels were low at the national scale due to snowfall until January and mid-February, but sufficient snow cover prevented serious crop damage, followed by a gradual approach to the average NDVI curve from March to April, which is related to a slight delay in the crop growth period mentioned in the previous report. VCIx was 0.83, with values below 0.8 mainly in the central as well as southeastern regions, and even below 0.5 in scattered areas in the northwest. Unfavorable water and temperature conditions had a slightly negative impact on arable cultivation, and the percentage of arable cultivation was 3% lower compared to the average of the last 5 years, but still satisfactory at 96%. The persistent low temperatures slowed the growth of the winter crops and the germination of the early sown summer crops.

Regional analysis

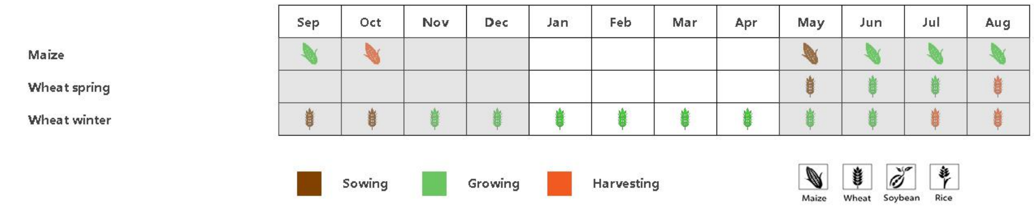
Poland is divided into four subregions based on agro-ecological characteristics, namely: (a) **Northern oats and potatoes area** (including the Western Pomeranian, Eastern Pomeranian and Wamenia-Masuria regions), (b) **Northern-central wheat and sugar-beet area** (including the Cuyavia-Pomeranian to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

In **Northern oats and potatoes area**, RAIN, TEMP, RADPAR and BIOMSS were all below average by 1%, 0.8°C, 10%, and 11%, respectively. NDVI was significantly below average in January and February, then close to average from March to April. CALF was 96%, below average by 2%. VCIx was 0.82. Crop conditions are close to normal.

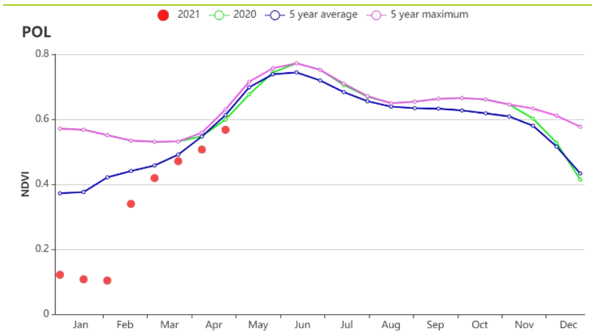
Compared to the average of last 15 years, rainfall in **Northern-central wheat and sugar-beet area** and **Central rye and potatoes area** was above by 5% and 3%, respectively. Temperature, PAR and biomass were all below average (TEMP: -0.8 ℃ and -1.1°C; RADPAR: -11% and -8%; BIOMSS: -9% and -9%; respectively). NDVI was significantly lower than average in January and February, however close to average in March and April. CALF in the two subregions was 95% and 97%. VCIx was 0.83 and 0.84.

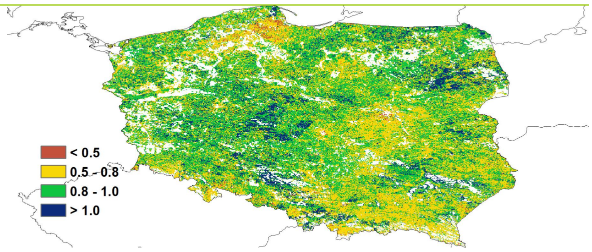
In **Southern wheat and sugar-beet area**, RAIN was above average by 6%, and TEMP, RADPAR and BIOMSS were below average by 1.2°C, 5% and 12% respectively. NDVI was below average in the whole period. CALF was 94% and VCIx was 0.81. Crop conditions were unfavorable.

Figure 3.36 Poland's crop condition, January - April 2021

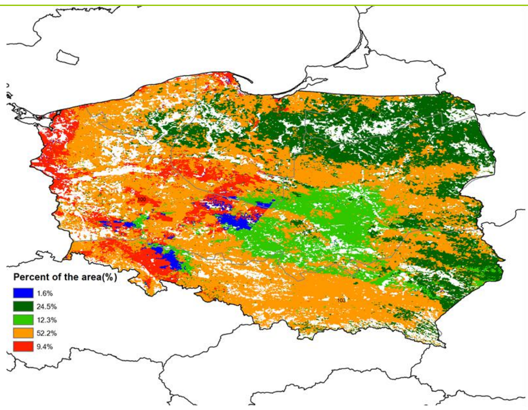


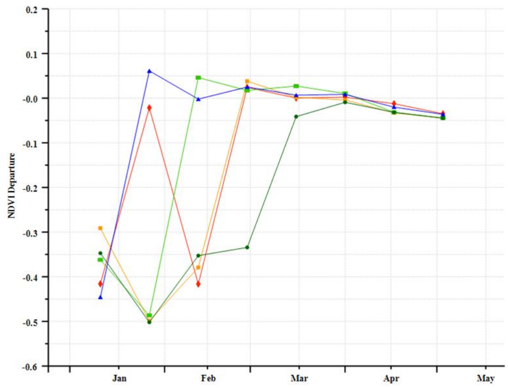
(a) Phenology of major crops



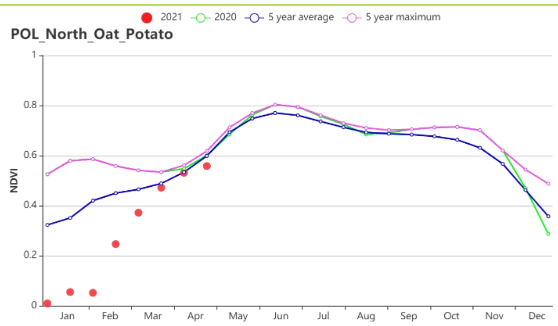


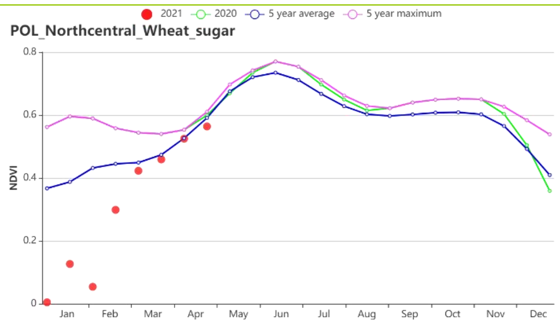
(b) Crop condition development graph based on NDVI (c) Maximum VCI



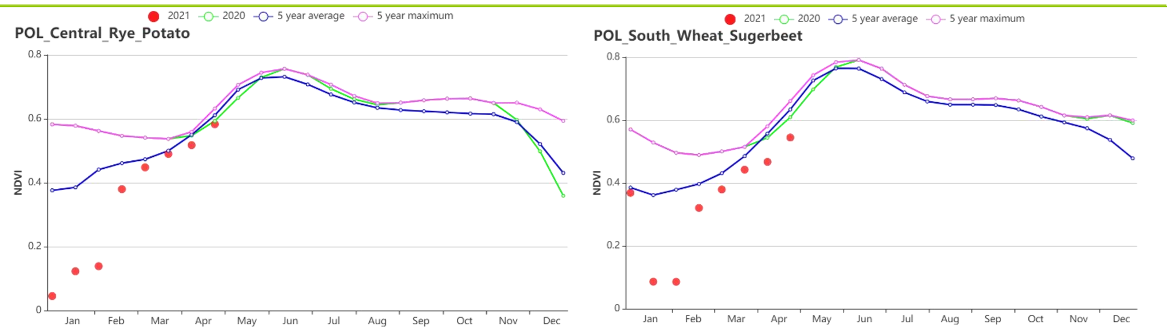


(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles

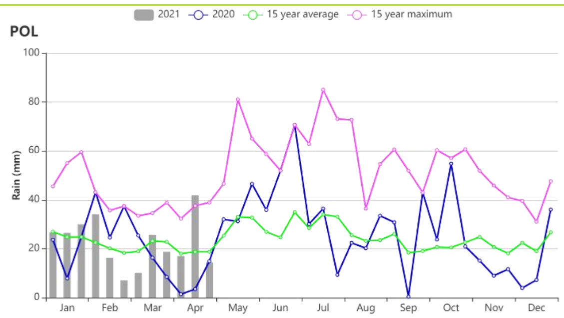


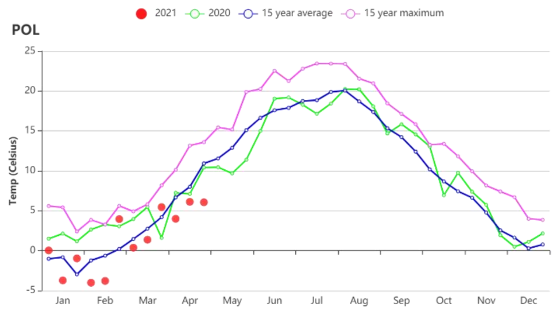


(f) Crop condition development graph based on NDVI, Northern oats and potatoes area (left) and Northern-central wheat and sugar bee area (right).



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





(h) Rainfall index

(i) Temperature Index

Table 3.63 Poland's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Northern oats and potatoes areas	262	-1	1.1	-0.8	399	-10	423	-11
Northern-central wheat and sugarbeet area	252	5	1.6	-0.8	408	-11	406	-9
Central rye and potatoes area	262	3	1.6	-1.1	432	-8	422	-9
Southern wheat and sugarbeet area	280	6	0.8	-1.2	488	-5	400	-12

Table 3.64 Poland's agronomic indicators by sub-national regions, current season's values and departure from 5YA, January - April 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Northern oats and potatoes areas	96	-2	0.82
Northern-central wheat and sugarbeet area	95	-3	0.83
Central rye and potatoes area	97	-2	0.84
Southern wheat and sugarbeet area	94	-5	0.81

[ROU] Romania

Winter wheat is the main crop that is grown in Romania during this reporting period. It was sown in late October. At the national level, rainfall was slightly above average (RAIN +11%); average temperature was a bit lower (-0.6℃) and radiation was also slightly below average (-2%). This resulted in a reduced estimate of biomass (-3%), as compared to the 15YA. CALF decreased by 2% and maximum VCI was at 0.85. According to the NDVI at the country level, crop conditions were below average in late March and April, which was consistent with the below-average temperatures during this period. However, NDVI caught up with the 5YA in most regions by late April. Crop conditions were generally favorable.

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).

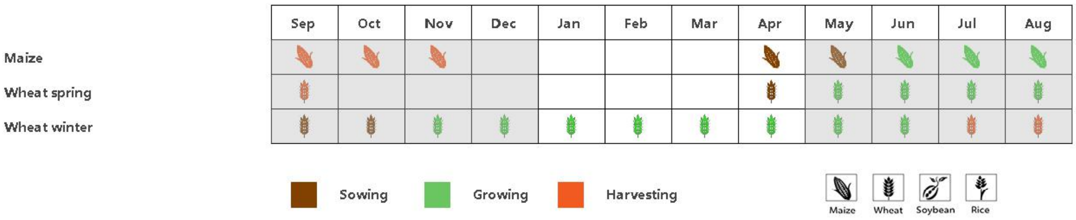
For the **Central mixed farming and pasture Carpathian hills**, compared to the 15YA, rainfall had increased by 14%, whereas temperature and radiation were lower (TEMP -1℃ and RADPAR -2%). According to the NDVI development, crop conditions were better than average in January and February but lower than average in March and April. The regional average VCI maximum was at 0.80. The NDVI spatial distribution shows that the NDVI was trending below average 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 increased by 10%, temperature remained average, radiation decreased by 2% and biomass increased by 1% as compared to the 15YA. The NDVI development graph shows that crop condition dropped to below average after March, but recovered to average levels by late April. The VCI max value of this region was 0.88 and according to the distribution map, the deep green 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.

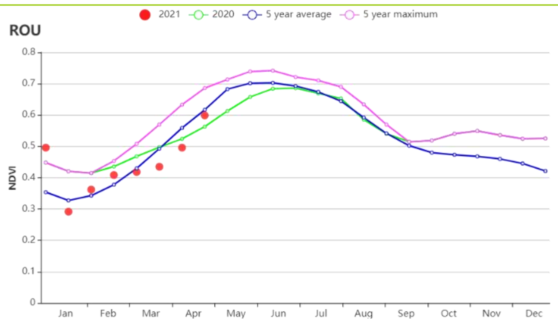
For the **Western and central maize, wheat and sugar beet plateau**, rainfall was higher than average by 8%, temperature and radiation were somewhat lower (TEMP -1℃, RADPAR -2%) and biomass decreased by 7%. Maximum VCI of this region was 0.78 and the spatial distribution was between 0.5 and 0.8 near the middle region. NDVI dropped below the 5YA starting in mid-March.

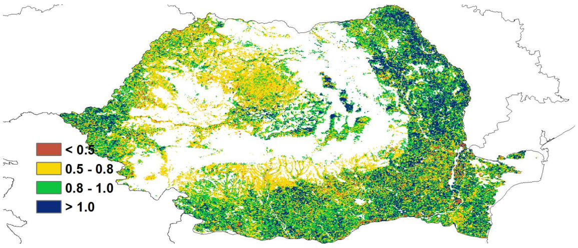
Overall, the cooler-than-normal temperatures slowed crop growth in March and early April. However, above-average rainfall promises favorable conditions for the grainfilling period of winter cereals.

Figure 3.37 Romania's crop condition, January - April 2021

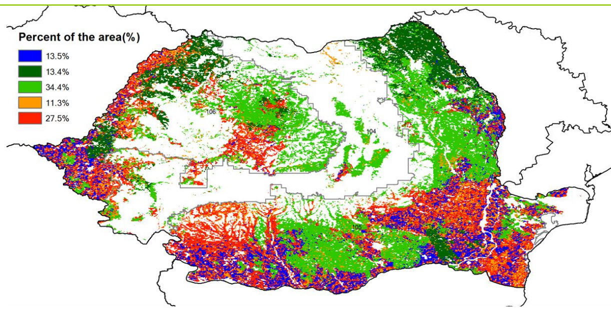


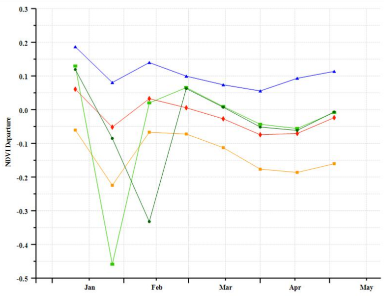
(a) Phenology of major crops



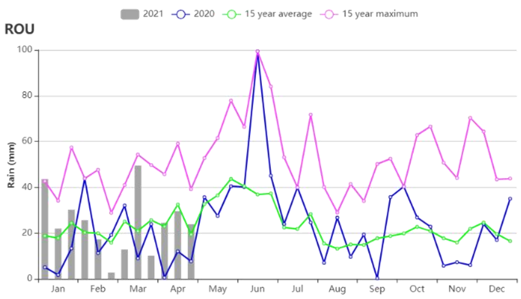


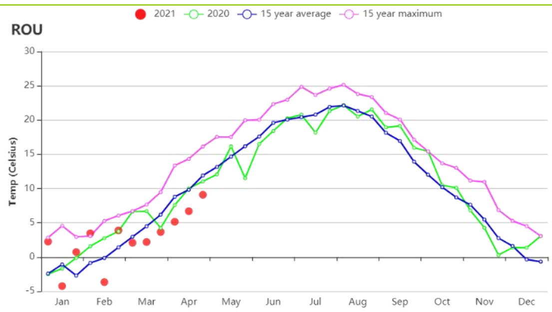
(b) Crop condition development graph based on NDVI (c) Maximum VCI



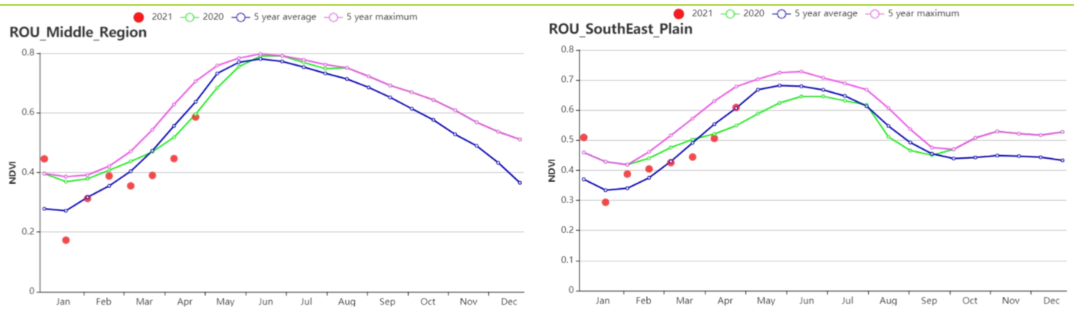


(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles

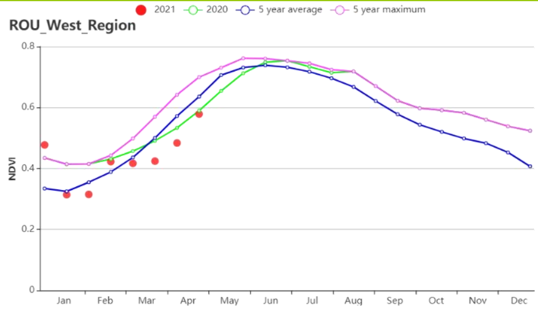




(f) Rainfall profiles (g) Temperature profiles



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



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

Table 3.65 Romania's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Central mixed farming and pasture Carpathian hills	336	14	1.1	-1	619	-2	410	-7
Eastern and southern maize, wheat and sugar beet plains	270	10	3.3	0	641	-2	504	1
Western and central maize, wheat and sugar beet plateau	295	8	2.4	-1	629	-2	454	-7

Table 3.66 Romania's agronomic indicators by sub-national regions, current season's values and departure from 5YA, January - April 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Central mixed farming and pasture Carpathian hills	93	-5	0.80
Eastern and southern maize, wheat and sugar beet plains	93	0	0.88
Western and central maize, wheat and sugar beet plateau	92	-5	0.78

[RUS] Russia

In Russia, the period from January until April is comprised of two parts: snow melting and the beginning of crop growth. The planting of spring crops started in April in the south.

NDVI stayed low unil late March due to snow cover. In April, it generally remained below the trend of the 5YA. Precipitation was generally close to the level of the previous year, except for April, when it exceeded the level of the last year and the 15-year average. Air temperatures mainly continued below the level of the previous year until the end of March.

Main regions of winter crop production showed negative NDVI departures during most of the analyzed period. In Middle Volga, Siberia, Central and Central Black soil regions VCIx was below 0.8. Positive NDVI departures were observed in April in Northern and Southern Caucasus. The VCIx values for these areas were 0.8-1.

The conditions of winter crops in Russia were negatively influenced by the lack of precipitation in autumn 2020. It slowed the germination and establishment of winter crops and the lasting effect can be seen in lower NDVI values for the analysed period compared to the 5-year average and the levels of the previous year. The situation in Middle Volga, Central and Central Black soil regions may have been worsened by the ice crusts on the soil surface during the dormant period of winter crops. Agroclimatic conditions were more favorable in the southern regions. The prospects for the winter crops are less favorable than last year.

Regional analysis

Based on cropping systems, climatic zones and topographic conditions, twelve agro-ecological zones (AEZ) are identified for Russia, among which nine are relevant for crop cultivation: South Caucasus, North Caucasus ,Central Russia， Central black soil area， Middle Volga, Ural and western Volga, Western Siberia, Middle Siberia and Eastern Siberia.

South Caucasus

Rainfall was at the level of the 15-year average. Temperature was 0.4 ℃ above the 15-year average. RADPAR was 5% below the 15-year average. Biomass was 1% below the 15-year average. CALF was 8% below 5-year average. VCI was 0.84. NDVI stayed mainly below 5-year average and the level of the previous year until the middle of April. In general, agroclimatic conditions were favourable for winter crops. The negative influence of autumn drought was compensated for and crop conditions improved in April to the level of the previous year and the 5-year average. The yield of winter crops is expected to be at the same level as last year.

North Caucasus

RAIN was 26 % above average, TEMP was near average and RADPAR was 12% below average. BIOMSS was 10% below average. CALF was 36% below 5-year average. VCIx was 0.65. NDVI mainly stayed below the 5-year average and the level of the previous year. The conditions for winter crops in this region were below average. A decrease in yield can be expected.

Central Russia and Central black soil area

The agroclimatic indicators show that the precipitation in Central Russia and Central black soil area was above the 15-year average by 19% and 22% respectively. Air temperature in both regions was below 15-year average: by 0.9 ℃ in Central Russia and by 0.3 ℃ in Central black soil area. The photosynthetically active radiation showed the same tendency. It was below the 15-year average by 17% in Central Russia and by 10% in Central black soil area. Biomass dropped by 11% in Central Russia and by 8% in Central black soil area, CALF was down by 27% and 57% respectively. VCIx was 0.87 in Central Russia and 0.61 in Central Black soil area. NDVI was mainly below the 5-year average and the level of the previous year. The state of winter crops in these regions is negatively influenced by the drought in autumn of 2020 and the ice crusts that developed on soil surface during winter. A decrease is expected in the yield of winter crops as compared to the previous year.

Middle Volga

Precipitation was 9% above the 15-year average. Air temperature was 0.2 ℃ below the 15-year average. RADPAR was 8% below the 15-year average. Biomass was 6% below 15-year average. CALF was 49% below the 5-year average. VCIx was 0.73. NDVI was mainly below the 5-year average and the level of the previous year until April when it reached the level of the previous year. The state of winter crops in this region is negatively influenced by the drought in autumn of 2020 and the ice crusts that developed on the soil surface during winter. A decrease is expected in the yield of winter crops as compared to last year.

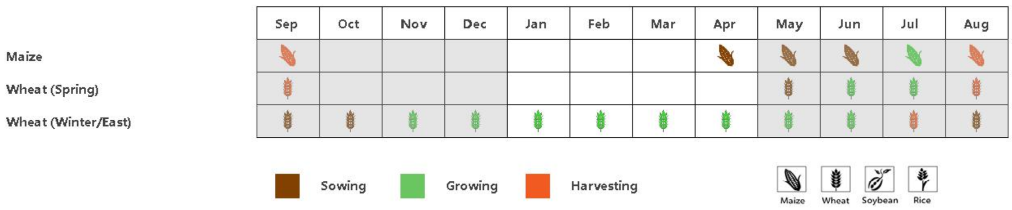
Ural and western Volga

Rainfall was 11% below the 15-year average. Air temperature was 0.3 ℃ below 15-year average. RADPAR was 2% below 15-year average. Biomass was 5% below 15-year average. CALF was 20% above the 5-year average. VCIx was 0.90. NDVI was mainly close to the 5-year average and the level of the previous year. Conditions for winter crops were normal for this region. The yield is expected to be above the level of the previous year.

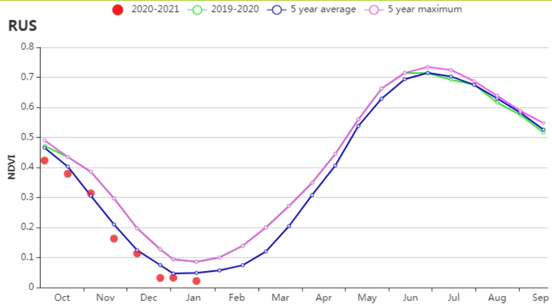
Western Siberia, Middle Siberia and Eastern Siberia

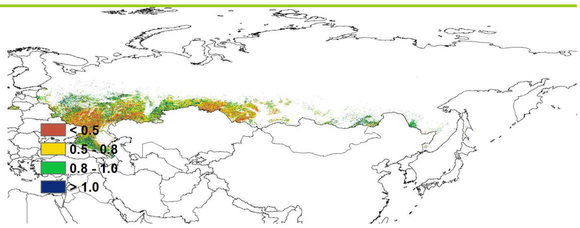
The agroclimatic indicators showed that there was an increase in rainfall in all these regions compared to the 15-year average: by 14% in Western Siberia, 30% in Middle Siberia and 15% in Eastern Siberia. Air temperature decreased in Western Siberia by 0.3°C, but increased in Middle and Eastern Siberia by 0.3 ℃ and 0.6 ℃ respectively. RADPAR was 4-7 % below the 15-year average. The unfavourable agroclimatic conditions resulted in a decrease of biomass in Western Siberia and Middle Siberia by 12% and 3%. In Western Siberia CALF was 60 % below the 5-year average, while in Middle and Eastern Siberia it was up by 9%. NDVI was mainly below or close to the 5-year average and the level of the previous year. The area of winter crops is insignificant in these regions; therefore their agroclimatic conditions will not affect winter crop production in the Russia Federation.

Figure 3.38 Russia's crop condition, January - April 2021



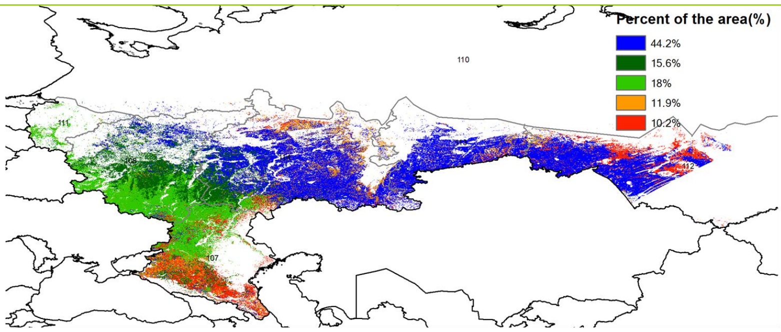
(a) Phenology of major crops

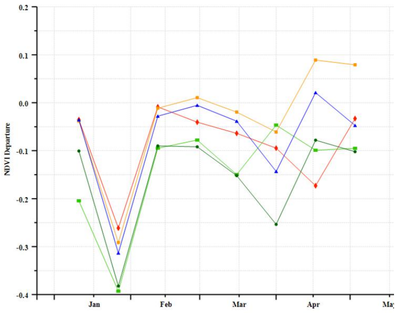




(b) Crop condition development graph based on NDVI

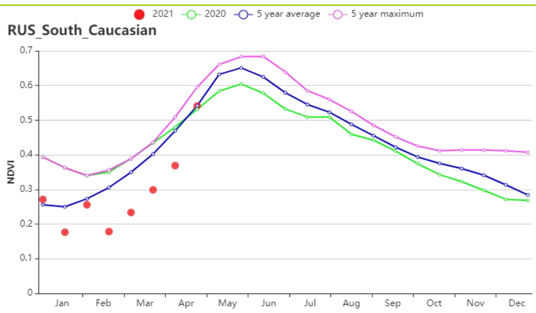
(c) Maximum VCI

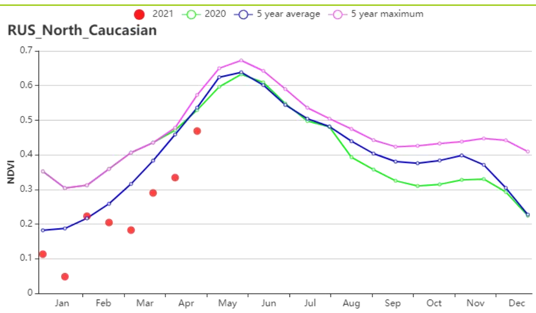




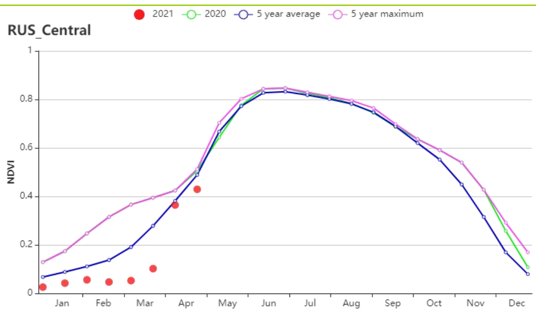
(d) Spatial NDVI patterns compared to 5YA

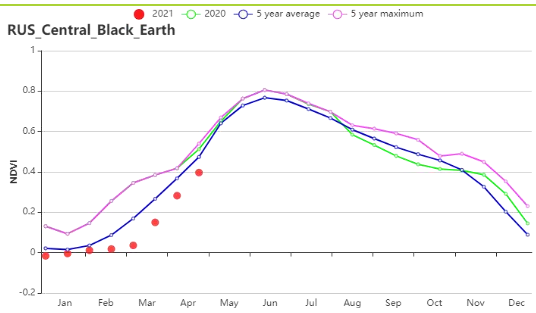
(e) NDVI profiles



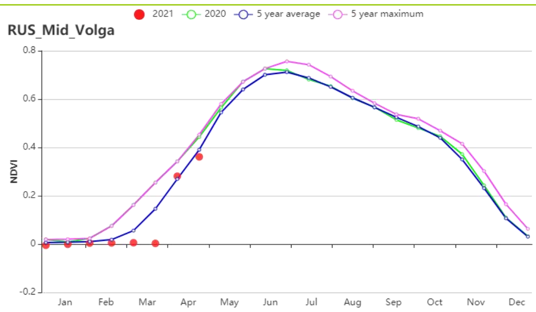


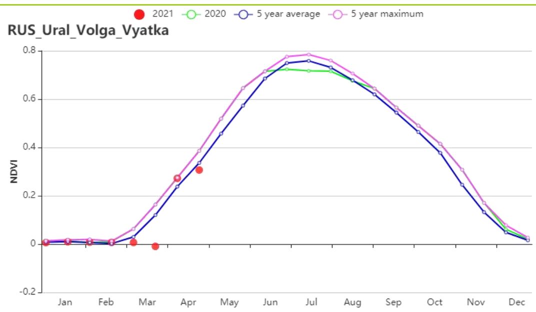
(f) Crop condition development graph based on NDVI, Southern Caucasus (left) and Northen Caucasus (right).



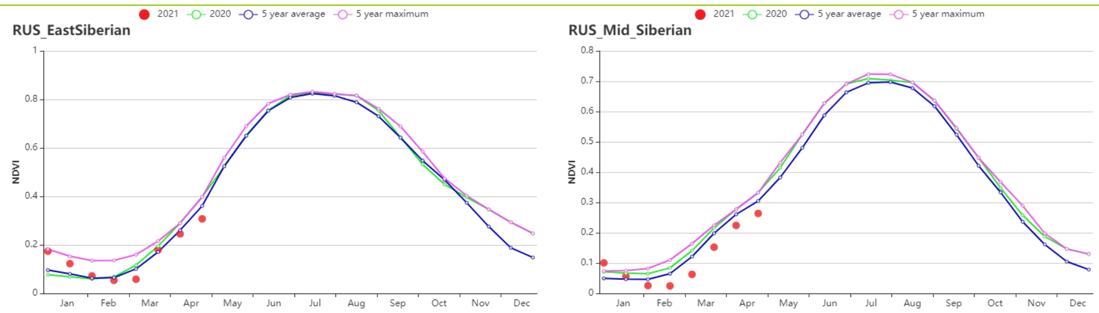


(g) Crop condition development graph based on NDVI, Central Russia (left) and Central black soils area (right).

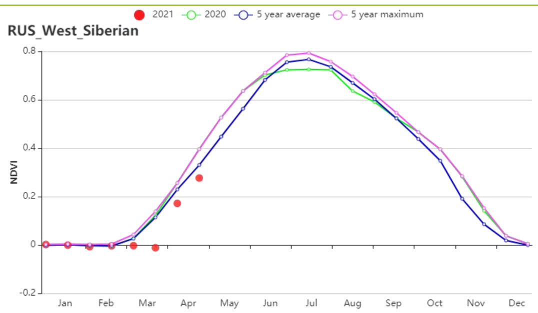




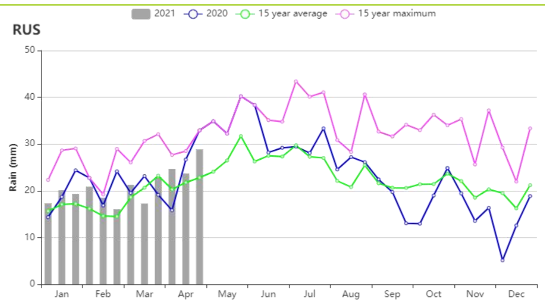
(h) Crop condition development graph based on NDVI, Middle Volga (left) and Ural and western Volga region (right).



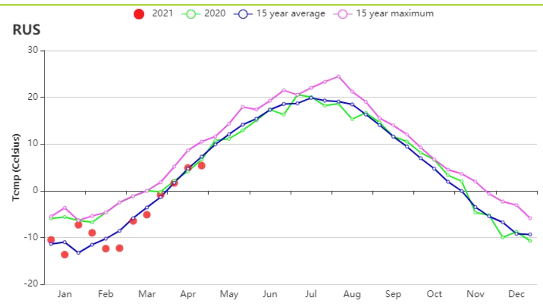
(i) Crop condition development graph based on NDVI, Eastern Siberia (left) and Middle Siberia (right).



(j) Crop condition development graph based on NDVI, Western Siberia.



(k) Rainfall index



(l) Temperature Index

Table 3.67 Russia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m2)	Departure (%)	Current (gDM/m2)	Departure (%)
Amur and Primorsky Krai	151	25	-9.5	0.9	663	-5	224	10
Central Russia	312	19	-3.9	-0.9	317	-17	275	-11
Central black soils area	313	22	-2.3	-0.3	406	-10	324	-8
Eastern Siberia	223	15	-9.4	0.6	620	-4	218	7
Middle Siberia	159	30	-11.4	0.3	604	-5	164	-3
Middle Volga	277	9	-5.4	-0.2	398	-8	259	-6
Northwest Region including Novgorod	276	2	-3.4	-0.8	302	-16	428	-4
Northern Caucasus	314	26	1.4	0.0	520	-12	281	-10
Southern Caucasus	280	0	1.7	0.4	644	-5	411	-1
Ural and western Volga region	168	-11	-7.7	-0.3	425	-2	224	-5
Western Siberia	-	-	-	-	-	-	-	-
West subarctic region	216	14	-8.4	-0.3	448	-7	216	-5

Table 3.68 Russia's agronomic indicators by sub-national regions, current season's values and departure from 5YA, January - April 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Amur and Primorsky Krai	4	-27	0.93
Central Russia	53	-27	0.87
Central black soils area	26	-57	0.61
Eastern Siberia	26	9	0.81
Middle Siberia	6	9	0.87
Middle Volga	17	-49	0.73
Northwest Region including Novgorod	55	-19	0.82
Northern Caucasus	47	-36	0.65
Southern Caucasus	69	-8	0.84
Ural and western Volga region	81	20	0.90
Western Siberia	4	-60	0.82
West subarctic region	1	-91	0.62

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[THA] Thailand

This report covers the production of dry season rice, which was planted in November and harvested in April. Maize planting started in April. Rainfall was slightly above average (+3%), while temperature and solar radiation were below the 15YA (TEMP -0.5°C, RADPAR -7%). Potential biomass production was reduced by -1%. NDVI generally trended below the 5YA. The maximum vegetation condition index (VCIx) was relatively high at 0.94. The cropped arable land fraction (CALF) during the growing season was close to the average levels. The NDVI trend, in combination with a high VCIx and close to average CALF indicates slightly below-average production levels.

Regional analysis

The regional analysis covers 4 main agro-ecological zones (AEZ) of Thailand: **Central double and triple-cropped rice lowlands, North-eastern single-cropped rice region, South-eastern horticulture area, and Western and southern hill areas**. The characteristics of rice planting are dependent on rice cultivation topology.

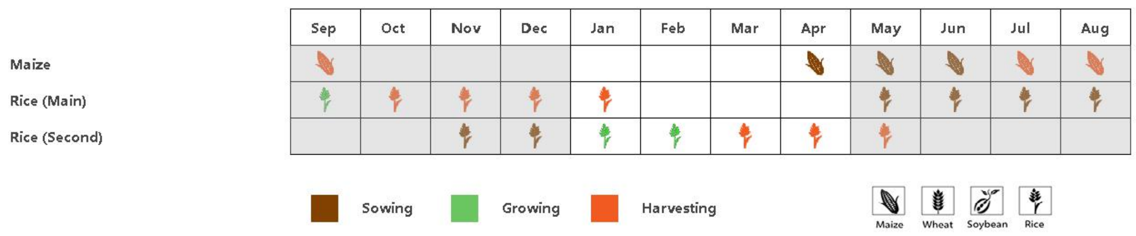
Indicators for the **Central double and triple-cropped rice lowlands** show a similar pattern as for the whole country: Temperature and radiation were below average (TEMP -0.5°C, RADPAR -9%) whilst the rainfall was higher than the 15YA by 12%. These weather factors led to a biomass increase (+14%). The fraction of cropped arable land (CALF) was unchanged and the maximum VCI was 0.93. According to the NDVI profile, the NDVI values were higher than in the previous year and close to the 5-year average during January to March 2021. In April, NDVI exceeded the 5YA. The second rice production is forecasted to be higher than last year.

In the **North-eastern single-cropped rice region,** temperature and radiation were below average (-0.9ºC and -7% respctively) and rainfall increased by 23%. Estimated biomass was 10% below the 15YA. VCIx was 0.95 and CALF was unchanged.

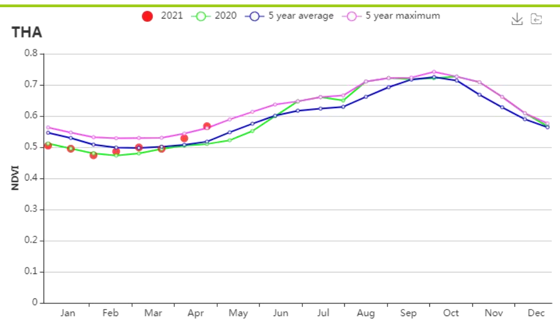
Crop condition in the **Western and southern hill area** experienced drier than average conditions (RAIN -9%). Temperature was slightly cooler (-0.2ºC) and solar radiation was below average by 6%. Estimated biomass was higher by 3%. VCIx was 0.93.

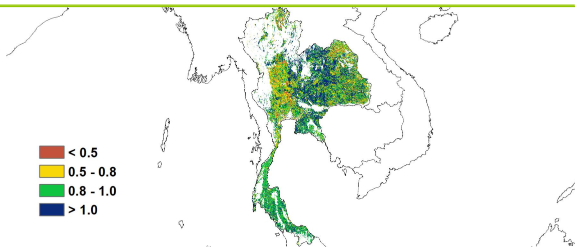
The **South-eastern horticulture area** experienced above-average rainfall (RAIN +29%) while temperature and solar radiation were below average (TEMP -0.7%, RADPAR -11%), leading to a biomass reduction (BIOMSS -8%).

Figure 3.39 Thailand's crop condition, January - April 2021

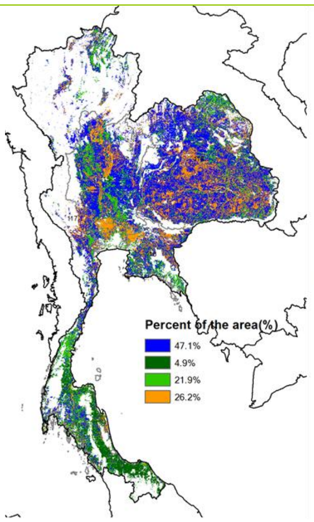


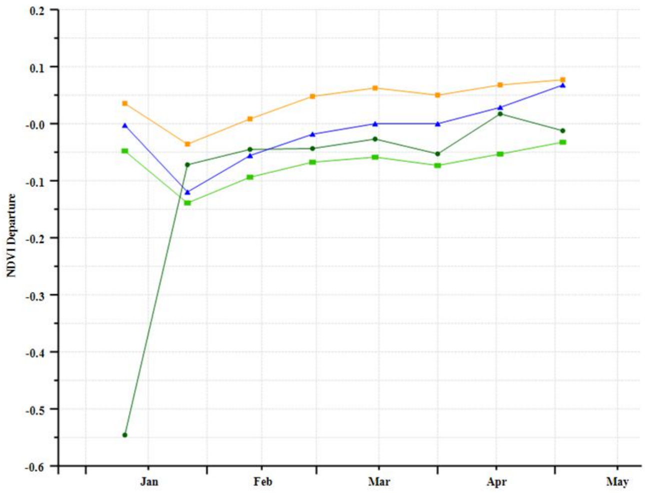
(a) Phenology of major crops



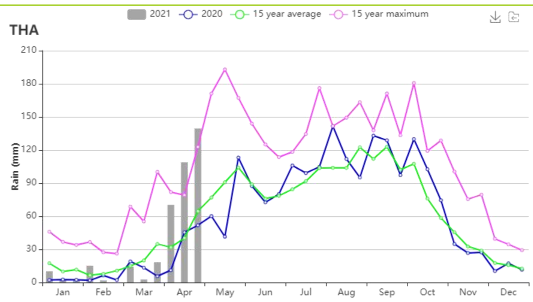


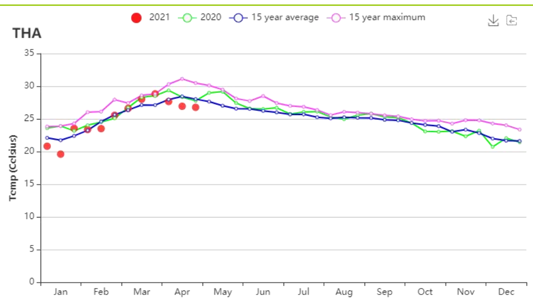
(b) Crop condition development graph based on NDVI (c) Maximum VCI



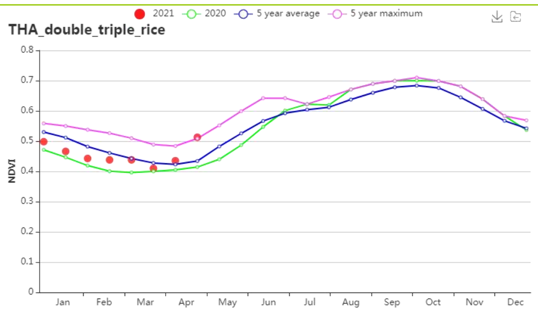


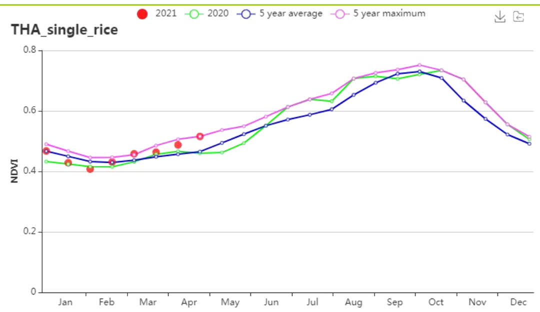
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



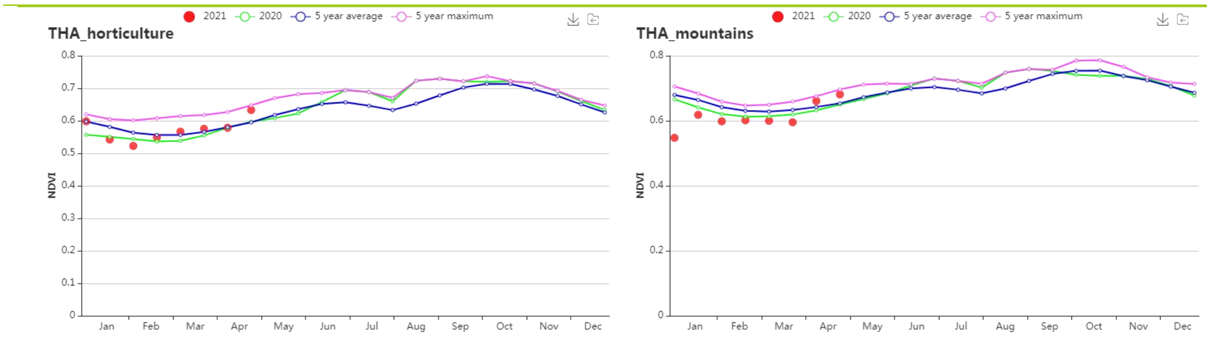


(f) Rainfall profiles (g) Temperature profiles





(g) Crop condition development graph based on NDVI in the double and triple-cropped rice lowlands (left) and single-cropped rice Nor eastern region (right)



(h)Crop condition development graph based on NDVI in the South-eastern horticulture area (left) and Western and southern hill area (right)

Table 3.69 Thailand's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Central double and triple-cropped rice lowlands	416	12	22.8	-0.5	971	-9	697	14
South-eastern horticulture area	508	29	24.1	-0.7	967	-11	820	-8
Western and southern hill areas	518	-9	22.1	-0.2	1011	-6	765	3
Single-cropped rice north-eastern region	346	23	21.7	-0.9	970	-7	579	-10

Table 3.70 Thailand's agronomic indicators by sub-national regions, current season's values and departure from 5YA, January - April 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Central double and triple-cropped rice lowlands	99	0	0.93
South-eastern horticulture area	99	0	0.93
Western and southern hill areas	100	0	0.93
Single-cropped rice north-eastern region	100	0	0.95

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[TUR] Turkey

Crop conditions in Turkey were below average during the whole monitoring period. Maize and rice were planted at the end of the reporting period, while winter wheat was still at the late vegetative stage. Rainfall was below average (RAIN, -7%), while sunshine and temperature were close to average (RADPAR +0%, TEMP +0.2°C), which led to a below-average potential biomass (BIOMSS, -3%). The cropped arable land fraction (CALF) decreased by 7% and the maximum VCI was 0.79.

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 northwestern Turkey and in some areas including the provinces of Hatay, Sanliurfa and Mardin in southeastern 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 remains 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.

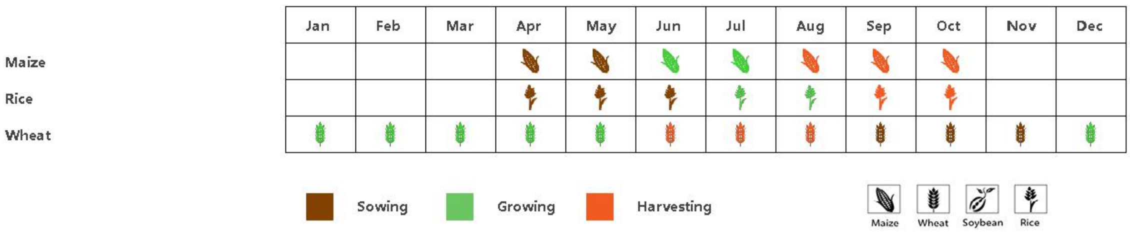
In the **Black Sea zone**, the NDVI was below average during the reporting period, except for early January. Rainfall was above average (RAIN +3%) and temperature was near average while sunshine was below average (RADPAR -4%). The biomass was below average (BIOMSS -2%). The VCIx reached 0.81 and CALF was down by 8%. Below-average cereal production is forecasted for this region.

Central Anatolia is the main grain production region of Turkey. It had slightly below average NDVI throughout the whole monitoring period. Both rainfall and sunshine were below average (RAIN -10%, RADPAR -1%). Temperature stayed near average (TEMP, +0.0%). The potential biomass production decreased by 4%. CALF fell 18% below average, which was the steepest fall among the four AEZs in Turkey, and the VCIx was 0.75. The condition of crops is assessed as average to below average.

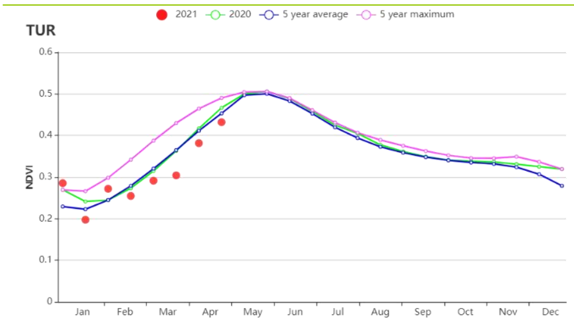
In the **Eastern Anatolian plateau**, the NDVI was above and close to average in early and mid-January and near average after January. This zone also suffered from lower rainfall (RAIN -12%). Temperatures and sunshine were above average (TEMP +1.1℃, RADPAR +4%), biomass was above average (BIOMSS +1%). CALF decreased by 7% and the VCIx was 0.84. All indicators agree in describing the conditions as fair for this AEZ.

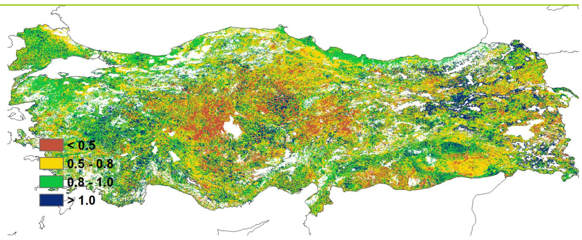
As shown by the NDVI profile in the **Marmara Aegean Mediterranean lowland zone**, the NDVI was average or slightly below during the reporting period. The rainfall was below average (RAIN -6%), temperature and radiation were close to average (TEMP, +0.2°C, RADPAR +0%). The CALF was above average (+1%), which was the only positive deviation from the mean among the four AEZs of Turkey. Also, the VCIx was the high at 0.82. Crop production prospects are estimated to be quite favorable.

Figure 3.40 Turkey's crop condition, January - April 2021

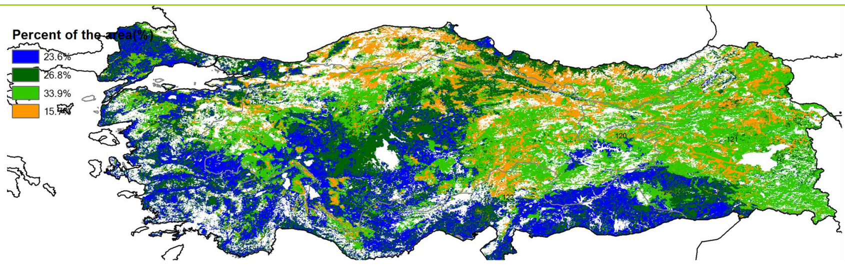


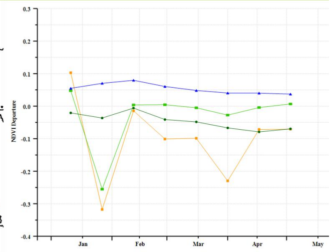
(a) Phenology of major crops



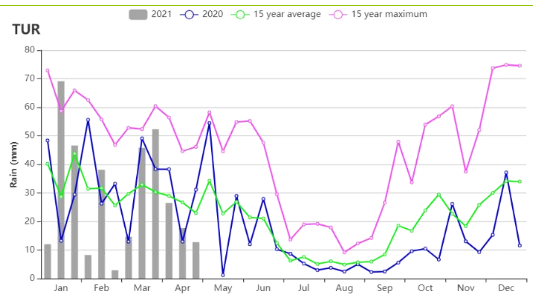


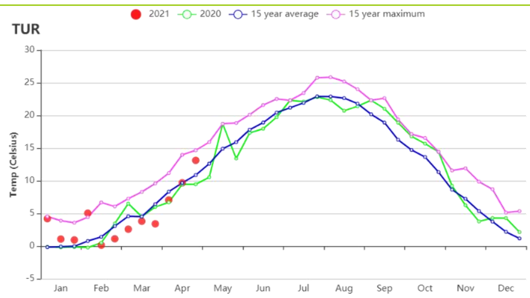
(b) Crop condition development graph based on NDVI (c) Maximum VCI



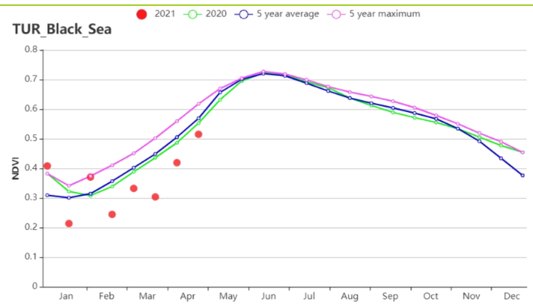


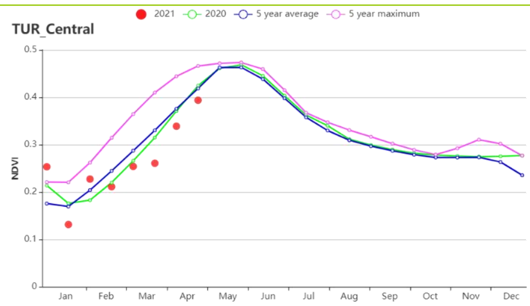
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



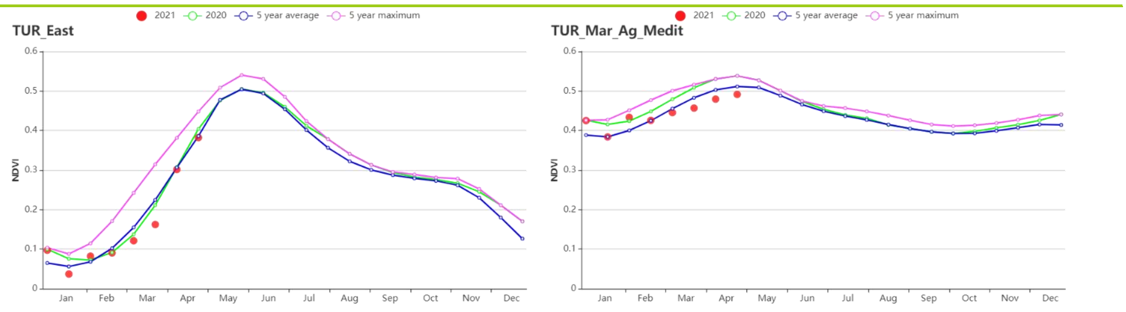


(f) Rainfall profiles (g) Temperature profiles





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



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

Table 3.71 Turkey's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Black Sea region	442	3	2.3	0.0	685	-4	476	-2
Central Anatolia region	268	-10	3.1	0.0	814	-1	477	-4
Eastern Anatolia region	380	-12	1.1	0.8	852	4	427	1
Marmara Agean Mediterranean lowland region	369	-6	7.5	0.2	833	0	603	-5

Table 3.72 Turkey's agronomic indicators by sub-national regions, current season's values and departure from 5YA, January - April 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Black Sea region	70	-8	0.81
Central Anatolia region	36	-18	0.75
Eastern Anatolia region	36	-7	0.84
Marmara Agean Mediterranean lowland region	75	1	0.82

[UKR] Ukraine

Maize and wheat are two major crops grown in the Ukraine. During this monitoring period (January to April 2021), only winter wheat and canola were growing in the field. Maize will be planted in May.

As shown by the national agroclimatic indicators, rainfall was above average (270 mm, +13%) however temperature (0.6 ℃ , -0.9 ℃) and radiation (484 MJ/m2, -9%) were lower than the 15-year average. Mainly due to low temperatures and lack of sunshine, spring green-up was slow. The potential biomass is estimated to be 8% below the 15-year average. Cropped arable land fraction (CALF 69%) had declined by 14% and maximum VCI reached 0.81 only. According to the crop condition development curve for the whole country, NDVI was far below the 5-year average at the beginning of this period. This was mainly due to snow cover. NDVI gradually improved over time and almost reached the 5-year average. Crop development was slower in the northern and eastern Ukraine (47.9% of total cropland) and parts of the central and western Ukraine (23.1% of total area). In line with the NDVI spatial patterns, VCIx for a large area of the east was less than 0.5, and between 0.5-0.8 in the west.

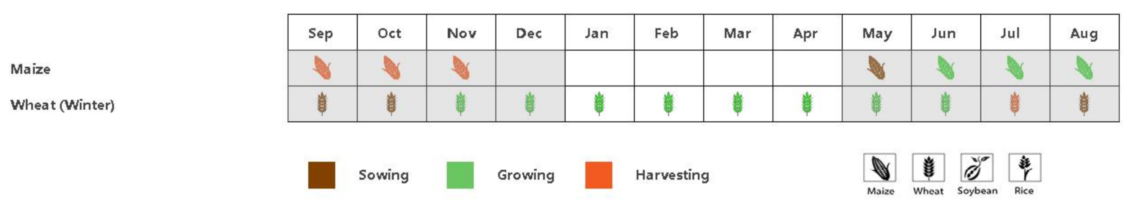
Wheat planting got off to a late start last fall and the below-average temperatures in the spring caused a slow development of wheat. However, soil moisture conditions are favorable and crop conditions can be assessed as normal.

Regional analysis

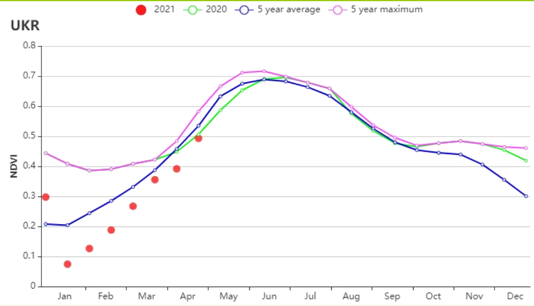
Regional analyses are provided for four agroecological zones (AEZ) defined by their cropping systems, climatic zones and topographic conditions. They are referred to as **Central wheat area** (184) with the Poltava, Cherkasy, Dnipropetrovsk and Kirovohrad Oblasts; **Northern wheat area** (186) with Rivne,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

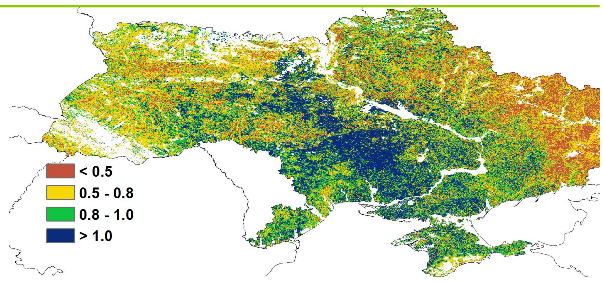
During this monitoring period, all four AEZs shared generally similar patterns in agroclimatic/ agronomic conditions and crop development curves. Rainfall was 11 to 19% higher than 15-year average from **Southern wheat and maize area** to **Eastern Carpathian hills**, temperatures were cooler by 0.5 to 1.2 ℃ and radiation decreased by 6 to 10%. Similar to the national level, potential biomass in all four AEZs was estimated at 3 to 13% below the 15YA. Cropped area (CALF) in this season was 14 to 15% below average and VCIx values were around 0.77 to 0.85. These are rather low values for the Ukraine. However, conditions gradually improved, aided by abundant rainfall.

Figure 3.41 Ukraine's crop condition, January - April 2021



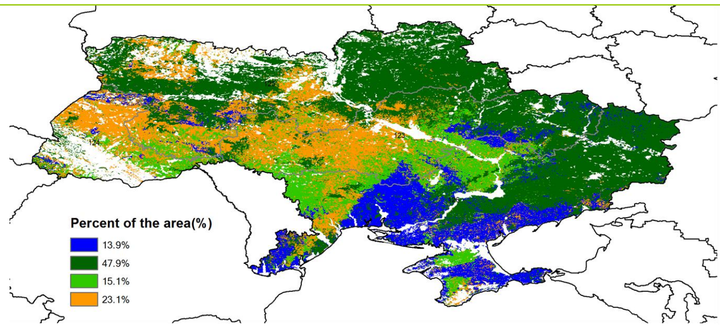
(a). Phenology of major crops

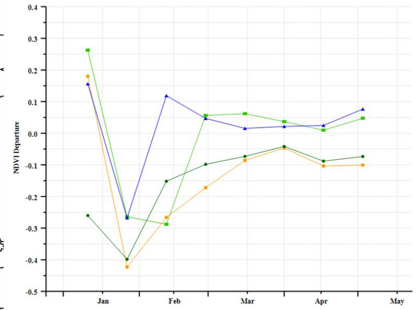




(b) Crop condition development graph based on NDVI

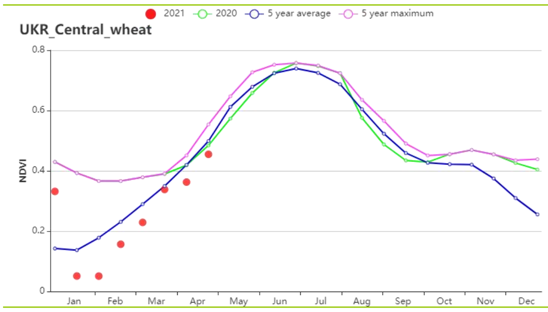
(c) Maximum VCI

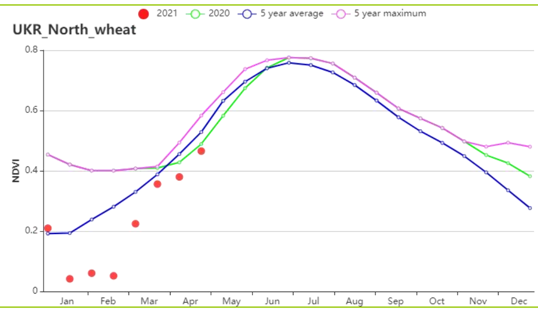




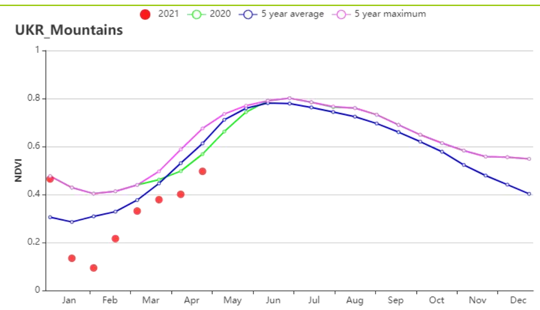
(d) Spatial NDVI patterns compared to 5YA

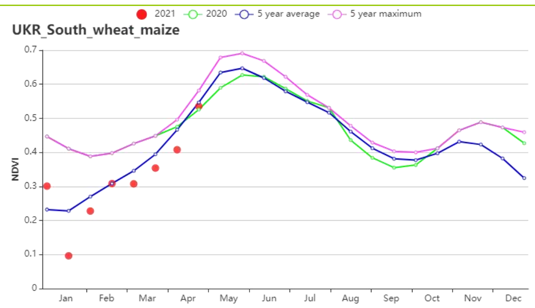
(e) NDVI profiles



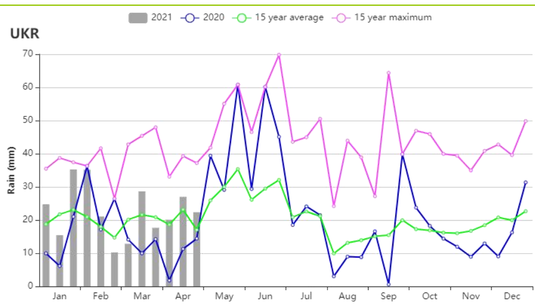


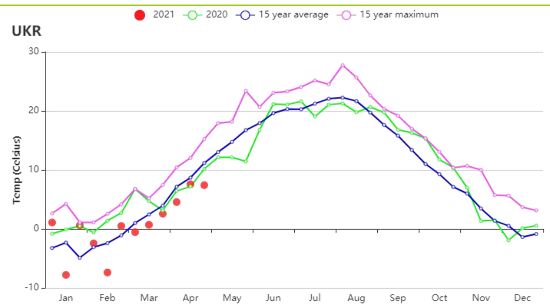
(e) Crop condition development graph based on NDVI (Central wheat area(left) Northern wheat area(right))





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





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

Table 3.73 Ukraine's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 2021

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	266	16	0.0	-1.0	468	-10	385	-11
Eastern Carpathian hills	334	19	0.4	-1.1	520	-6	389	-13
Northern wheat area	278	12	-0.3	-1.2	440	-8	372	-13
Southern wheat and maize area	244	11	1.6	-0.5	519	-9	443	-3

Table 3.74 Ukraine's agronomic indicators by sub-national regions, current season's values and departure from 5YA, January - April 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Central wheat area	61	-14	0.85
Eastern Carpathian hills	82	-15	0.73
Northern wheat area	69	-15	0.77
Southern wheat and maize area	70	-15	0.82

[USA] United States

The monitoring period for this report begins in January 2021 and ends in April 2021. During this period, winter wheat broke dormancy and reached the heading stage in late April in the southern regions. Spring wheat, corn, soybeans and rice planting started in late March and will last till early May. In general, the crop conditions were slightly below the 5-year average.

Nationwide, agro-climatic conditions were close to average during this period with a minor drop in precipitation (-5%), temperature (-0.5 ℃) and radiation (-2%) compared with 15YA. Significant below average precipitation occurred in California (-40%), North Dakota (-32%), Montana (-23%), Idaho (-20%), Indiana (-20%), and Michigan (-28%). In California, where extreme drought conditions were observed, most fields are irrigated. However, water supply is restricted since water levels in the reservoirs in the west of the USA are already below average due to the prolonged drought conditions.

In most wheat production regions of the USA, water is the most critical factor limiting yield. The top producer state of winter wheat, Kansas, had significantly higher than average precipitation by 20%, which was favorable for winter wheat growth. Oklahoma and Texas are also important winter wheat producing states in the U.S. Moderately above average and slightly below average precipitation occurred in Oklahoma (8%) and Texas (-4%), which provided normal soil moisture for winter wheat growth. A strong cold wave occurred in Mid-February. It seems that it did not cause much harm to winter wheat. Nationwide, the VCIx value of 0.75 indicates average crop conditions during this monitoring period. Pixels with low VCIx values (<0.5) were mainly located in the western Great Plains, where winter wheat growth was delayed. Colder-than-normal temperatures also hampered the sowing and emergence of spring crops. The cropped arable land fraction (CALF) was 5% lower than the average for the past 5 years. In short, the crop conditions assessed by CropWatch were slightly below average during this period. They were generally favorable for wheat grown in the Southern Plains, but unfavorable for the West and North-West.

Regional analysis

Southern Plains

For the largest winter wheat producing region in the United States, the NDVI development profile and VCIx of 0.67 indicated below-average crop conditions for this period. During this period, precipitation was near average (5%), while temperature and radiation were significantly below the 15-year average at 1.5 ℃ and 5% respectively. Potential biomass was 2% above average due to higher precipitation. A strong cold front swept across the southern plains in mid-February, causing a significant drop in temperatures (15℃ below the 15-year average). The abnormal low temperatures, accompanied by low RADPAR, resulted in delays of spring green-up of winter wheat. At the same time, CALF values were 10% lower than average compared to the 5-year average. As summer approaches, winter wheat will enter the grain filling and harvesting stage. CropWatch will be closely monitoring the changes in agri-climatic conditions, crop condition, and yield of winter wheat in this region.

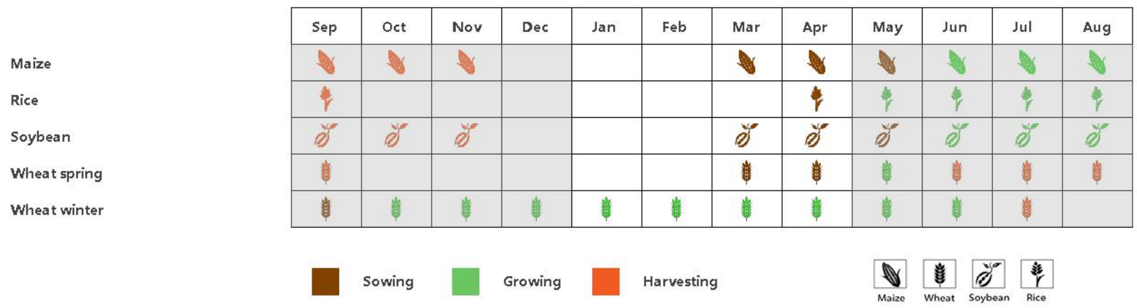
Northwest

The Northwest is the second largest winter wheat production region in the United States. The NDVI development profile and VCIx of 0.65 in this period indicated below-average crop conditions. During this period, this region suffered a precipitation shortage by 17% as compared to the 15YA. The crop condition development graph based on NDVI in the Northwest indicates below average crop development. Drier-than-usual conditions also negatively impacted the planting and germination of the summer crops, resulting in CALF being significantly lower by more than 30% as compared to the 5YA. Conditions are generally unfavorable for this region due to drought conditions.

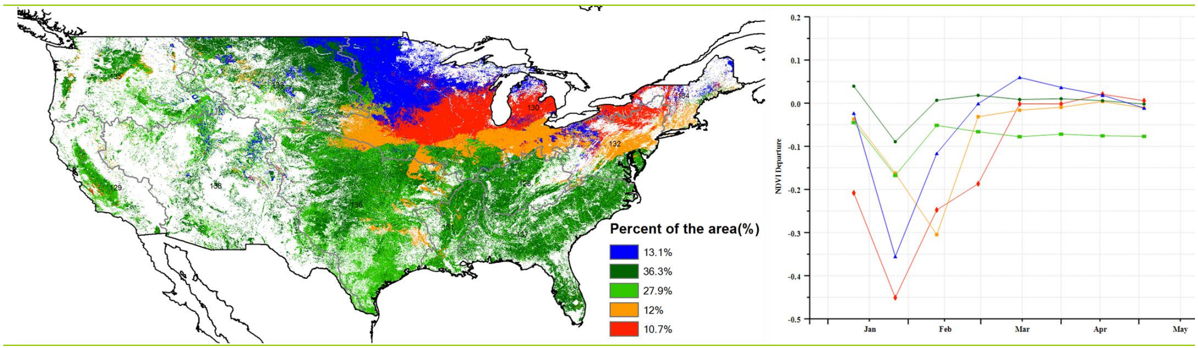
California

California is an important winter wheat producing region in the USA. The below-average NDVI development profile and VCIx of 0.60 indicated the poor crop conditions during this period. The region experienced severe drought with precipitation significantly below average by 41%. March and April are critical for winter wheat, as water requirements increases considerably once stem elongation starts. However, precipitation in the region has been significantly below average since February. The insufficient rainfall resulted in well-below average crop conditions as shown by the NDVI profiles. Although RADPAR was 8% higher than average, potential biomass was 22% lower than average due to the drought conditions. CALF was 17% below the 5YA. Considering that California has a well-established agricultural irrigation system that can provide the necessary water for winter wheat growth, CropWatch assessed that the negative impact of drought on winter wheat yields as minimal.

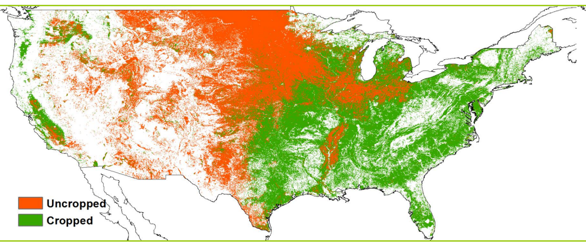
Figure 3.42 United States crop condition, January - April 2021

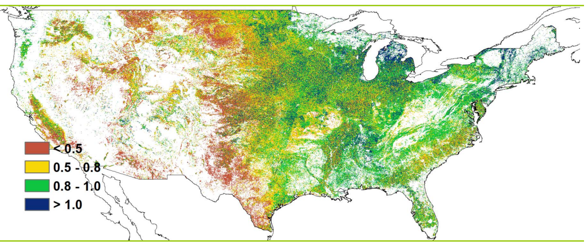


(a). Phenology of major crops

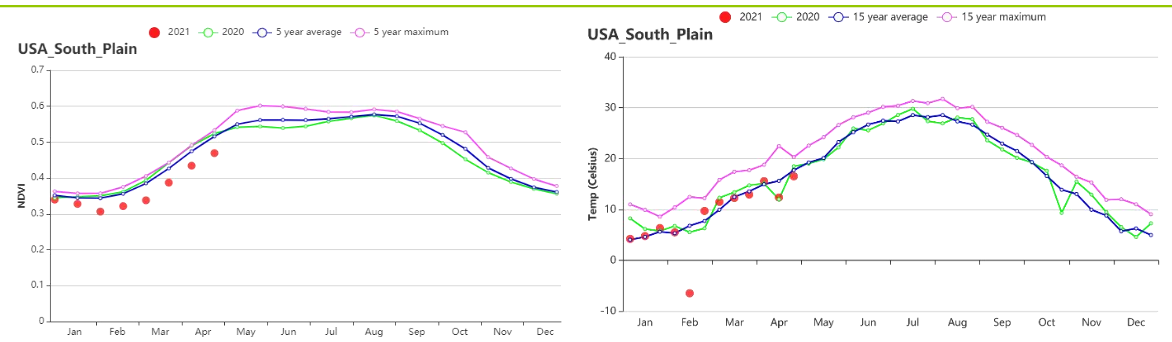


(b) NDVI departure clustering and its development profile

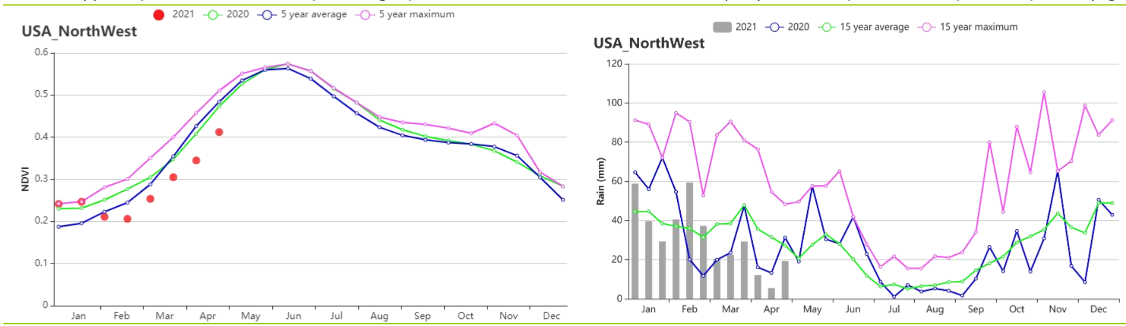




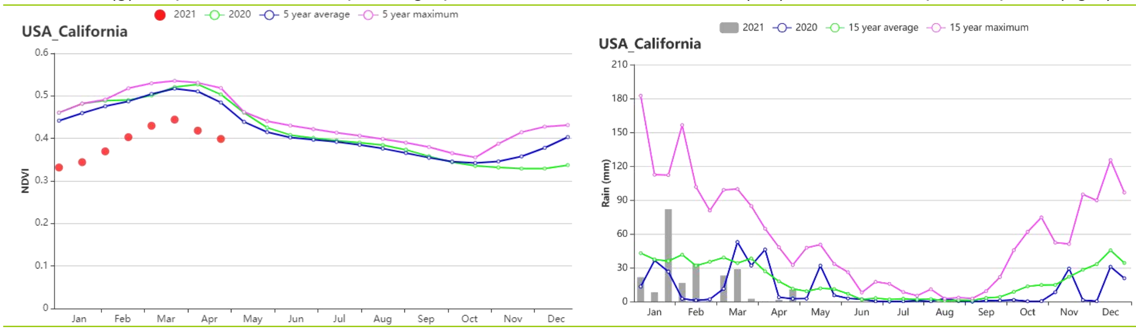
(c) Cropped and uncropped arable land (d) Maximum VCI



(f) Crop condition development graph based on NDVI of South Plain(left) and temperature departure profile(right)



(g) Crop condition development graph based on NDVI of Northwest(left) and rainfall departure profile(right)



(h) Crop condition development graph based on NDVI(California) and Rainfall profile(right)

Table 3.75 United States' agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure	Current (° C)	Departure	Current(MJ/ ㎡)	Departure	Current(gDM/m2)	Departure
Blue Grass region	502	-3	6.4	-0.2	753	0	664	-2
California	230	-41	8.7	0	962	8	404	-22
Corn Belt	300	-9	0.7	0.3	663	-3	443	5
Lower Mississippi	542	1	10.5	-0.9	780	-4	838	-3
North-eastern areas	371	-12	1.7	0.3	682	0	458	1
Northwest	374	-17	1.2	0	698	7	406	-1
Northern Plains	179	-17	-1.3	0	749	0	360	-1
Southeast	465	8	12.1	-0.1	858	-3	836	2
Southern Plains	301	5	8.8	-1.1	844	-4	569	2

Table 3.76 United States' agronomic indicators by sub-national regions, current season's values and departure, January - April 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current
Blue Grass region	97	0	0.86
California	65	-17	0.6
Corn Belt	40	10	0.87
Lower Mississippi	76	1	0.85
North-eastern areas	97	4	0.91
Northwest	41	-30	0.65
Northern Plains	4	-71	0.57
Southeast	99	0	0.83
Southern Plains	58	-10	0.67

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 SYR THA TUR UKR USA **UZB** VNM ZAF ZMB

[UZB] Uzbekistan

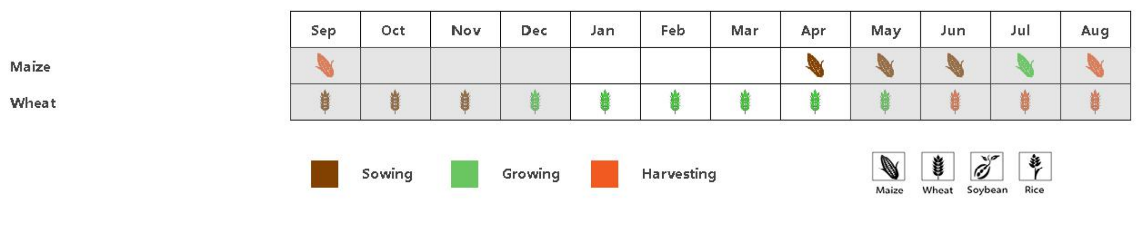
The monitoring period from January to April covers the main growth period of winter wheat and the planting of maize in Uzbekistan. The national average VCIx was 0.59, and the cropped arable land fraction decreased by 44%. Among the CropWatch agroclimatic indicators, RAIN was below average (-20%), while TEMP and RADPAR were above average (+0.3℃ and +4%). The rainfall was generally below average except in March. The combination of factors resulted in an decreased BIOMSS (-9%) compared to the fifteen-year average. As shown by the NDVI development graph, crop conditions were below the five-year average during the monitoring period from January to April. NDVI cluster graphs and profiles show that 29% of the agriculture areas had above-average conditions from February to late March. They are covering mainly parts of the Qunghirot, Altynkul, Takhtakupyr, Chimbay, Beruni, Turtkul provinces and some small parts of Denau, Kitab and Termez provinces. Another 8% of the agriculture areas had above-average conditions from March to April in most of the eastern and southern provinces. It was normal or subnormal in other regions. Overall, crop conditions were generally unfavorable due lack of rainfall in April.

Regional analysis

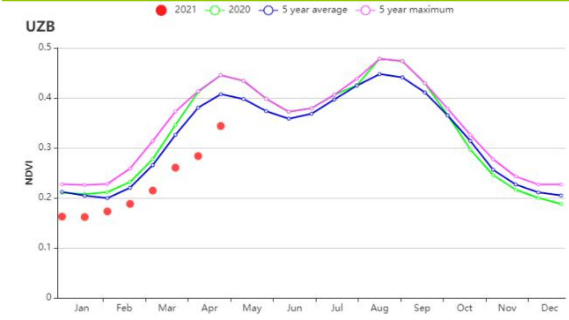
In the Eastern hilly cereals zone, NDVI was below the five-year average from January to late April. The RAIN was below average (-21%), while RADPAR and TEMP were above the fifteen-year average (+5% and +0.3°C). The combination of these factors resulted in an increased BIOMSS (+3%). The maximum VCI index was 0.61 and Cropped Arable Land Fraction decreased by 44% compared to the five-year average. Overall crop prospects are unfavorable.

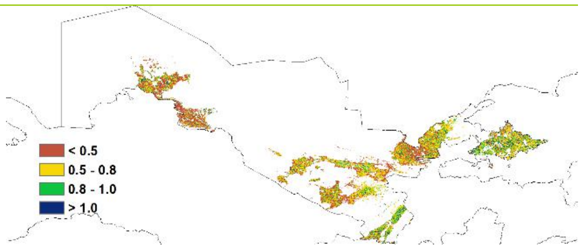
In the Aral Sea cotton zone, accumulated rainfall and radiation were below average during the monitoring period (RAIN -14% and RADPAR -2%), and the temperature was slightly below average (TEMP -0.1°C). The BIOMSS index increased by 16% compared to the fifteen-year average. No croplands are cultivated during this monitoring period.

Figure 3.43 Uzbekistan's crop condition, January - April 2021

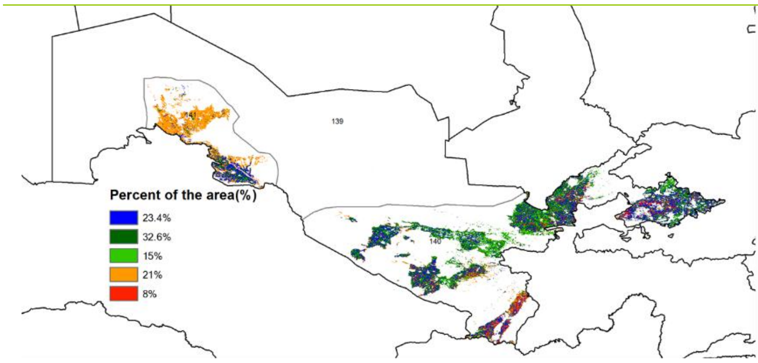


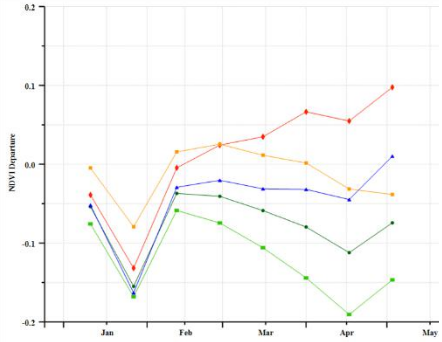
(a) Phenology of major crops



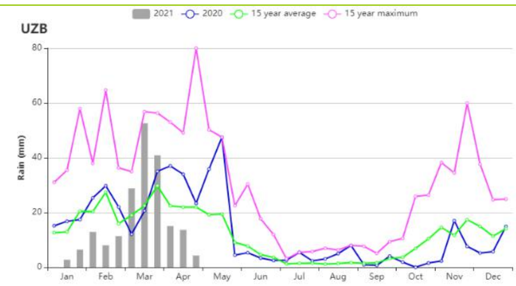


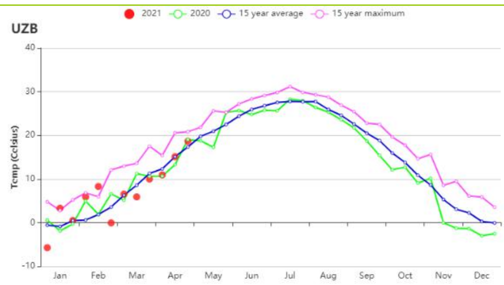
(b) Crop condition development graph based on NDVI (c) Maximum VCI



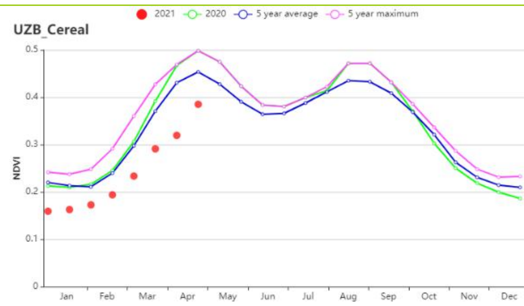


(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles

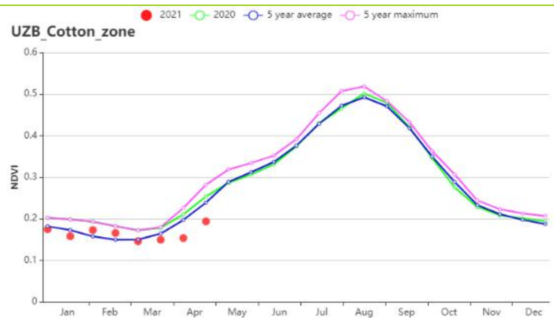




(f) Rainfall profiles (g) Temperature profiles



(h) Crop condition development graph based on NDVI Central region with sparse crops (left) Eastern hilly cereals region (right)



(i) Crop condition development graph based on NDVI Aral Sea cotton region

Table 3.77 Uzbekistan's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Aral Sea cotton zone	56	-14	5.5	-0.1	796	-2	302	-13
Eastern hilly cereals zone	213	-21	6.7	0.3	879	5	444	-11
Central region with sparse crops	79	-35	7.3	0.5	847	3	276	3

Table 3.78 Uzbekistan's agronomic indicators by sub-national regions, current season's values and departure from 5YA, January - April 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Aral Sea cotton zone	-	-	-
Eastern hilly cereals zone	32	-44	0.61
Central region with sparse crops	-	-	-

[VNM] Vietnam

This report covers the grain filling period and harvest of winter-spring rice, followed by planting of summer-autumn rice in the Mekong Delta and the southeast of Vietnam. In the central part, winter rice was also followed by summer rice, but planting took place in April only. In the north, winter-spring rice was planted in January. It will be ready for harvest in May.

During this reporting period, the total precipitation in Vietnam was slightly above average (RAIN +4%). Between January and March, rainfall was generally slightly below average, but above average in April. Temperatures were also slightly above the 15YA (TEMP, +0.2°C). Early January was cooler than average, but subsequently, temperatures pretty much followed the 15YA. A similar pattern was observed for photosynthetically active solar radiation: it was mostly below average in January and above average thereafter. The estimated biomass was 4% below the 15YA.

Based on the NDVI crop condition development graph, the crops conditions were below the 5YA for the country. The largest negative departure was observed in March. Almost all cropland was cultivated except for some areas in Minh Hai, Soc Trang in the Mekong River Delta, and the southern part of Dong Nai in the South East. There was not any noticeable change in the cropped arable land fraction (CALF). The national average VCIx was 0.91. As to the spatial distribution of NDVI profiles, crop conditions in practically all areas were below average. Mekong River Delta, the Southeastern and Northwestern part of Vietnam had relatively poor crop conditions.

Regional analysis

Based on cropping systems, climatic zones, and topographic conditions, several agro-ecological zones (AEZ) can be distinguished for Vietnam: North Central Coast, North East, Red River Delta, South East, South Central Coast, North West, Central Highlands, Mekong River Delta.

The North Central Coast recorded an average rainfall of 342 mm, 2% below average, while the temperature was 19.2°C, a reduction by 0.2 ℃ as compared to the 15YA. RADPAR was above average (+7%) and BIOMASS was close to average. Overall, VCIx was 0.94 and CALF was close to average. According to the NDVI-based development graph, crop conditions were below the five-year average

In the North West, the average rainfall was 55% above the 15YA while the temperature was close to the 15YA. Radiation was slightly lower than average (+3%). The potential biomass was above average (-+13%) and the VCIx was 0.93. According to the NDVI-based development graph, crop conditions were below the 5YA and recovered to the long-term average in April. Conditions were generally unfavorable for winter rice.

In the Red River Delta, the average rainfall was 361 mm (RAIN +20%). The temperature was up by 0.4 ℃ and the VCIx was 0.89. RADPAR (4%) was above the 15YA and BIOMSS was at averagee. According to the NDVI-based development graph, crop conditions were lower than the 5Y average. CALF decreased by 5%. The crop output is expected to be unfavorable.

In the South East, total rainfall was 209 mm, 15% below 15YA. The temperature was 25.7°C, which was -0.5 ℃ cooler than the 15YA. RADPAR was higher than average (+4%). BIOMASS was below average (-13%). According to the NDVI-based development graph, crop conditions were lower than the five-year average, except for April, when they improved to above average conditions. Overall, VCIx (0.87) and CALF (94%) indicated below average conditions in this region.

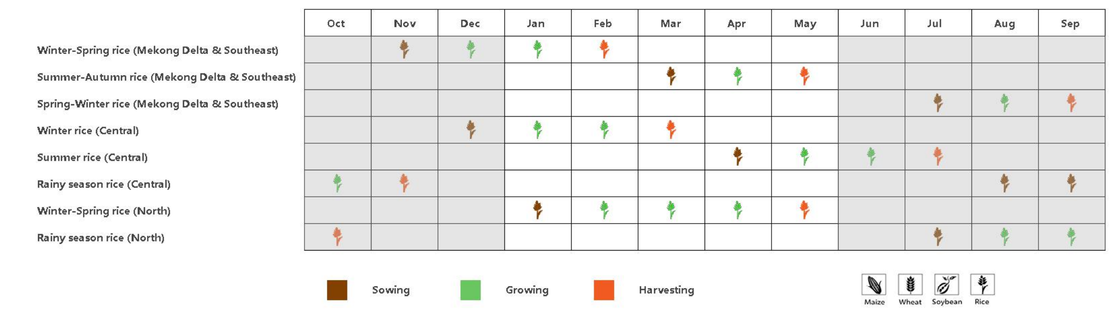
In the South Central Coast, the average rainfall was about 268 mm, 37% below average, while TEMP was 19.9°C, which was -0.7℃ cooler than the 15YA. RADPAR was above average (+7%). BIOMASS was below average (-19%). According to the NDVI-based development graph, crop conditions were lower than the 5YA. VCIx for this region was 0.89 and CALF slightly decreased by 1%.

The average rainfall in the Central Highlands was about 191 mm, 25% below average, while TEMP was 21.6°C, a decrease by -0.6°C, as compared to the 15YA. RADPAR was above average (+6%). BIOMASS was below average (-13%). According to the NDVI-based development graph, crop conditions were near the 5YA. Overall, high VCIx (0.86) and stable CALF expected normal conditions.

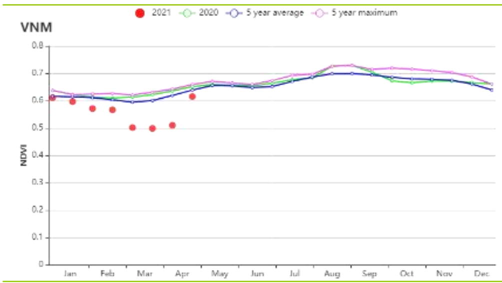
In the Mekong River Delta, rain was 281 mm, 10% below the 15YA. The average temperature was 27°C, which was 0.5 ℃ lower than the 15YA. PAR (RADPAR) was higher than average (3%). BIOMASS was below average (-8%). According to the NDVI-based development graph, crop conditions were close to the 5YA only in February, whereas in the remaining months, they were below.VCIx (0.86) and CALF (86%) indicate moderate conditions in this region.

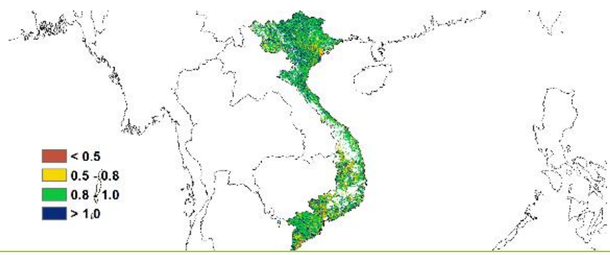
The North East region recorded the highest rainfall among all the regions, resulting in a positive departure by +37%. TEMP was above average by 0.3°C, and the RADPAR decreased by 3%. CALF in this region did not significantly change and VCIx reached 0.95.

Figure 3.44 Vietnam's crop condition, January - April 2021



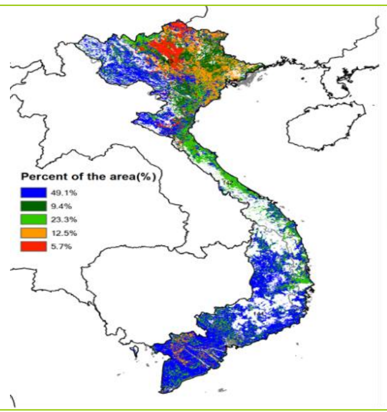
(a). Phenology of major crops

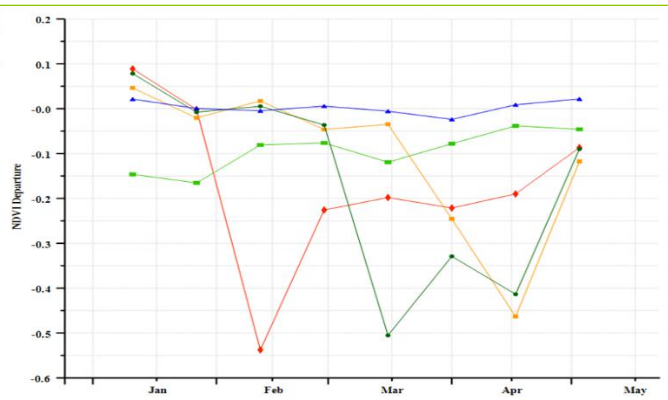




(b) Crop condition development graph based onNDVI

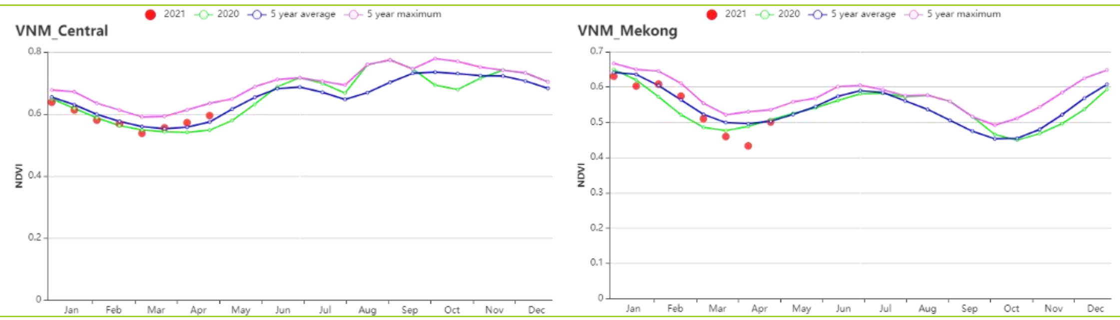
(c)Maximum VCI



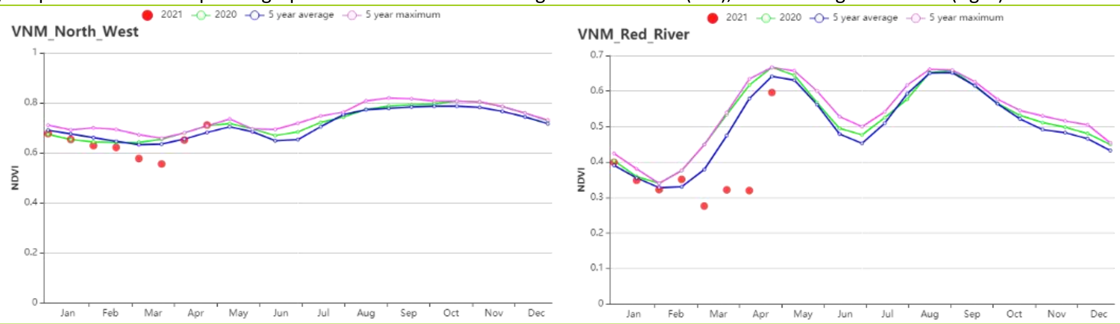


(d) Spatial NDVI patterns compared to 5YA

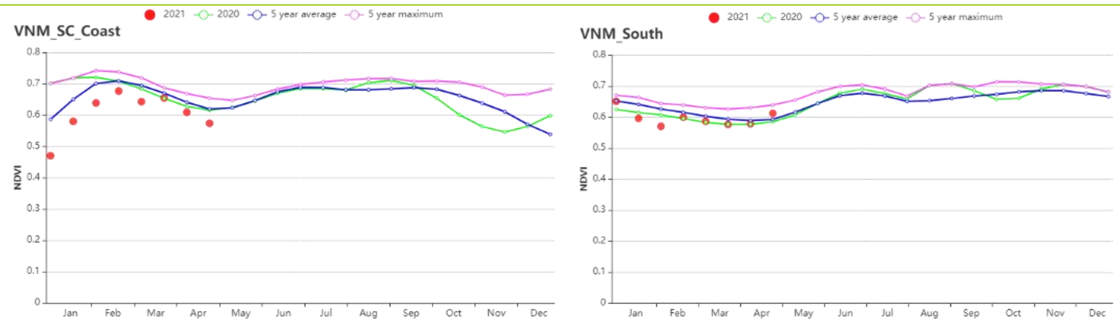
(e) NDVI profiles



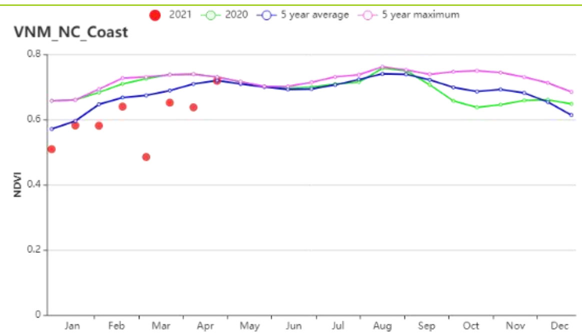
(f) Crop condition development graph based on NDVI Central Highlands Vietnam (left), and Mekong River Delta (right).



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



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



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

Table 3.79 Vietnam's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure from 15YA (%)	Current (gDM/m²)	Departure from 15YA (%)
Central Highlands	**197**	**-25**	**21.6**	**-0.6**	**1185**	**6**	**616**	**-13**
Mekong River Delta	**284**	**-10**	**27**	**-0.5**	**1223**	**3**	**784**	**-8**
North Central Coast	**347**	**-2**	**19.2**	**-0.2**	**943**	**7**	**818**	**-3**
North East	**437**	**37**	**17.1**	**0.3**	**695**	**-3**	**811**	**5**

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure from 15YA (%)	Current (gDM/m^2)	Departure from 15YA (%)
North West	376	55	17.4	0.1	924	-3	780	13
Red River Delta	362	20	19.6	0.4	673	4	777	0
South Central Coast	272	-37	19.9	-0.7	1092	7	734	-19
South East	214	-15	25.7	-0.5	1225	4	602	-13

Table 3.80 Vietnam's agronomic indicators by sub-national regions, current season's values and departure from 5YA,January - April 2021

Region	Cropped arable land fraction		Maximum VCI
	Current	Departure from 5YA (%)	Current
Central Highlands	98	1	0.86
Mekong River Delta	87	1	0.91
North Central Coast	98	0	0.94
North East	99	0	0.95
North West	100	0	0.93
Red River Delta	90	-5	0.89
South Central Coast	96	-1	0.89
South East	94	1	0.87

[ZAF] South Africa

In South Africa, soybean and maize are the main crops being produced during this monitoring period. In the west, maize planting finished in January and harvest will start in June. In the east, maize harvest started in April. Soybean was grown from January to March and harvest began in April.

Based on the NDVI development graph, the crop conditions were near the 5-year maximum at the beginning of this monitoring period. It subsequently started to decline to below 5YA levels in April. At the national level, the CropWatch agroclimatic indicators showed that RAIN and TEMP were close to the 15-year average. With a slightly lower RADPAR (-2%), the BIOMSS decreased by 11% compared to the 15-year average. The VCIx was 0.93, and CALF increased by 6% compared with the last 5 years. The cropped arable land fraction (CALF) increased by 6%. According to the maximum vegetation condition index (VCIx), conditions in the eastern region were better than in the southern region. As to the spatial distribution of NDVI profiles, crop conditions in about 40.3% of the cropland were above average and about 8.9% of the area was below average during the whole monitoring period. The areas with negative departures were mainly in the center of the eastern region. Overall, crop conditions were below average.

Regional analysis

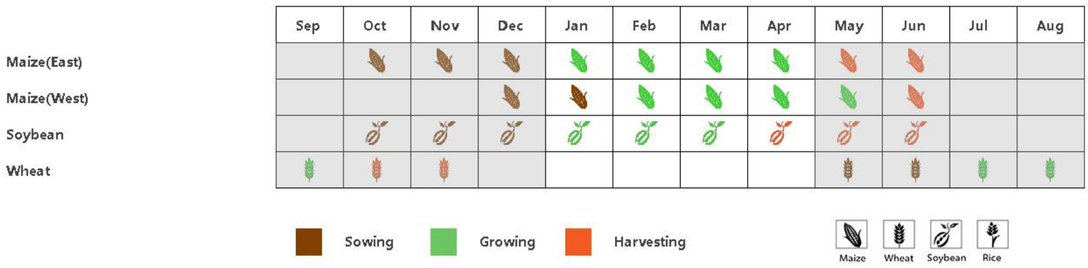
RAIN in the **Arid and desert zones** was above average (135 mm, 18%). With average TEMP (20.5 °C, -0.2°C) and RADPAR (1280 MJ/m2, -3%), BIOMSS was reduced by 5%. CALF increased substantially (+17%) and VCIx was 0.81. The crop condition development graph based on NDVI indicates that initially highly favorable conditions developed into average conditions staring in February. Crop production is expected to be normal

In the **Humid Cape Fold mountains**, TEMP was near average (19.7 °C, +0.1 °C). With below-average RAIN (320mm, -7%) and RADPAR (1110 MJ/m2, -2%), BIOMSS was below the 15-year average (-11%). CALF was 95% and VCIx was 0.93. The crop condition development graph based on NDVI also indicated above-average conditions.

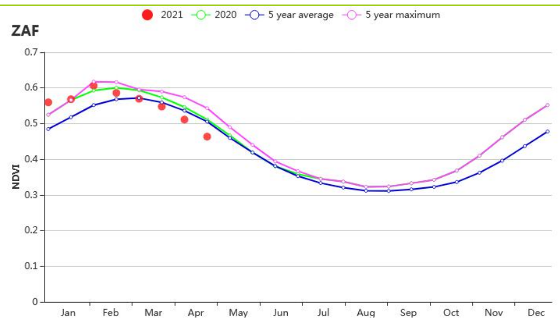
In the **Mediterranean zone**, TEMP was near (19.3 °C, -0.1 °C), while below-average conditions were observed for RAIN (96 mm, -3%) and RADPAR (1247 MJ/m2, -5%). Estimated BIOMSS was reduced by 9%. CALF increased substantially (24%, +22%) and VCIx was 0.77. According to the crop condition development graph, the NDVI was above the 5-year average for most of the period. Crop conditions were near average.

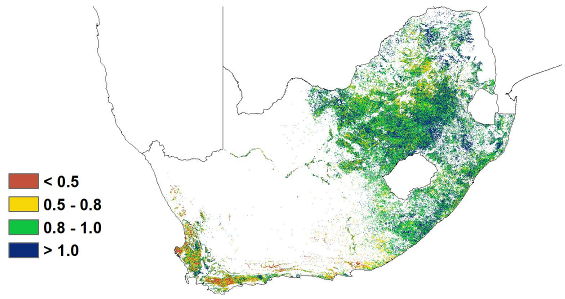
In the **Dry Highveld and Bushveld maize areas**, all agroclimatic indicators were close to the 15-year average: RAIN(244 mm, +1%), TEMP (19.1 °C, -0.4°C) and RADPAR (1235 MJ/m2, -2%). BIOMSS was reduced by 11%. CALF was above the 5YA (99%, +7%) and VCIx was 0.95. The crop condition development graph based on NDVI indicated similar conditions as in the Arid and Desert zones, which had developed from above-average to below-average condtions starting in March. Crop conditions were normal.

Figure 3.45 South Africa's crop condition, January - April 2021

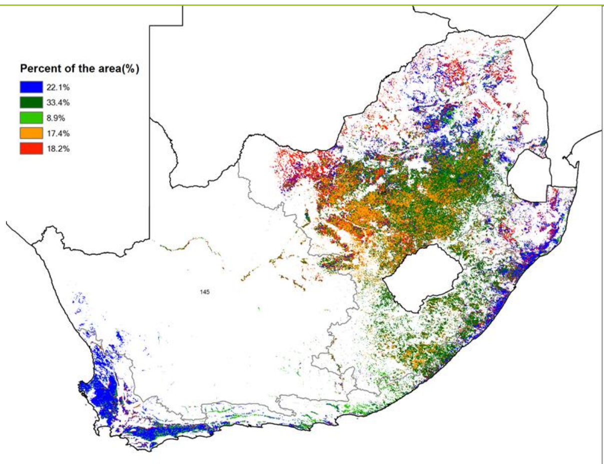


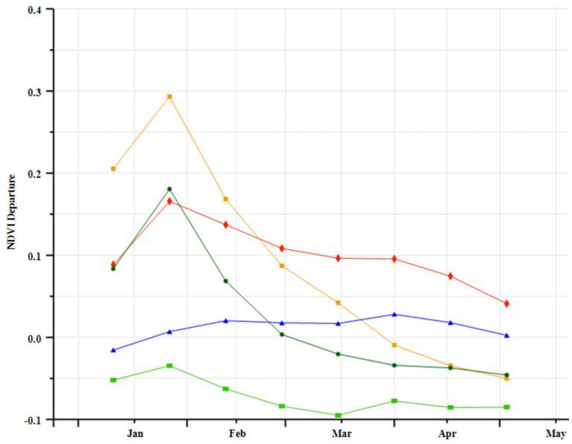
(a) Phenology of major crops



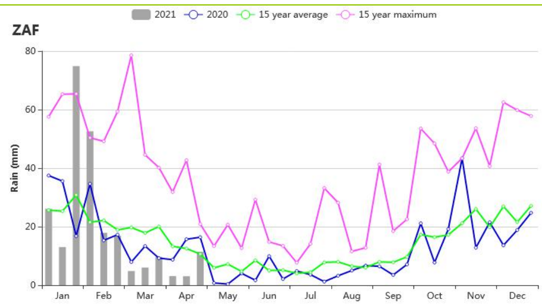


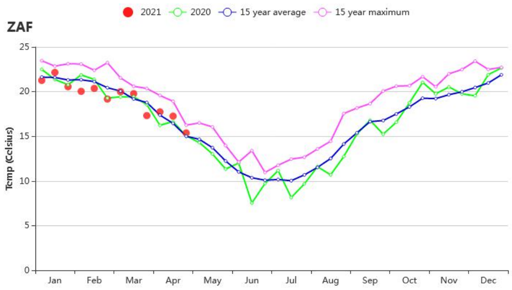
(b) Crop condition development graph based on NDVI (c) Maximum VCI



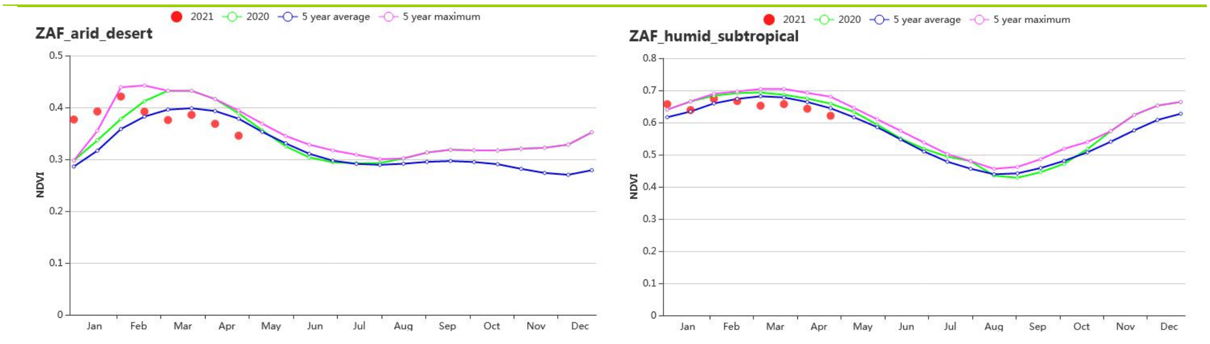


(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles

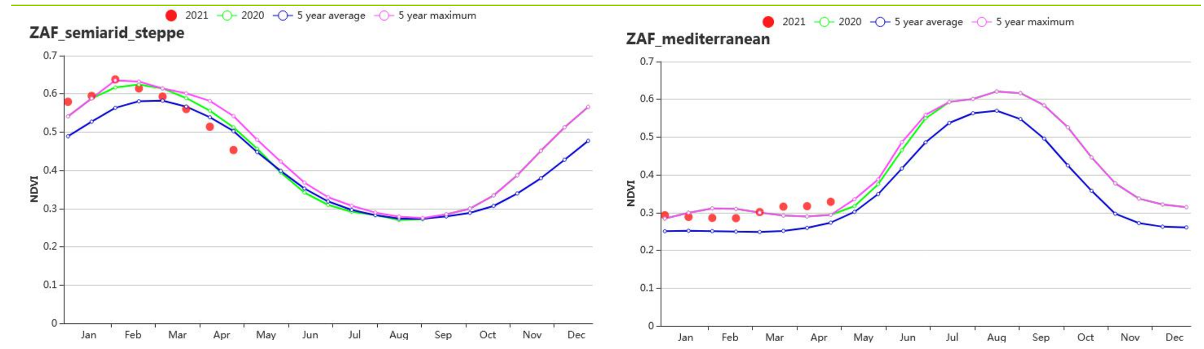




(f) Rainfall profiles (g) Temperature profiles



(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 3.81 South Africa's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Arid and desert zones	135	18	20.5	-0.2	1280	-3	537	-5
Humid Cape Fold mountains	320	-7	19.7	0.1	1110	-2	802	-11
Mediterranean zone	96	-3	19.3	-0.1	1247	-5	502	-9
Dry Highveld and Bushveld maize areas	244	1	19.1	-0.4	1235	-2	668	-11

Table 3.82 South Africa's agronomic indicators by sub-national regions, current season's values and departure from 5YA, January - April 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Arid and desert zones	59	17	0.81
Humid Cape Fold mountains	95	0	0.93
Mediterranean zone	24	22	0.77
Dry Highveld and Bushveld maize areas	99	7	0.95

[ZMB] Zambia

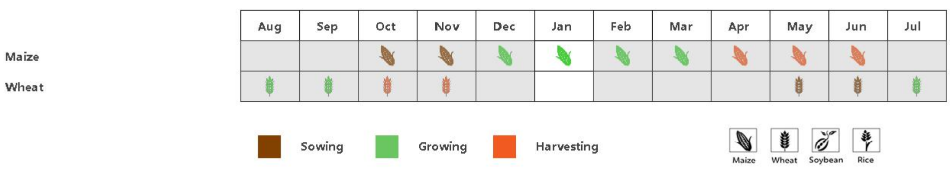
This report covers the main part of the growing season for rainfed crops in Zambia. The main cereal crops are maize, sorghum and millet which were planted between late October and early January depending on the agroecological region. Rainfall during the reporting period was well distributed, resulting in good moisture conditions for crop growth. The harvest of the main cereal crops started in April and preliminary forecasts indicate an annual maize production of 3.5 million metric tonnes.

Based on the CropWatch indicators at the national scale there was a slight decrease (-6.6%) in rainfall (906 mm), as well as a reduction in potential radiation (-3.8%) and biomass production (-8%). The NDVI was also below average in January and February. However, there was recovery by the time of the peak of the growing season, when it reached the 15-year average level. The area under cultivation was 100% (CALF=>99.9%) an increase of 1%. Average VCIx was predominantly more than 0.9 ranging 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. Crop conditions in Zambia were below average.

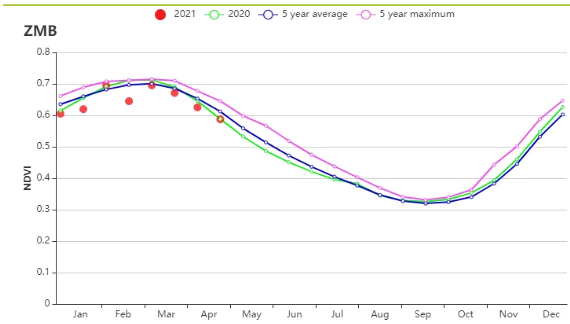
Regional analysis

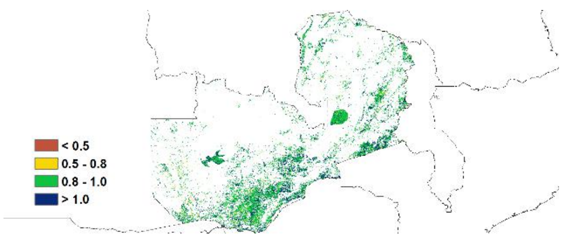
The analysis of agroecological regions showed a reduction in rainfall received in the Western-semi arid plain (-28.4%), Northern High rainfall zone (-9.7%), and Central - Eastern and Southern Plain (-2.1%), while the Luangwa-Zambezi valley received an above-average rainfall (+3.6%). Temperature and radiation were below average (-0.4ºC and -4% respectively). In combination with reduced rainfall, the estimated biomass was15%, 7%, 6%, 9% below average. Cropped Arable Land Fraction (CALF) was almost close to 100%. The negative departures in biomass and NDVI indicate a slight reduction of potential agricultural productivity in some regions of the country. Infestations of African Migratory Locust (AML) between January and March 2021 in southern and western parts affected nearly 30 percent of the national maize output.

Figure 3.46 Zambia's crop condition, January - April 2021

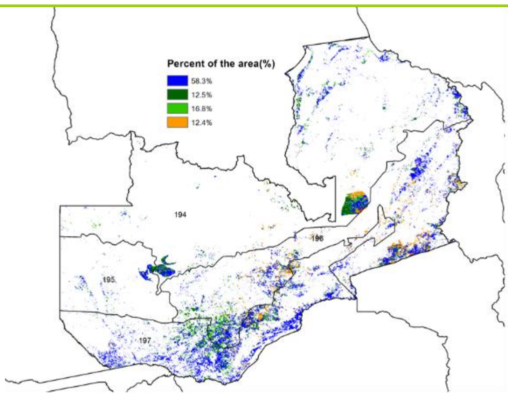


(a) Phenology of major crops

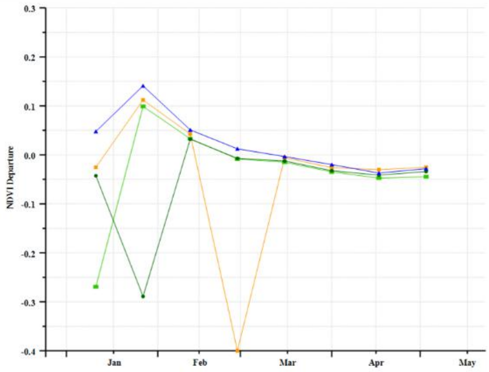




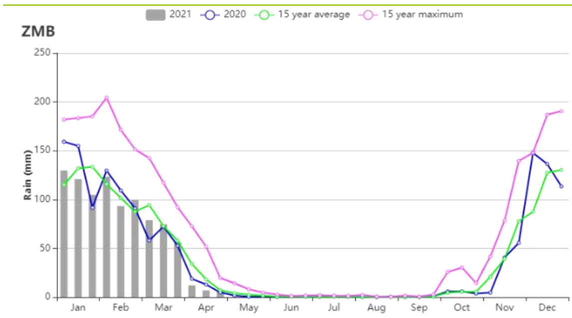
(b) Crop condition development graph based on NDVI (c) Maximum VCI



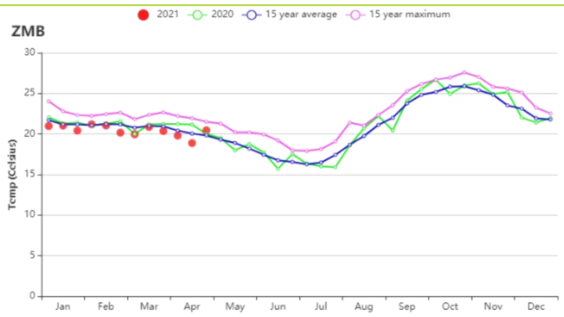
(d) Spatial NDVI patterns compared to 5YA



(e) NDVI profiles



(f) Rainfall profiles



(g) Temperature profiles

Table 3.83 Zambia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 2021

Region	RAIN		Temp		RADPAR		BIOMSS	
	Current (mm)	Departure from 15YA(%)	Current (C)	Departure from 15YA(%)	Current (MJ/m2)	Departure from 15YA(%)	Current (gDM/m2)	Departure from 15YA(%)
Luangwa Zambezi rift valley	846.5	3.6	21.3	-0.6	1191.8	-4.1	1089	-9
Northen high rainfall zone	1015.2	-9.7	19.4	-0.4	1065.5	-3.7	1256	-7
Central-eastern and southern plateau	929.5	-2.1	20.5	-0.4	1119.4	-4.1	1215	-6
Western semi-arid plain	546.8	-28.4	22.0	-0.4	1165.4	-4.5	1029	-15

Table 3.84 Zanbia's agronomic indicators by sub-national regions, current season's values and departure from 5YA, January - April 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Luangwa Zambezi rift valley	846.5	3.6	21.3
Northen high rainfall zone	1015.2	-9.7	19.4
Central-eastern and southern plateau	929.5	-2.1	20.5
Western semi-arid plain	546.8	-28.4	22.0

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

This report covers the main growing period of winter wheat and rapeseed. The sowing of the first summer crops, such as spring maize and early rice started in March. Generally speaking, agro-climatic conditions over the major winter crops producing regions were favorable. For China, RAIN and RADPAR decreased by 11% and 3%, respectively, as compared to the 15-year average, whereas TEMP increased by 0.9°C. Consequently, BIOMSS was 5% average average and VCIx was quite fair, with a value of 0.88.

Spatially, 57.7% of the arable land experienced average precipitation throughout the reporting period. The south-eastern region (12.2% of cropland) went through rainfall fluctuations over time, mainly negative anomalies, with the largest negative rainfall anomalies (more than 30 mm below average) occurred in late January and late March. Average rainfall was 24% below the 15YA in that region. The remaining regions with green color went through some rainfall fluctuations, but they were mainly positive departures. Temperature anomalies varied over time across the whole country. The blue marked areas had the biggest positive temperature departure (almost +5.0 ℃) in mid-Februrary. They included the provinces of Shaanxi, Henan, Shandong, Jiangsu, Anhui, Hubei, and Hunan. Uncropped areas mainly occurred in the North-west and North-east regions and the provinces of Gansu, Ningxia, Shanxi, and some parts of Hebei and Shaanxi in Northern parts of China (Figure 4.4).

In April, the cropping season is well underway in southern and central China. According to the spatial VCIx patterns (Figure 4.5), favorable crop conditions (VCIx larger than 0.8) occurred widely all across China especially in the Huanghuaihai; values between 0.5 and 0.8 were observed for the provinces of Shanxi, Shaanxi, Hebei, and Ningxia where cropland was not fully cultivated during the monitoring period according to the CALF map. The potential biomass (Figure 4.6) showed significant variability across regions. Positive anomalies (more than 20%, marked in blue) occured in south-eastern regions of the country, including Guangdong, Fujian and some parts in Guangxi, Jiangxi and Zhejiang, while negative anomalies (-20% or more) were mainly observed in the provinces of Guizhou, Hunan, Hubei, Sichuan, and Gansu, as well as in some parts of Ningxia, Shanxi, Shandong, Henan, Xinjiang, and Anhui. When it comes to VHIn (Figure 4.7), high values (above 36) are widespread in China, indicating limited water deficit effects on most of the winter crops.

As for the main producing regions at the sub-national level, rainfall was above average, ranging from +12% to +46%, except for Lower Yangtze region and Southeastern China. Temperature departures were all positive, ranging from +0.6℃ to +1.3°C, with the highest positive departure in

Lower Yangtze region. RADPAR was below average, except for Lower Yangtze region and Southeastern China. Consequently, BIOMSS increased in almost all the regions compared to average with the anomalies ranging from 4% to 25%, except for Lower Yangtze Region and Southern China. CALF in all regions was quite different, ranging from 11% below average in Loess region to 7% above average in Huang Huaihai. As for VCIx, the values were quite high for all the regions, ranging between 0.81 and 0.94, with the lowest value occurred in Loess region mainly related to the reduced planted area.

Table 4.1 CropWatch agro-climatic and agronomic indicators for China, January to April 2021, departure from 5YA and 15YA

Region	Agroclimatic indicators				Agronomic indicators	
	Departure from 15YA (2006-2020)				Departure from 5YA (2016-2020)	Current period
	RAIN (%)	TEMP (°C)	RADPAR (%)	BIOMSS (%)	CALF (%)	Maximum VCI
Huanghuaihai	46	0.8	-8	25	7	0.94
Inner Mongolia	32	0.8	-5	20	/	0.88
Loess region	31	0.8	-8	12	-11	0.81
Lower Yangtze	-23	1.3	1	0	1	0.91
Northeast China	26	0.9	-5	24	/	0.89
Southern China	-24	1.1	11	-9	-2	0.88
Southwest China	12	0.6	-10	4	0	0.92

Figure 4.1 China crop calendar

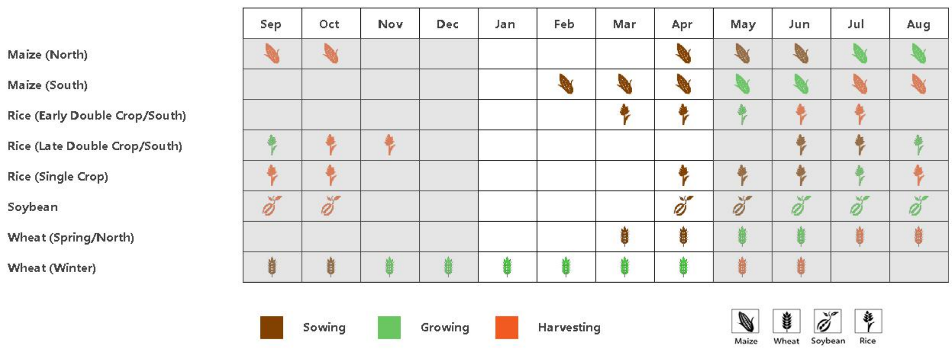


Figure 4.2 China spatial distribution of rainfall profiles, January - April 2021

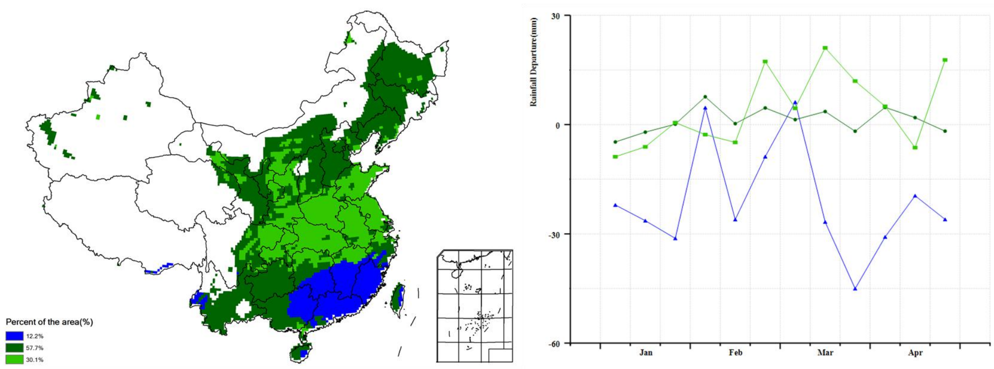


Figure 4.3 China spatial distribution of temperature profiles, January - April 2021

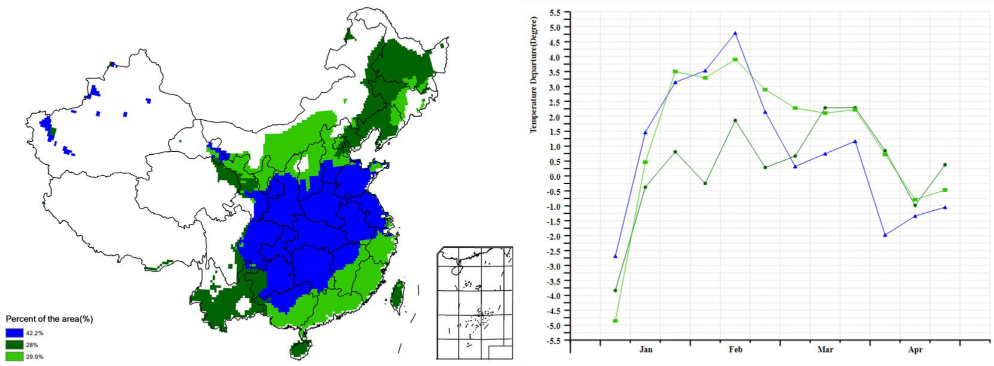


Figure 4.4 China cropped and uncropped arable land, by pixel, January - April 2021

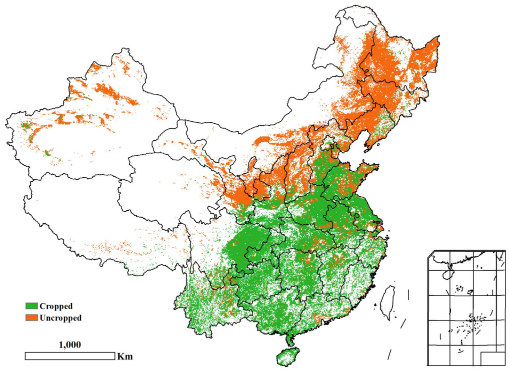


Figure 4.5 China maximum Vegetation Condition Index (VCIx), by pixel, January - April 2021

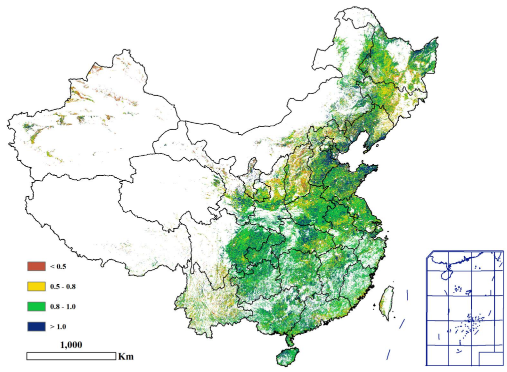


Figure 4.6 China biomass departure map from 15YA, by pixel, January - April 2021

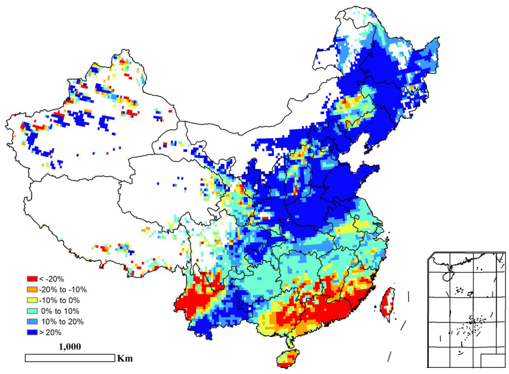
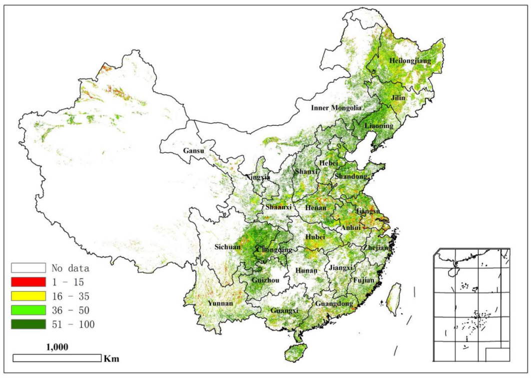


Figure 4.7 China minimum Vegetation Health Index, by pixel, January - April 2021



4.2 China crops prospects

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.

(1) Winter crop production

The overall favorable weather conditions benefitted winter crops. During the overwintering to regreening and jointing stages, RAIN and TEMP were above average (+25% and +0.8°C). Benefitting from good agro-climatic conditions and proper crop management, winter crop conditions are overall favorable. CropWatch puts the total output of winter crops at 132.46 million tons, up by 0.7% or 0.96 million tons from 2020 (Table 4.2).

The planted area of winter crops in the Huanghuaihai Plain has expanded compared with 2020, especially in Shandong, Hebei, and Anhui with an increase of 2.8%, 1.7%, and 0.3%, respectively. The production also increased, which prompted the total output of winter crops in these provinces to increase by 1.13 million tons (+4.4%), 0.317 million tons (2.6%), and 0.106 million tons (0.9%), respectively. As the largest winter crop producting province, Henan has a slight decline in winter crop planted area and yield, resulting in a decrease of winter crop production by 0.257 million tons. Affected by the drier weather during the sowing period in the autumn of 2020, the winter crop planted area on the Loess region including Shanxi, Shaanxi and Gansu has decreased by 2.3%, 3.5% and 4.3%, respectively. During the re-greening to jointing stages of winter wheat, Shaanxi and Gansu received significantly above average precipitation, which provided favorable soil moisture conditions for the winter crops. The increase in yield partly compensates for the reduction in planted area, resulting in a reduction of winter wheat production by only 2.4% in these provinces. In contrast, RAIN has continued to be low since the wintering period in Shanxi Province, the decline in both yield and planted area has led to a 3.5% reduction in winter crop production, which is the largest reduction of production percentage wise among all provinces. The area of winter crop planted in the three provinces of Hubei, Chongqing and Sichuan has also been reduced. However, the increase in yield in the three provinces compensated for the reduction in area, and only minor production changes in those three provinces resulted.

Table 4.2 China, 2021 winter crop production (thousand tons) and percentage difference with 2010, by province

	2020	2021			
Provinces	Production (kton)	Area change (%)	Yield change (%)	Production change (%)	Production (kton)
Hebei	12336	1.7	0.9	2.6	12653
Shanxi	2352	-2.3	-1.3	-3.5	2270
Jiangsu	10216	-1.1	-0.6	-1.6	10049
Anhui	12042	0.3	0.6	0.9	12148
Shandong	25638	2.8	1.6	4.4	26771
Henan	28081	-0.4	-0.5	-0.9	27824
Hubei	5492	-1.4	0.4	-1.0	5435
Chongqing	2318	-0.8	1.3	0.5	2329
Sichuan	5785	-1.2	1.8	0.6	5820
Shaanxi	4223	-3.5	1.1	-2.4	4121
Gansu	3605	-4.3	1.9	-2.4	3517
Sub total	112087	0.0	-	0.8	112938
Other provinces	19415	0.0	-	0.6	19524
National total*	131502	0.5	0.3	0.7	132463

* Production of Taiwan province is not included.

(2) Winter wheat output

The total winter wheat output in 2021 is expected to be 122.26 million tons, an increase of 1.11 million tons compared to 2020, or up by 0.9%. The total planted area of winter wheat is estimated at 23.95 million hectares, with an increase of 0.5%, and the average yield of winter wheat is predicted at 5104 kg/ha, up by 0.4% from 2020(Table 4.3).

As far as the main producing provinces are concerned, both the planted area and yield of winter wheat in Hebei, Anhui and Shandong increased from 2020, and the output of winter wheat increased by 0.309 million tons, 0.123 million tons and 1.12 million tons respectively. Water deficit affected Shanxi's winter wheat, and both the yield and planted area decreased, resulting in a 3.5% decrease in winter wheat output. The winter wheat planted area in Jiangsu and Henan decreased slightly. The two provinces were affected by strong winds and heavy rains in May. The adverse weather resulted in wheat lodging in parts of Jiangsu and Henan, leading to a slight decrease of wheat yield by 0.6% and 0.5%, respectively. As a result, winter wheat output dropped by 0.163 million tons and 0.269 million tons in Jiangsu and Henan, respectively. The area of winter wheat in Hubei, Chongqing, Sichuan, Shaanxi, and Gansu has decreased, while the average winter wheat yield has increased. The departure of winter wheat production from 2020 is less than 0.1 million tons.

Table 4.3 China, 2021 winter wheat area, yield, and production and percentage difference with 2020, by province

	Area (kha)			Yield (kg/ha)			Production (kton)		
Provinces	2020	2021	Δ(%)	2020	2021	Δ(%)	2020	2021	Δ(%)
Hebei	1965	1998	1.7	6123	6177	0.9	12032	12341	2.6
Shanxi	517	505	-2.3	4406	4351	-1.3	2277	2197	-3.5
Jiangsu	1978	1956	-1.1	5052	5023	-0.6	9990	9828	-1.6
Anhui	2430	2442	0.5	4745	4770	0.5	11527	11650	1.1
Shandong	4281	4399	2.8	5935	6032	1.6	25409	26532	4.4
Henan	5373	5350	-0.4	5205	5177	-0.5	27963	27694	-1.0
Hubei	984	971	-1.3	4007	4022	0.4	3945	3907	-1.0
Chongqing	343	340	-0.9	3332	3372	1.2	1143	1146	0.3
Sichuan	1289	1284	-0.4	3833	3899	1.7	4941	5004	1.3
Shaanxi	1072	1034	-3.5	3861	3905	1.1	4138	4040	-2.4
Gansu	452	433	-4.3	3980	4057	1.9	1801	1757	-2.4
Sub total	20684	20713	0.1	5085	5122	0.7	105167	106096	0.9
Other provinces	3156	3240	2.7	5065	4990	-1.5	15983	16165	1.1
National total*	23839	23953	0.5	5082	5104	0.4	121150	122261	0.9

* Production of Taiwan province is not included.

(3) Early rice planted area

In 2021, the total area of early rice in the eight major producing provinces of China is estimated at 5.029 million hectares. Compared with the expanded early rice area in 2020, when the government had encouraged early rice cultivation, the area in 2021 was reduced by 0.715 million hectares, but it is still larger than in 2019. With the exception of the early rice planted area in Anhui Province, which increased from 2020, all other seven major early rice producing provinces presented a decrease in planted area compared to 2020. Hunan and Jiangxi are the two largest early rice producing provinces in the country. The early rice area is estimated at 1.5223 million hectares for Hunan (-1.4%) and 1.1447 million hectares for Jiangxi (-1.9%). Early rice in Hubei Province shrank by 1.8% from 2020, resulting in 0.1507 million hectares only. The main reason is that farmers switched to shrimp-rice farming or crab-rice farming, because it is more profitable. This new farming practices even caused a reduction in winter wheat cultivation in this province.

4.3 Regional analysis

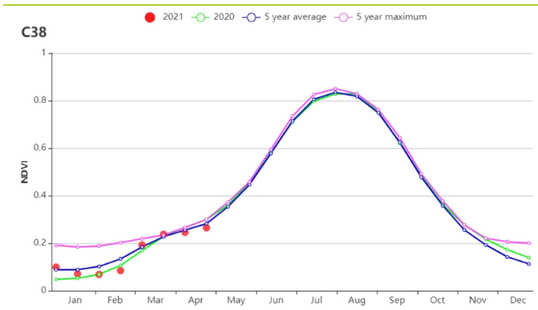
Figures 4.8 through 4.14 present crop condition information for each of China's seven agricultural regions. The provided information is as follows: (a) Phenology of major crops; (b) Crop condition development graph based on NDVI, comparing the current season up to October 2019 to the previous season, to the five-year average (5YA), and to the five-year maximum; (c) Spatial NDVI patterns for January - April 2021 (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 2021. Additional information about agro-climatic indicators and BIOMSS for China is provided in Annex A.

Northeast region

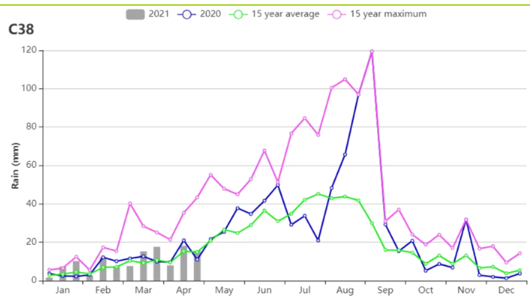
Due to the cold winter weather, no crops were grown in the northeast of China during this monitoring season (January to April 2021). CropWatch Agroclimatic Indicators (CWAIs) show that the precipitation greatly deviated from the average level. The total precipitation increased by 26%. It was above average level in mid-January, late January, mid-February, mid-March, and late March. The photosynthetically active radiation was below average (RADPAR, - 5%) and the temperatures were above average (TEMP +0.9 °C). Altogether, the potential biomass was 25% above the fifteen-year average level.

Overall, higher precipitation and warmer temperatures are beneficial to the spring sowing in the northeast of China. However, sowing dates in some low-lying areas in Northeast China were delayed due to waterlogging caused by above average rainfall. Warmer temperatures in May will facilitate the germination and good establishment of the summer crops.

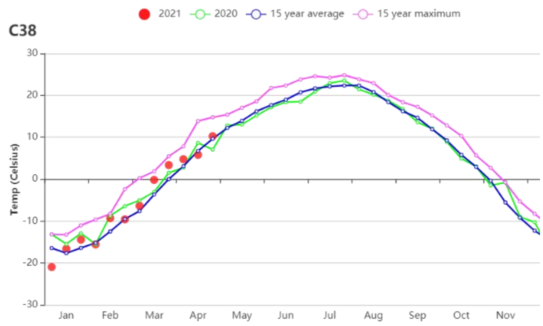
Figure 4.8 Crop condition China Northeast region, January - April 2021



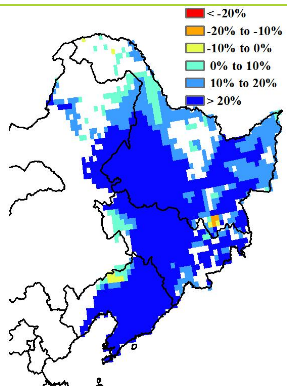
(a) Crop condition development graph based on NDVI



(b) Time series rainfall profile



(c) Time series temperature profile



(d) Potential biomass departure from 15YA

(e) Waterlogged fields of Youyi farm in HeiLongjiang province (2021-3-22)

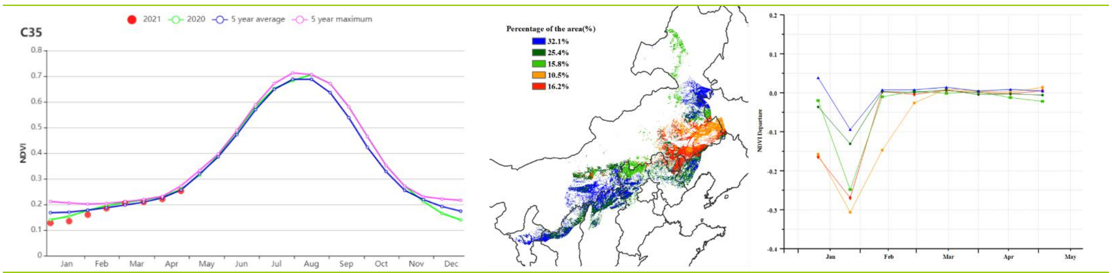
(f) Waterlogged fields of Youyi farm in HeiLongjiang province (2021-4-22)

Inner Mongolia

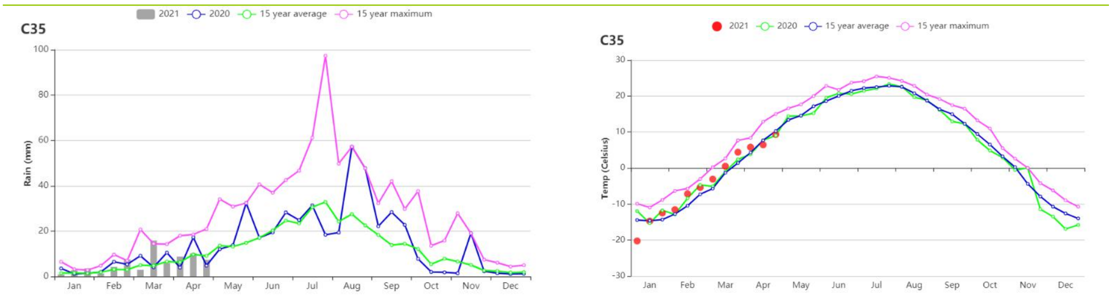
During the reporting period, the main summer crops in Inner Mongolia were maize and soybean. Generally, their condition was favorable.

Rainfall was above average (RAIN +8%), TEMP was slightly higher than average by 0.3°C, and RADPAR was just average. The resulting BIOMSS was significantly above average (20%). The NDVI development graph indicates good crop condition from June to August, almost at the same level as the maximum of the 5YA. This is also confirmed by high maximum VCI values in the whole region. National VCIx averages 0.97. In July, about 34.4% of the region was below average, in particular central and eastern Inner Mongolia, northern Hebei, northern Shanxi and western Liaoning, which suffered from moderate drought. Thereafter, crop condition improved and reached— and sometimes exceeded — the maximum of the 5YA from July to August. Favorable rainfall boosted crop growth, as clearly shown by above-average NDVI and confirmed by the spatial NDVI patterns and profiles in the area mentioned above. After September, as crops were reaching ripeness, weather conditions had limited effects on crop yield. CALF in this region was above average by 8% compared to the 5YA. At the same time, cropping intensity was 4% above average at 94%. On the whole, good production is expected from Inner Mongolia.

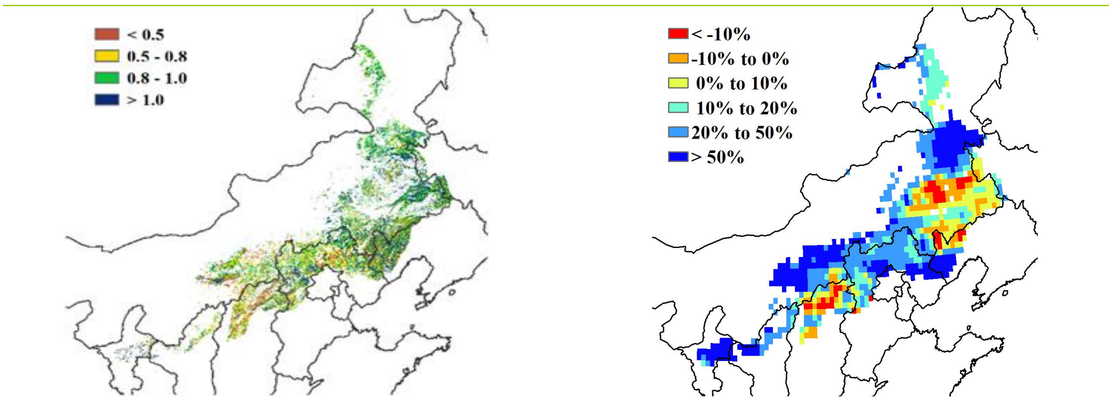
Figure 4.9 Crop condition in China Inner Mongolia, January - April 2021



(a) Crop condition development graph based on NDVI (b) Spatial patterns of NDVI departures from 5YA (c) NDVI departure profiles



(d)Time series rainfall profile (e)Time series temperature profile



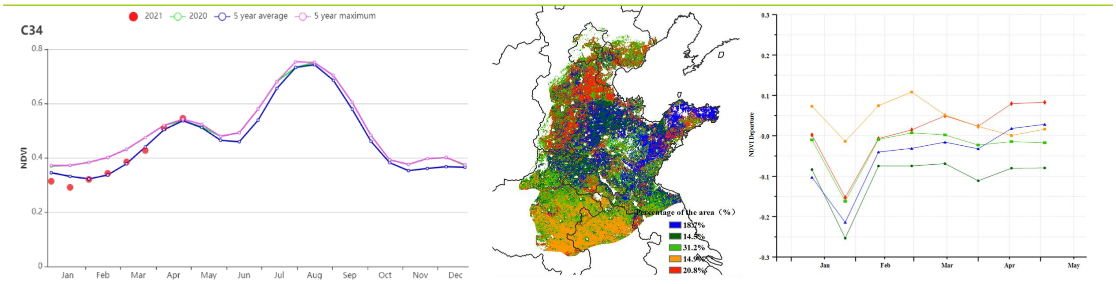
(f) Maximum VCI (g) Potential biomass departure from 15YA

Huanghuaihai

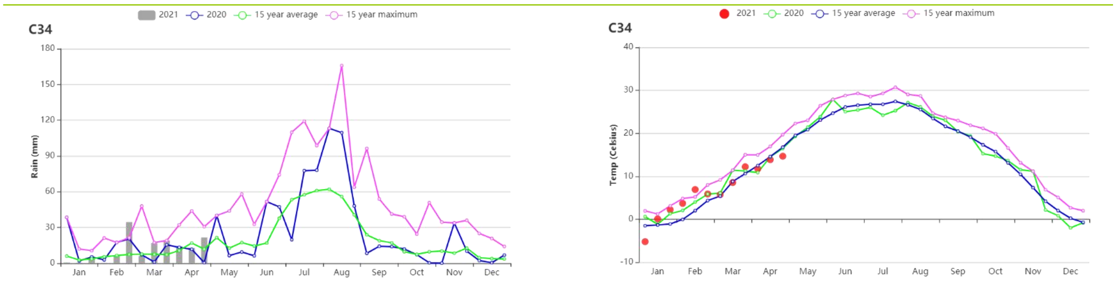
The Huanghuaihai region is in the North China Plain, where winter wheat - summer maize double cropping is the major cropping practice. The monitoring period of this report is from January to April, during which the winter wheat progressed from winter dormancy to the flowering stage. Harvest will be completed in mid-June.

Agro-climatic indicators showed that precipitation increased by 46%, radiation decreased by 8% and temperature rose by 0.8℃ compared to the 15YA. Altogether, it led to a 25% increase in BIOMSS compared to the 15YA. The CALF exceeded the 5YA by 7%. The VCIx value was 0.94. The NDVI-based crop growth profile shows that the growth of winter wheat was slightly lower than 5YA before February and then slowly recovered to reach the maximum conditions observed in the previous 5 years by the end of April. As shown by NDVI clusters and profiles, 14.9% of cropland over northern Anhui and eastern Henan presented positive NDVI departures. In Shandong province, 14.5% of cropland over Northern and southern Shandong were negative, indicating that crops in these areas were in slightly less favorable conditions. The maps of maximum VCI show a similar distribution as the spatial NDVI patterns. The potential biomass departure map shows that biomass in the most part of the region was higher than the average level. All in all, conditions for winter wheat in the Huanghuaihai region are favorable.

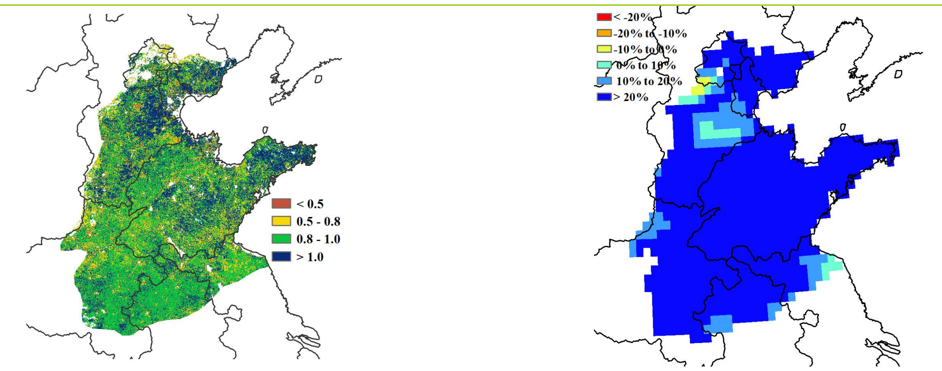
Figure 4.10 Crop condition China Huanghuaihai, January - April 2021



(a) Crop condition development graph based on NDVI (b) Spatial patterns of NDVI departures from 5YA (c) NDVI departure profiles



(d)Time series rainfall profile (e)Time series temperature profile



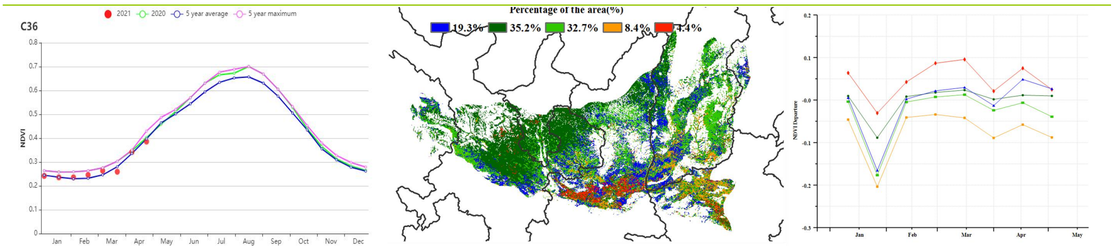
(f) Maximum VCI (g) Potential biomass departure from 15YA

Loess region

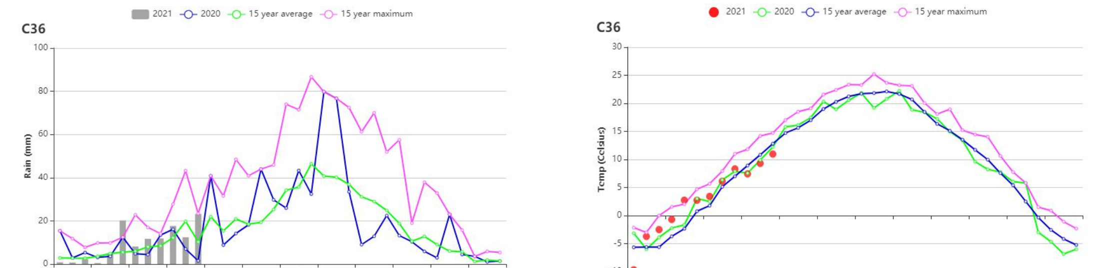
During this reporting period, winter wheat, spring wheat and spring maize were the main crops grown in this region. Winter wheat was sown from late September to mid-October and will be harvested in mid-June. Spring wheat and spring maize were sown in late March to April. Crop conditions in the Loess region were close to average compared to the previous five years.

The CropWatch Agroclimatic Indicators (CWAIs) for this region were above the 15YA, precipitation was above average (RAIN, +31%), and so was the temperature (TEMP, +0.8°C). Radiation was below average (RADPAR, -8%). Altogether, it resulted in a above-average estimate of biomass (+12%). According to the regional NDVI development graph, the crop conditions were close to the 5-year average from January to February, but slightly below average from late March to April. Temperatures were slightly above average between January and March and then dropped to slightly cooler-than-average levels. The precipitation was also close to the 15-year average without drastic changes. NDVI clusters and profiles show that crop conditions were close to average in most areas of the region; about 8.4% of the areas were below the 5-year average from February to April, mainly in the northwest part of Henan Province. The Maximum VCI map shows a relatively low value of VCIx (0.81). According to the CALF map, 33% of the farmland was cultivated, which was 11% below the 5YA. In general, the agricultural conditions in the Loess region were slightly below average.

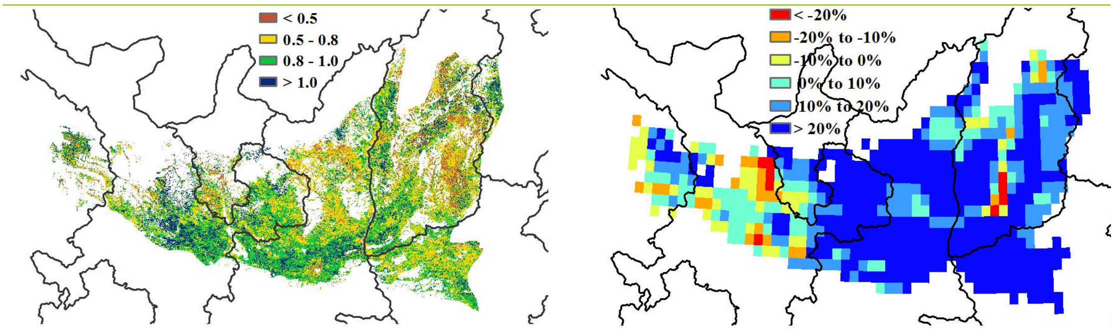
Figure 4.11 Crop condition China Loess region, January - April 2021



(a) Crop condition development graph based on NDVI (b) Spatial patterns of NDVI departures from 5YA (c) NDVI departure profiles



(d)Time series rainfall profile (e)Time series temperature profile



(f) Maximum VCI (g) Potential biomass departure from 15YA

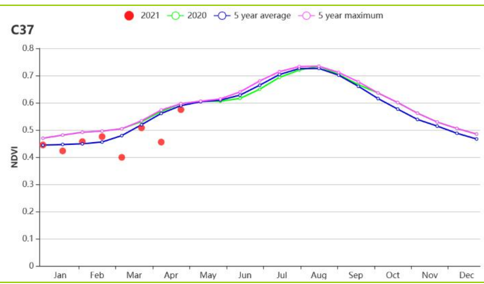
Lower Yangtze region

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. No crops were growing in the field in Fujian, the southern Jiangxi, and Hunan provinces.

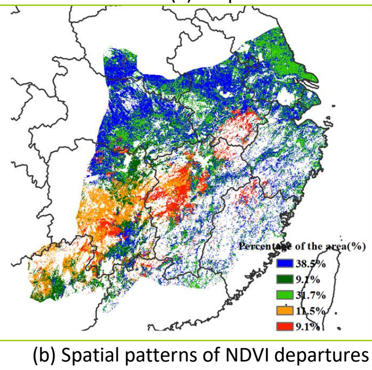
According to the CropWatch agroclimatic indicators, the Lower Yangtze region experienced a dryer season compared to the 15YA, with accumulated precipitation at 23% below average. The temperature and photosynthetically active radiation were slightly above average (TEMP 1.3 ℃, RADPAR 1%). The agroclimatic conditions resulted in average biomass production potential compared to the 15YA. As shown in the NDVI development graph, crop conditions were slightly below the 5-year average. Only 38.5% of the area, primarily distributed in the north of this region, including Jiangsu, Anhui, Hubei, and Henan provinces, showed slightly better crop conditions than the 5YA. NDVI in the remaining areas presented below-average levels. The potential biomass departure map showed that most places in this region had positive anomalies up to 20%, especially in the Hubei and Henan province. The average VCIx of this region is 0.91, and most area had VCIx values ranging from 0.8 to 1.

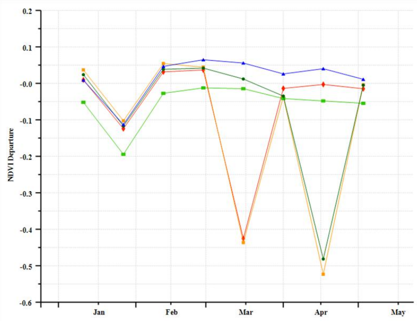
The crop conditions in the Lower Yangtze region are currently assessed as close to but below average.

Figure 4.12 **Crop condition China Lower Yangtze region, January - April 2021**

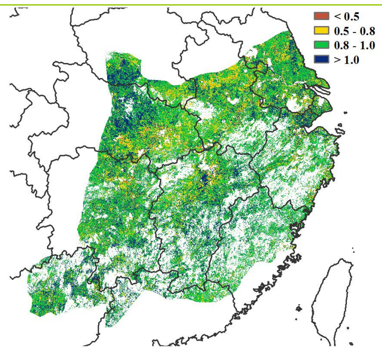


(a) Crop condition development graph based on NDVI

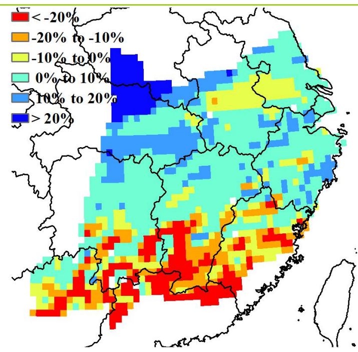




(b) Spatial patterns of NDVI departures from 5YA (c) NDVI departure profiles



(d) Maximum VCI



(e) Biomass departure

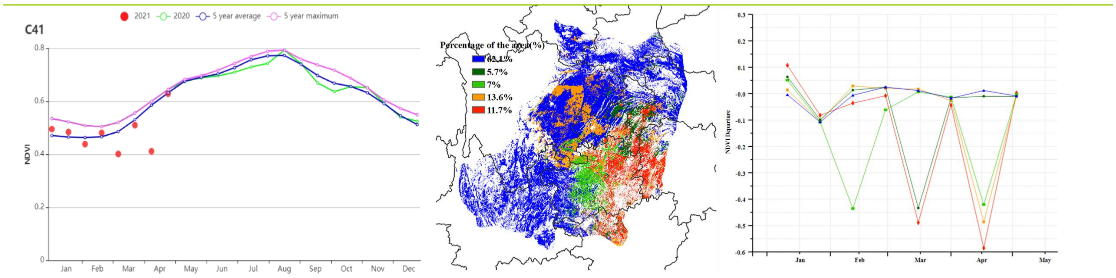
Southwest region

This reporting period covers the dormancy to flowering stage of winter wheat in southwestern China. According to the regional NDVI profile, crop conditions were generally close to the 5-year average.

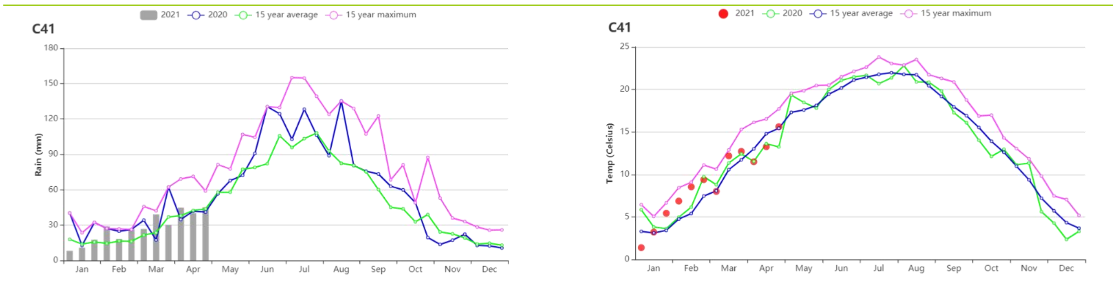
On average, rainfall was above the fifteen-year average (Rain +12%), whereas solar radiation was below average (RADPAR -10%). Temperature was close to average (TEMP +0.6 °C). The resulting BIOMSS was 4% above average mainly due to lower radiation. The cropped arable land fraction remained at the same level as in the last five years, which indicated there was no change in crop planting for this period.

According to the NDVI departure clustering map and the profiles, values were close to average in general, except in Yunnan, central Sichuan and neighboring areas in south-western Chongqing. In January, the overall NDVI in the region was close to the average level. Rainfall and RADPAR were below average for Yunnan (-5% and -1% respectively), but Chongqing experienced above-average rainfall accompanied by cloudier skies (RAIN +25%, RADPAR -14%). Average NDVI throughout the monitoring period was observed in eastern Guizhou and Sichuan, where radiation was below average and precipitation above average (See Annex A.11). The maximum VCI reached 0.92, indicating that peak conditions were comparable to the last five years. The winter crops had reached the flowering period at the end of April. If the rainy and cloudy weather conditions persist in May, wheat yield losses may occur. Conditions were mixed, but generally close to average.

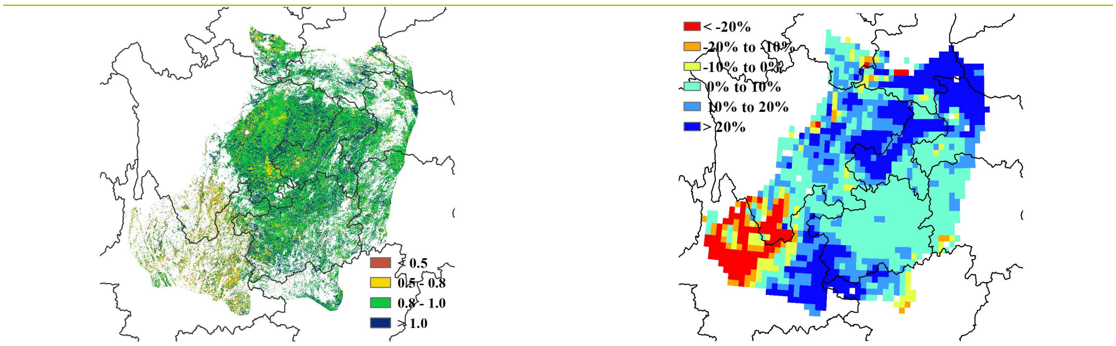
Figure 4.13 Crop condition China Southwest region, January - April 2021



(a) Crop condition development graph based on NDVI (b) Spatial patterns of NDVI departures from 5YA (c) NDVI departure profiles



(d)Time series rainfall profile (e)Time series temperature profile



(f) Maximum VCI (g) Potential biomass departure from 15YA

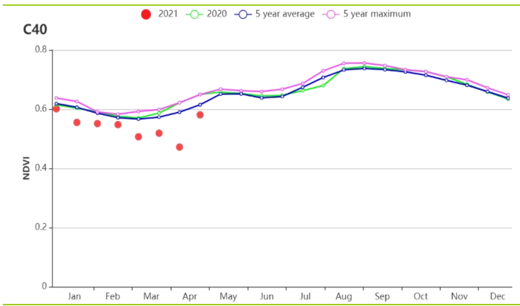
Southern China

During this monitoring period, winter wheat reached flowering stage in March and was approaching maturity by the end of April. Also, the transplanting of early rice was almost concluded. According to the crop condition development graph based on NDVI, crop conditions were below the 5-year average.

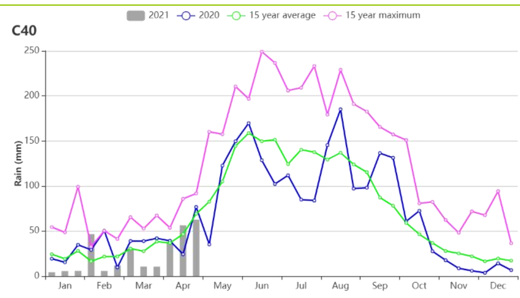
For the whole region, rainfall was below the 15YA (-24%), whereas radiation was above average (+11%). Temperature was higher than average (+1.0°C). Low rainfall resulted in a 9% drop in BIOMSS but with great spatial variation across the region. It was below average in western Yunnan, Guangxi, Guangdong and southern Fujian mainly due to the low precipitation. As shown by the NDVI departure clustering map and the profiles, values were obviously below average during the reporting period. This was mainly due to the reduced precipitation which caused drought conditions in Yunnan. The average rainfall since April benefitted the land preparation and transplanting of early rice in Guangdong and Guangxi. The cropped arable land fraction was 2% below average, a drop from the planted area of early rice in the bumper 2020. The average VCIx of the Southern China region was 0.88, and most area had VCIx values ranging from 0.80 to 1.00. Low VCIx values were mostly scattered in Yunnan province which was consistent with the below-average BIOMSS map.

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

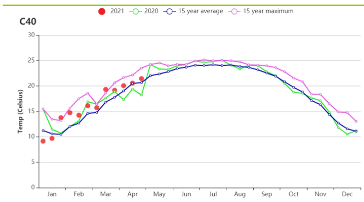
Figure 4.14 Crop condition in Southern China, January - April 2021



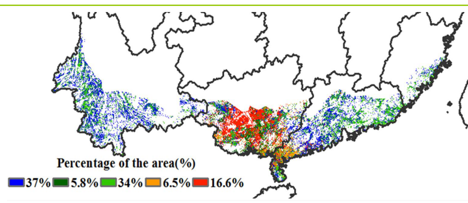
(a) Crop condition development graph based on NDVI



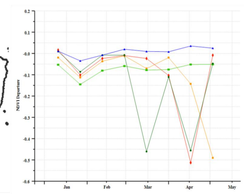
(b) Time series rainfall profile



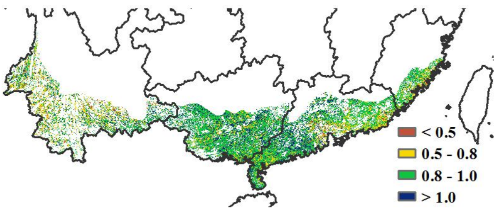
(c)Time series temperature profile



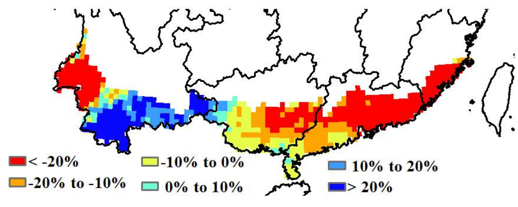
(b) Spatial patterns of NDVI departures from 5YA



(c) NDVI departure profiles



(f) Maximum VCI



(g) Potential biomass departure from 15YA

4.4 Major crops trade prospects

This section analyzes the import and export situation of maize, rice, wheat and soybean in the first quarter of 2021 in China.

Rice

In the first quarter, China's rice import was 1.454 million tons, up 158.3% over the previous year. The main import source countries were Pakistan, Myanmar, Vietnam, Thailand and India, accounting for 29.4%, 26.4%, 15.3%, 10.3% and 10.2% of the total import respectively, with an import value of US$310 million. The export of rice was 657.2 kilotons, an increase of 26% over the previous year, and the export value was US$282 million.

Wheat

In the first quarter, China imported 2.92 million tons of wheat and wheat products, an increase of 131.2% over the previous year, and the import value was US$728 million.

Maize

In the first quarter, China's maize imports were 6.7266 million tons, an increase of 437.8% over the previous year. The main source countries of imports were the United States, Ukraine and Russia, accounting for 51.8%, 47.5% and 0.5% of the total imports respectively, and the import value was US$1.658 billion.

Soybean

In the first quarter, China imported 21.1739 million tons of soybeans, an increase of 19% over the previous year. The main source countries of imports were the United States, Brazil and Argentina, accounting for 90.3%, 6.4% and 0.5% of the total imports respectively, and the import value was US$10.199 billion. The export of soybean was 18.6 kilotons, down 32.1% from the previous year.

On the basis of the remote sensing-based predictions of production in major agricultural producing countries in 2021 and the Major Agricultural Shocks and Policy Simulation Model, which is derived from the standard GTAP (Global Trade Analysis Project), it is estimated that the import of major grain crop varieties will increase in 2021. The details are as follows:

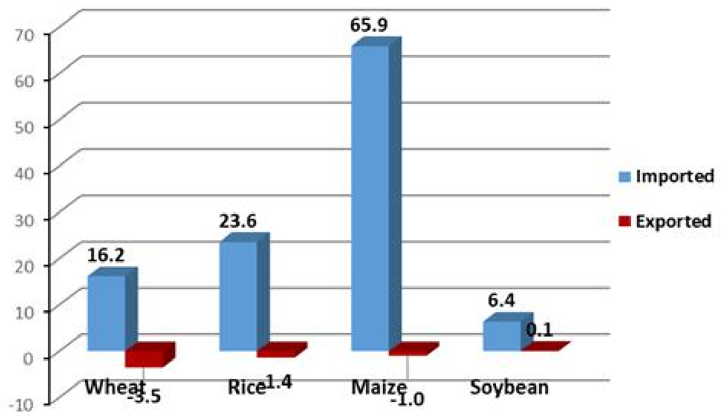
Rice imports will increase by 23.6% and exports will decrease by 1.4% in 2021. Under the influence of COVID 19 pandemic, the import demand will expand with a slight increase in demand for different quality and brand rice. The import demand will expand in 2021, and the import of rice will continue to increase in the year of 2021.

China's wheat import will increase by 16.2% and its export will decrease by 3.5% in 2021. From the overall supply and demand situation of domestic wheat, it is less likely to maintain a high level of import in the future, and it is expected that wheat import will increase in 2021.

China's import of maize is expected to increase by 65.9% in 2021 while its export will be basically flat. The large increase will be promoted by the tight relationship between supply and demand of maize in China. In addition, China's domestic maize price, as a result of rising produciton cost, will still be higher than the international market price.

China's soybean import will increase by 6.4% in 2021, and its export will be basically flat. Due to the steady growth of China's soybean consumption demand and limited domestic soybean production, it is expected that China's soybean import will continue to increase in 2021.

Figure 4.15 Rate of change of imports and exports for rice, wheat, maize, and soybean in China in 2021 compared to those for 2020(%)



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 2021. 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 in southern hemisphers 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, including Afghanistan, Argentina, Brazil and other 36 major agricultural producing and exporting countries. 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: 18% for maize, 36% for rice, 76% for wheat (most of it being northern hemisphere winter wheat) and 47% for soybeans.

Based on the remote sensing monitoring and forecasting of mjor crops (maize, rice, wheat, and soybean) that are in growing period or to be harvested, this report further analyzes the impact of the Covid-19 on the production of major grain and oil crop.

Global production

Global maize production in 2021 is expected to be 1.059 billion tons, down 1.1% and 11.66 million tons; global rice production is expected to be 753 million tons, down 1.0%; global wheat production is 726 million tons, down 2.1% and 15.66 million tons; global soybean production is expected to be 320 million tons, down 1.0%. 2021 The widespread dry and hot weather in January-early May of the year adversely affected the production of global staple food and oil crops, and the impact of the Covid-19 on the production chain of food and oil crops further exacerbated the tight situation of international staple food and oil crop supply.

Wheat

Some of the major wheat producing countries in the northern hemisphere shrank in acreage. In India, Pakistans, winter wheat production is almost all irrigated agriculture, usually wheat sowing period of precipitation conditions will not have a significant impact on wheat planting area. Due to the impact of severe Covid-19 epidemic, wheat sown area shrunk by 2.0% and 3.0%, respectively. Since late March this year, there has been a steep increase in the number of confirmed cases of the Covid-19 in India, France, Germany and Iran, which may also affect the upcoming wheat harvest. China is expected to increase winter wheat production by 0.7% due to effective controls and measures to protect winter wheat acreage and yields, which have increased slightly.

Most winter wheat-producing countries in the Northern Hemisphere suffered from low rainfall and generally lower yields. Wheat in most winter wheat-producing countries in the Northern Hemisphere was sown during September-October 2020, and the overall precipitation in the Northern Hemisphere since sowing was lower than the average of the past 15 years. By early May 2021, the growth of winter wheat in many countries such as Afghanistan, Belarus, France, Uzbekistan, India and Pakistan was significantly lower than that of the same period last year, and wheat yields decreased by 19.1%, 11.4%, 7.2%, 5.1%, 3.5% and 3.2%, respectively. Iran, Afghanistan, Uzbekistan, Poland, Hungary and other countries wheat shrinkage are more than 3%. The decline in winter wheat yields and acreage resulted in a more than 5%decline in winter wheat production in Afghanistan, France, Hungary, India, Iran, Pakistan, and Uzbekistan, resulting in a 2.1% reduction in global wheat production. Morocco saw a significant increase in wheat yields compared to the severe drought year of 2020, with a recovery increase in wheat production of 43.2%.

Global wheat production is generally lower than 2020 due to multiple factors such as drought and the Covid-19 epidemic.

Soybean

In 2021, the total soybean production in Argentina and Brazil, the two major soybean producing countries in the Southern Hemisphere, was 149.44 million tons, a 2.7% reduction. Among them, Brazil's soybean production was 96.3 million tons, a 4.7%reduction and 4.74 million ton reduction in production, achieving the lowest yield in the past three years, which is related to the reduction in planted area caused by the country's Covid- epidemic, drought-induced yield decline and fertilization and dosing and other field management measures are not timely, not in place and other factors. Argentina soybean production is 53.14 million tons, an increase of about 1.1%, mainly due to good agro-meteorological conditions in January-April prompted a small increase in soybean yields.

Maize

Unfavorable agro-meteorological conditions led to a year-over-year decline in maize production in the Southern Hemisphere and Equatorial countries. Total maize production in the Southern Hemisphere and Equatorial countries (Table 5.1) was 191.17 million tons, an increase of 3.5% year-on-year and a decrease of 6.94 million tons; Bangladesh, Angola, Brazil and Kenya experienced the largest year-on-year decreases in maize production, with 20.8%, 13.9%, 7.3% and 4.0% decreases, respectively. Among them, the main reason for the reduction in maize production in Kenya is the reduction in planted area, Bangladesh and Angola are mainly due to drought led to a decline in rain-fed maize yields, the significant decline in maize production in Brazil is affected by the dual impact of persistent drought and the new crown epidemic, maize production was substantially damaged. South Africa, Zambia and the Philippines 3 countries agro-meteorological conditions are generally conducive to maize production, 3 countries maize production increase of 5.5%, 3.1% and 4.5% year-on-year, respectively.

Using early monitoring indicators of crop acreage, it was found that the progress of maize sowing in Ethiopia, Pakistan, Nigeria, Mexico and Turkey is 22.1%, 11.4%, 11.0%, 6.6% and 3.9% lower than the same period last year, respectively, and if unfavorable agro-meteorological conditions continue later, it is expected that maize acreage and production in the above five countries will be lower than last year.

Rice

Most rice producing countries in South and Southeast Asia experienced a year-on-year decline in rice production. 2021 January - early May, precipitation in most parts of South and Southeast Asia was significantly low, with Bangladesh receiving the lowest level of precipitation in the same period in the past 15 years. Severe drought led to a significant decline in rice production during the dry season, with Bangladesh, Cambodia and Indonesia experiencing a 4.0%, 2.7% and 1.3% reduction in rice production, respectively. Myanmar was affected by a variety of unfavorable factors, and the rice planting area shrank by 6.2% year-on-year, which, coupled with the decline in yield due to drought conditions, caused a significant reduction of 7.7% in rice production in the country. On the contrary, dry season precipitation in Thailand and the Philippines was more than 30% higher than the average precipitation, prompting rice production to increase by 2.2% and 4.5%, respectively.

Table 5.1 2021 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 2021 production when compared with corresponding 2020 values

	Maize		Rice		Wheat		Soybean	
	2021	Δ%	2021	Δ%	2021	Δ%	2021	Δ%
Afghanistan					3905	-25.0		
Angola	2549	-13.9	45	-1.9				
Argentina	54307	0.5	1982	2.3			53140	1.1
Bangladesh	1891	-20.8	44161	-4.0				
Belarus					2983	-3.5		
Brazil	81126	-7.3	12049	4.1			96300	-4.7
Cambodia			9850	-2.7				
China					127981	0.7		
Egypt					11977	-0.7		
France					32184	-7.6		
Germany					26144	-1.9		
Hungary					4914	-5.7		
India					90726	-5.3		
Indonesia	15836	-4.9	64053	-1.3				
Iran			2750	-6.4	13413	-18.4		
Italy					7827	0.1		
Kenya	2774	-4.0						
Kyrgyzstan					3389	-21.4		
Mexico					9024	43.2		

	Maize		Rice		Wheat		Soybean	
	2021	Δ%	2021	Δ%	2021	Δ%	2021	Δ%
Morocco	2031	0.6	386	0.8	21	4.6		
Mozambique	1897	1.1	23616	-7.7				
Myanmar					25822	-6.1		
Pakistan	7468	4.5	21666	4.5				
Philippines					10425	-3.0		
Poland					8002	8.0		
Romania					57709	3.7		
Russia	12413	5.5						
South Africa			2527	0.5				
Sri Lanka			41519	2.2				
Thailand					18663	-3.5		
Turkey					24589	11.1		
Ukraine					12281	-3.5		
United Kingdom					54150	1.5		
USA					8024	-12.0		
Uzbekistan	5322	-1.5	45875	-2.0				
Vietnam	3554	3.1						
Zambia	191168	-3.5	270478	-1.4	554154	-1.5	149440	-2.7
Sub-total	**867433**	**-0.5**	**482381**	**-0.8**	**171659**	**-4.0**	**170810**	**0.6**
Global	**1058601**	**-1.1**	**752858**	**-1.0**	**725813**	**-2.1**	**320250**	**-1.0**

5.2 Disaster events

Introduction

Humans are facing unprecedented disasters in 2021, such as mega-fires, extreme weather events, droughts, desert locust swarms, and the COVID-19 pandemic. They negatively impact health, food production, nutrition and the economy. These disasters are highly interacting in a connected world to form various familiar and unfamiliar challenges, particularly to the agriculture sector. This report presents the major disasters that threatened human lives and food production in the first quarter of 2021.

Desert Locust

Locusts keep threatening and devastating crop fields, mainly in East and West Africa and the Arabian Peninsula(Figure 5.1). Thanks to the massive control process conducted during the last four months in the Horn of Africa, the number of adult locusts was notably reduced. However, high rains in April helped remaining swarms to mature in May, giving rise to hopper bands, particularly in Ethiopia. Small groups of adults were also observed over other African countries such as Sudan, Mali, Algeria, and Morocco. Moreover, a large movement of mature desert locust adults carried by southerly winds from the Arabian Peninsula toward Syria, Lebanon, Jorden, and Iraq was also observed.

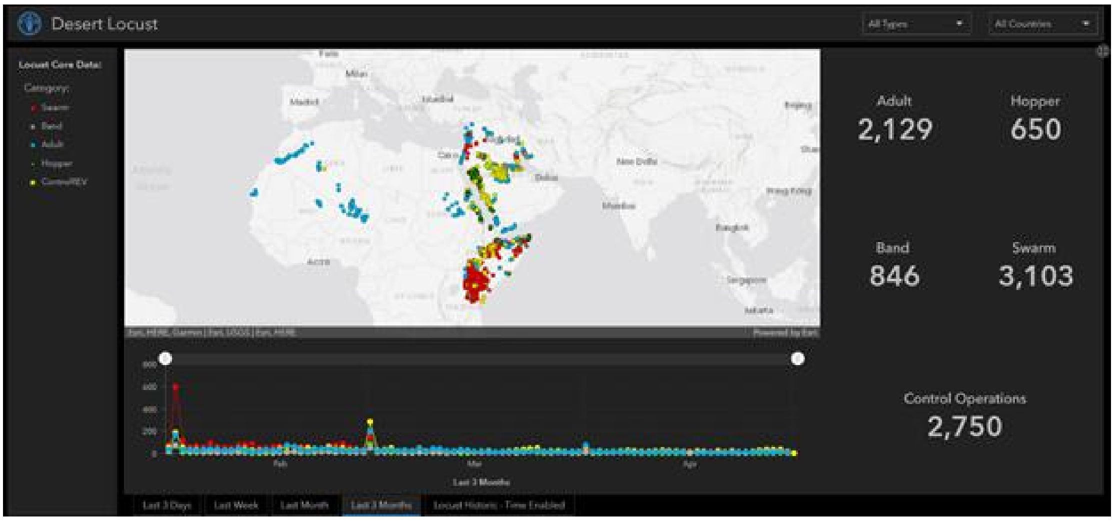


Figure 5.1 FAO Locust Data Explorer: (https://www.arcgis.com/apps/dashboards/de4f7abc248545f6bb514c3d38f59f26)

Based on current information on locusts' distribution and the future weather forecasts, it is expected that more swarms will immigrate from the African horn towards eastern Ethiopia by July and towards the south to reach Kenya in June. Moreover, according to FAO experts forecast, a large number of hopper bands are expected to move towards Yemen and west Iran by May-July(Figure 5.2).

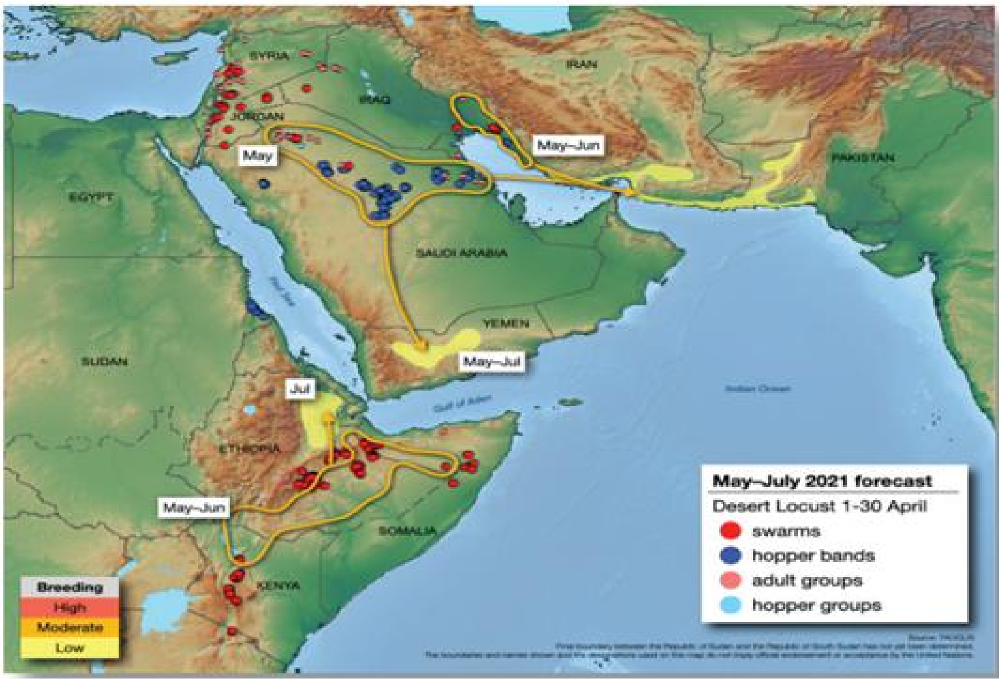


Figure 5.2 FAO forecast to locust movement in May-July 2021 (http://www.fao.org/ag/locusts/common/ecg/1914/en/DL511e.pdf).

Floods & Cyclone

Tropical Cyclone Eloise severely hit Southern African countries, notably Mozambique, in late January 2021, causing the death of a dozen people and severe damage to infrastructure due to heavy floods(Figure 5.3). In central Mozambique, the storm and subsequent floods caused the displacement of more than 16,000 people, damaged around 17,000 houses, and caused the loss of many people's lives. The floods also caused landslides near Beira, Mozambique. In this region, 25 centimeters of rain was recorded in only 24 hours, leading to rivers overflow and road closures. Moreover, tens of thousands hectares of farmland were submerged. In addition, many tree crops were destroyed by the intense wind storms associated with the cyclone.

Figure 5.3 Flooding occurred in Mozambique after Hurricane Eloise in January 2021. The left image was acquired before the floods on December 27, 2019, while the right image was acquired on January 30, 2021, which shows the flooded area (dark blue). Both images were acquired by Landsat 8 OLI sensor and displayed in false color (bands 7-5-3 in RGB combination). Source: (https://earthobservatory.nasa.gov/images/147866/eloise-floods-mozambique).

In Angola and, more specific the Luanda Province, severe flooding started after a period of heavy rain on April 19. Drainage channels blocked by garbage reportedly worsened the situation. The floods caused the death of 24 persons, the damage to 2289 houses, 4 bridges, and 14 schools, as reported by the national government. In the north of Africa, Morocco and Algeria were hit by floods in early March 2021.

Over the East Coast of Australia, heavy rains began on March 16, 2021. They led to widespread flooding, which affected regions from the North Coast to the Sydney metropolitan area in the south. The floods were considered the worst flooding in the last 60 years, and the Australian government declared many parts of the East Coast a natural disaster zone. The economic losses were extreme since the floods have forced 18,000 people to evacuate. The floods are expected to contribute to rising food prices due to the losses of hundreds of livestock and crops and infrastructure damage. The most severe damage was in the farms in the Mid-North Coast; the region produces bananas, avocados, and 75% of Australia's blueberries.

In South American countries, including Venezuela, Colombia, Bolivia, and Brazil, severe floods in April were responsible for the displacement of thousands of people and the destruction of infrastructures. More notably, the Floods in Oriximiná, Pará in Brazil, affected approximately 14,020 people, flooded 3,000 homes, and caused severe livestock and crop damage. In Asia, severe floods were reported in Vietnam and Philippines in April 2021, affecting thousands of citizens in both countries and the death of 3 persons in North Vietnam.

Drought

Taiwan is facing the worst drought in more than five decades during 2021. The government had to ration the water for households and businesses. It resorted to cloud seeding around several reservoirs. However, most reservoirs in Taoyuan, Hsinchu, and Miaoli are less than 15% full, while in central Taiwan, many reservoirs are even less than 10% full, as measured in March and April 2021. For example, the official data showed that the Baoshan Reservoir was only 9% full in March 2021 compared to 34% in March 2020(Figure 5.4). Farmers were the group hit hardest by the extreme drought conditions. Struggling to ensure supplies, irrigatiion was stopped for more than 74,000 hectares of farmland last year.

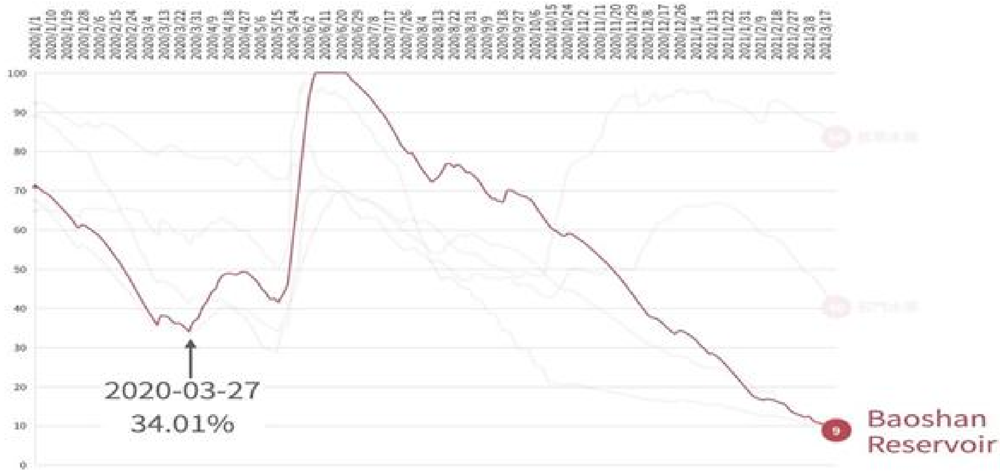


Figure 5.4 Water level changes observed in Baoshan Reservoir since 2020
(URL: https://international.thenewslens.com/article/149527).

The USA is also facing a dry spring season in 2021 after a weak 2020-summer monsoon caused a lack of rainfall, particularly in states such as Arizona, Utah, Nevada, Colorado, and New Mexico(Figure 5.5). According to NOAA's forecast over those states, higher than average spring temperatures and low soil moisture caused drought conditions to intensify. The current spring drought is expected to hamper winter wheat production and force farmers to reduce the area cultivated with wheat or replace it with other crops such as yellow pea due to its relatively low input costs and its ability to survive on less moisture.

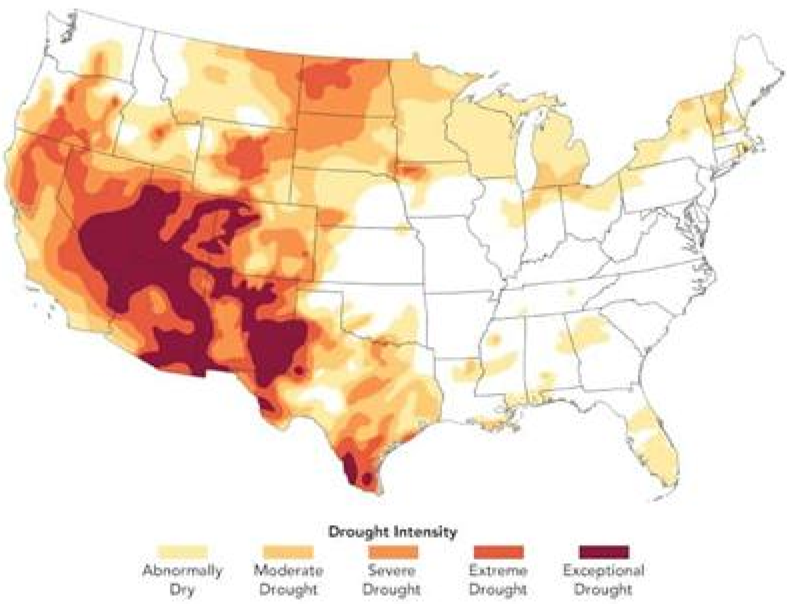


Figure 5.5 Map of drought conditions in the United States on March 23, 2021 (https://droughtmonitor.unl.edu/).

A severe drought hit Brazil during its rainy season from November to April 2021. It is still ongoing and is considered the worst drought in 20 years. It has caused the rise of major crop prices such as corn, wheat, and soybeans (Figure 5.6). Parana, the second-largest corn-producing state in Brazil, is currently experiencing the most severe drought conditions. Other regions that are badly affected are the Northeast and the Pantanal.

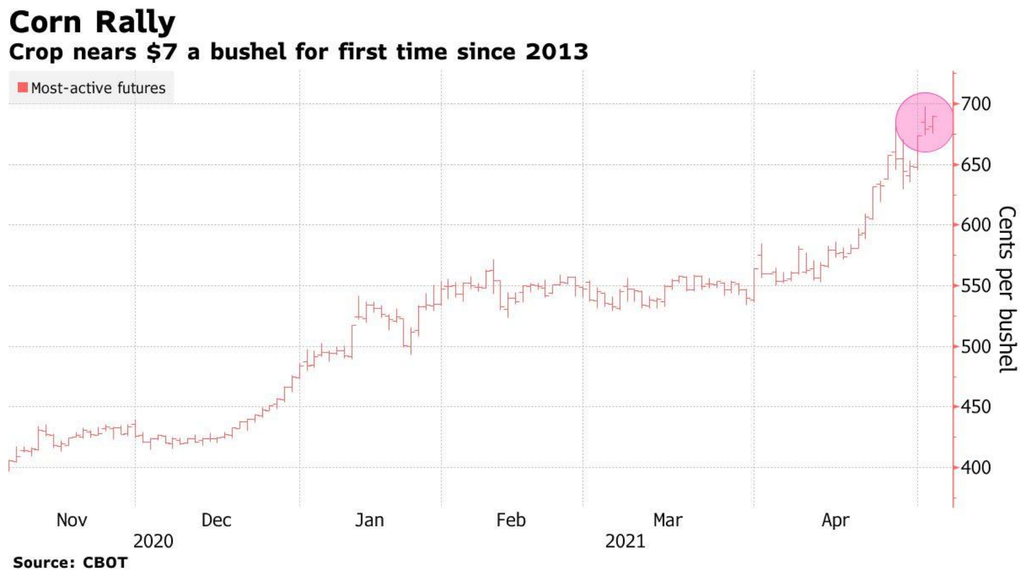


Figure 5.6 The rise of corn price due to severe drought in Brazil started in April 2021.

In Afghanistan, below-normal rainfall since October 2020 led to severe drought by the beginning of this year. It is still ongoing and has caused reduced accumulation of snow. This is critical for water access during the spring and summer agricultural seasons. Hence, a deficit in wheat production by 16 to 27% is expected this year. This deficit is expected to worsen the food insecurity situation in the country since the number of provinces under acute hunger has increased from four provinces in the first quarter of 2020 to 10 provinces in March.

COVID-19

The COVID-19 pandemic continues to threaten human health, the economy, and food production in 2021. Although many vaccines were developed by the end of 2020, the vaccination process has only started in January 2021 and is still ongoing. The third wave of COVID-19 severely hit several countries. India was the world's worst-hit country in early April 2021. The number of infected people in India by the end of April exceeded 19 million people, and the number of the total deaths was above 200 thousand, as reported by national and international organizations.

The sharp rise in coronavirus cases overlaps with a so-called "agriculture crisis" in India because thousands of Indian farmers have been protesting since September 2020 over three new agricultural laws that they say threaten their livelihoods. These three laws allow farmers and traders to do business outside government-run wholesale markets that have dominated agriculture since the Green Revolution. The laws also shorten the list of staple crops, which are considered essential to Indians' nutrition and to the agricultural economy, to 22 crop types. Nearly 90% of India’s agricultural sector comprises small and marginal farmers, making them particularly vulnerable to economic shocks. Particularly with COVID-19 lockdowns, the farmers found their movements restricted and faced a shortage of laborers, including farmworkers and operators for harvest machinery. The overlap between economic shocks and the COVID-19 pandemic threatens India's national food security and adds more pressure on Indian farmers.

5.3 Update on El Niño

The El Niño–Southern Oscillation (ENSO) continues at neutral levels. Climate model outlooks currently indicate this neutral phase will last at least until October. Oceanic indicators of ENSO persist at neutral levels, with Pacific sea surface temperatures close to the long-term average across most of the equatorial region. Beneath the surface, temperatures are near average, with slightly warmer than average waters across much of the sub-surface. Atmospheric indicators such as the Southern Oscillation Index (SOI) and cloud patterns are also close to average. Trade winds have been stronger than average in the far west, but near average elsewhere [1].

Figure 5.7 illustrates the behavior of the standard Southern Oscillation Index (SOI) published by the Australian Bureau of Meteorology (BOM) for the period from April 2020 to April 2021. 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 16.5 in January to 11.5 in Feburary, then decreased to -0.3 in March, then increased to 2 in April.

Figure 5.7 Monthly SOI-BOM time series from April 2020 to April 2021 (Source: http://www.bom.gov.au/climate/current/soi2.shtml)

The SST map (Figure 5.8 and Figure 5.9) for April shows cooler-than-average SSTs along most of the eastern half of the equator in the Pacific Ocean, extending into the tropics along the coastline of South America. These cool anomalies were generally stronger in April than during March in the east of the basin, while in the central and western equatorial Pacific SSTs have returned to near average temperatures. April values of the three key NINO indices were: NINO3 −0.4 °C, NINO3.4 −0.3 °C, and NINO4 −0.1 °C.

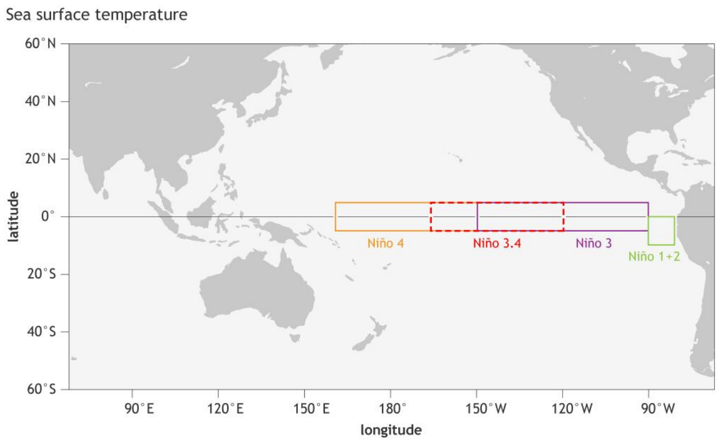


Figure 5.8 Map of NINO Region (Source: https://www.climate.gov/sites/default/files/Fig3_ENSOindices_SST_large.png)

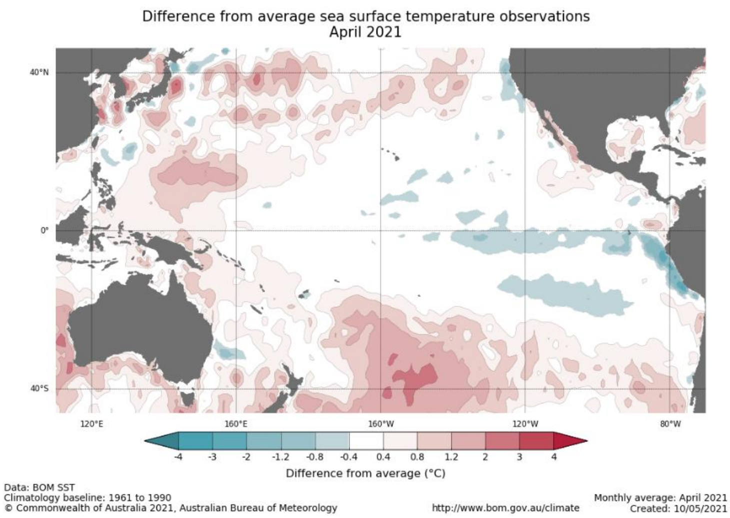


Figure 5.9 April 2021 sea surface temperature departure from the 1961-1990 average (Source:http://www.bom.gov.au/climate/enso/wrap-up/archive/20210511.ssta_pacific_monthly.png?popup)

Annex A. Agroclimatic indicators

Table A.1 Jan - Apr 2021 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 5YA dep. (%)
C01	Equatorial central Africa	637	-19	23.2	-0.2	1173	-2	1089	-8
C02	East African highlands	227	-15	19.5	-0.4	1307	-3	479	-15
C03	Gulf of Guinea	103	-27	27.3	0.0	1301	-1	391	-18
C04	Horn of Africa	460	-2	21.1	-0.5	1268	-1	815	-6
C05	Madagascar (main)	1013	-13	22.5	0.2	1210	3	1415	0
C06	Southwest Madagascar	414	-23	25.8	0.7	1239	0	955	-10
C07	North Africa-Mediterranean	208	-1	11.1	0.4	945	-2	463	-5
C08	Sahel	21	1	27.6	0.0	1343	-3	81	-28
C09	Southern Africa	577	-3	21.6	-0.3	1203	-1	976	-7
C10	Western Cape (South Africa)	105	-12	19.1	-0.1	1211	-5	532	-10
C11	British Columbia to Colorado	321	-13	-2.4	0.0	722	3	310	-1
C12	Northern Great Plains	224	-2	0.5	0.1	721	-2	404	4
C13	Corn Belt	368	-13	0.9	0.5	647	-2	423	3
C14	Cotton Belt to Mexican Nordeste	399	3	11.0	-0.6	838	-4	694	0
C15	Sub-boreal America	207	-4	-6.2	1.7	513	-3	235	9
C16	West Coast (North America)	373	-27	7.1	-0.1	824	8	450	-16
C17	Sierra Madre	50	-41	16.7	0.0	1312	2	233	-27
C18	SW U.S. and N. Mexican highlands	94	-25	9.0	-0.2	1073	1	303	-10
C19	Northern South and Central America	441	6	23.2	-0.2	1150	-1	743	1
C20	Caribbean	129	-37	23.7	0.3	1166	2	631	-15
C21	Central-northern Andes	975	-1	14.9	-0.4	1007	-3	778	-9
C22	Nordeste (Brazil)	183	-57	26.1	0.7	1262	0	737	-28
C23	Central eastern Brazil	458	-52	24.6	1.1	1184	0	993	-28
C24	Amazon	1082	-17	24.2	0.0	1053	-1	1406	-4
C25	Central-north Argentina	556	7	22.5	-0.8	1052	-9	1047	1
C26	Pampas	451	-6	22.0	-0.3	1133	-4	952	-4
C27	Western Patagonia	196	-26	13.4	-0.2	1186	-1	492	-10
C28	Semi-arid Southern Cone	181	-5	17.9	-0.5	1230	-5	537	1
C29	Caucasus	296	-13	3.8	0.8	811	2	453	-4
C30	Pamir area	342	-17	3.7	0.5	930	3	408	-10

65 Global MRUs		RAIN Current (mm)	RAIN 15YA dep. (%)	TEMP Current (°C)	TEMP 15YA dep. (°C)	RADPAR Current(MJ/m^2)	RADPAR 15YA dep. (%)	BIOMSS Current (gDM/m^2)	BIOMSS 5YA dep. (%)
C31	Western Asia	135	-31	7.9	1.0	916	2	327	-23
C32	Gansu-Xinjiang (China)	126	27	-2.2	0.1	853	-4	254	14
C33	Hainan (China)	227	-19	21.2	-0.1	1052	11	708	-8
C34	Huanghuaihai (China)	137	46	6.7	0.8	845	-8	389	25
C35	Inner Mongolia (China)	71	32	-4.0	0.8	859	-5	234	20
C36	Loess region (China)	114	31	2.9	0.8	905	-8	329	12
C37	Lower Yangtze (China)	390	-23	11.6	1.3	716	1	767	0
C38	Northeast China	123	26	-5.7	0.9	749	-5	280	24
C39	Qinghai-Tibet (China)	206	-45	0.5	0.0	1072	2	296	-11
C40	Southern China	288	-24	16.2	1.1	913	11	681	-9
C41	Southwest China	336	12	9.0	0.6	718	-10	619	4
C42	Taiwan (China)	131	-57	19.7	0.4	1067	10	529	-24
C43	East Asia	334	16	-1.2	0.9	757	-2	376	15
C44	Southern Himalayas	103	-39	19.0	0.4	1138	1	295	-29
C45	Southern Asia	92	7	25.7	0.1	1274	-1	301	-11
C46	Southern Japan and Korea	481	-3	7.8	1.5	825	2	704	10
C47	Southern Mongolia	56	-10	-11.4	0.9	807	-2	130	-6
C48	Punjab to Gujarat	42	-33	23.6	1.0	1187	-1	192	-20
C49	Maritime Southeast Asia	1204	-9	24.2	0.0	1116	1	1392	-1
C50	Mainland Southeast Asia	254	7	24.6	-0.1	1201	1	591	-7
C51	Eastern Siberia	229	9	-10.3	-0.3	530	-6	179	-6
C52	Eastern Central Asia	130	51	-11.8	0.8	671	-5	170	4
C53	Northern Australia	1121	9	25.6	-0.1	1212	-2	1353	-1
C54	Queensland to Victoria	267	18	19.9	-1.1	1141	-5	700	3
C55	Nullarbor to Darling	154	47	21.0	0.0	1191	-4	609	12
C56	New Zealand	251	-17	14.5	0.0	1034	3	679	-10
C57	Boreal Eurasia	284	-7	-4.9	-0.5	376	-3	239	-7
C58	Ukraine to Ural mountains	288	12	-2.5	-0.6	395	-11	319	-8
C59	Mediterranean Europe and Turkey	340	-6	7.1	0.0	778	-1	580	-2
C60	W. Europe (non Mediterranean)	314	-5	3.6	-0.6	575	1	488	-6
C61	Boreal America	315	2	-7.5	0.4	416	-5	186	-2
C62	Ural to Altai mountains	200	7	-6.8	-0.1	530	-4	243	-7
C63	Australian desert	107	-4	21.6	-0.8	1234	-3	527	-4
C64	Sahara to Afghan deserts	36	-53	17.5	0.7	1150	0	196	-35
C65	Sub-arctic America	83	3	-21.5	1.2	311	-3	42	9

Table A.2 Jan - Apr 2021 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 5YA Departure (%)
ARG	Argentina	449	16	21.6	-0.5	1107	-7	667	-7
AUS	Australia	308	14	20.7	-0.8	1151	-4	468	-26
BGD	Bangladesh	5	-97	24.0	0.7	1224	3	486	-26
BRA	Brazil	625	-39	24.4	0.8	1165	0	769	-6
KHM	Cambodia	229	-29	26.5	-0.2	1221	4	678	-7
CAN	Canada	264	-13	-4.4	1.3	547	-2	70	-2
CHN	China	263	-11	7.3	0.9	799	-3	211	-5
EGY	Egypt	38	-27	15.8	0.3	1017	0	270	-26
ETH	Ethiopia	151	-16	20.1	-0.4	1332	-2	451	-17
FRA	France	300	-19	5.6	-0.1	644	6	153	-1
DEU	Germany	300	0	2.6	-0.9	522	1	120	-15
IND	India	49	-45	23.7	0.3	1238	0	364	-20
IDN	Indonesia	1265	-11	24.3	0.0	1120	2	740	0
IRN	Iran	111	-49	9.3	1.7	1042	5	283	0
KAZ	Kazakhstan	198	13	-4.7	0.1	620	-4	106	-7
MEX	Mexico	86	-29	19.0	0.0	1240	0	405	-15
MMR	Myanmar	102	-22	21.5	0.3	1223	-2	414	-10
NGA	Nigeria	64	-51	26.9	-0.1	1342	1	363	-27
PAK	Pakistan	238	-22	13.5	0.6	1056	2	308	-12
PHL	Philippines	829	32	24.6	-0.1	1125	-2	765	-3
POL	Poland	268	4	1.2	-1.1	443	-7	106	-21
ROU	Romania	292	11	2.6	-0.6	632	-2	151	-16
RUS	Russia	251	13	-5.5	-0.2	449	-8	78	-15
ZAF	South Africa	240	0	19.2	-0.3	1222	-2	662	-14
THA	Thailand	386	43	25.1	-0.3	1195	1	634	-13
TUR	Turkey	347	-7	4.3	0.2	814	0	196	-7
GBR	United Kingdom	375	-2	4.6	-0.7	462	8	101	0
UKR	Ukraine	270	13	0.6	-0.9	484	-9	119	-23
USA	United States	338	-5	5.0	-0.2	770	-2	190	-3
UZB	Uzbekistan	197	-20	6.6	0.3	871	4	228	6
VNM	Vietnam	314	4	20.6	-0.2	993	3	543	-5
AFG	Afghanistan	178	-43	6.7	1.4	1010	5	256	1
AGO	Angola	591	-28	21.9	-0.2	1177	1	713	-12
BLR	Belarus	284	11	-1.0	-0.9	368	-12	85	-25
HUN	Hungary	206	-11	3.7	-0.9	623	-1	161	-17
ITA	Italy	321	-17	6.0	-0.6	735	1	208	-12
KEN	Kenya	362	-20	20.7	-0.4	1290	-3	686	-12
LKA	Sri_Lanka	698	26	25.3	0.0	1217	-2	826	0
MAR	Morocco	292	36	10.9	0.0	975	-4	302	-5
MNG	Mongolia	121	83	-10.9	1.4	747	-6	86	-8
MOZ	Mozambique	743	-3	23.4	-0.1	1206	1	799	-6
ZMB	Zambia	906	-7	20.4	-0.4	1121	-4	727	-21

*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 - Apr 2021 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 5YA Departure (%)
Buenos Aires	239	-1	20.8	0.0	1130	-7	726	-2
Chaco	561	14	24.3	-0.6	1085	-5	1145	9
Cordoba	342	26	21.6	-0.7	1123	-8	850	5
Corrientes	596	20	23.5	-0.6	1123	-5	1129	8
Entre Rios	490	33	22.6	-0.3	1105	-7	995	11
La Pampa	183	6	21.8	-0.1	1188	-5	660	-1
Misiones	598	-7	22.4	-0.6	1174	-2	1087	-12
Santiago Del Estero	557	20	23.0	-1.1	1027	-9	1113	10
San Luis	248	26	20.8	-0.7	1171	-6	806	11
Salta	1073	19	19.4	-0.9	979	-10	1214	2
Santa Fe	492	38	23.1	-0.7	1101	-7	980	11
Tucuman	662	8	18.5	-0.8	1008	-12	1017	-4

Table A.4 Australia, Jan - Apr 2021 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 5YA Departure (%)
New South Wales	310	39	20.3	-1.5	1191	-3	733	9
South Australia	98	-14	19.4	-1.1	1129	-5	514	-8
Victoria	192	5	17.3	-1.3	1041	-8	609	-4
W. Australia	197	13	21.8	0.0	1203	-3	634	8

Table A.5 Brazil, Jan - Apr 2021 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 5YA Departure (%)
Ceara	248	-61	26.8	0.8	1257	2	876	-30
Goias	216	-80	25.3	2.5	1208	-1	721	-52
Mato Grosso Do Sul	269	-69	26.1	1.7	1166	-3	781	-45
Mato Grosso	826	-36	24.8	0.8	1088	-3	1242	-19
Minas Gerais	419	-55	22.7	1.0	1269	6	937	-30
Parana	462	-46	21.8	0.3	1181	1	958	-29
Rio Grande Do Sul	483	-9	21.6	-0.2	1148	-3	1024	-8
Santa Catarina	710	-4	19.3	-0.4	1091	-3	1134	-9
Sao Paulo	280	-74	24.2	2.0	1210	6	745	-48

Table A.6 Canada, Jan - Apr 2021 agroclimatic indicators (by province)

	RAIN Current (mm)	RAIN 15YA Departure (%)	TEMP Current (°C)	TEMP 15YA Departure (°C)	RADPAR Current (MJ/m²)	RADPAR 15YA Departure (%)	BIOMSS Current (gDM/m²)	BIOMSS 5YA Departure (%)
Alberta	147	-20	-4.8	0.5	587	6	263	-1
Manitoba	206	8	-5.2	1.9	522	-10	266	10
Saskatchewan	157	-10	-4.8	1.4	567	-1	273	5

Table A.7 India, Jan - Apr 2021 agroclimatic indicators (by state)

	RAIN Current (mm)	RAIN 15YA Departure (%)	TEMP Current (°C)	TEMP 15YA Departure (°C)	RADPAR Current (MJ/m²)	RADPAR 15YA Departure (%)	BIOMSS Current (gDM/m²)	BIOMSS 5YA Departure (%)
Andhra Pradesh	17	-65	26.5	-0.3	1307	0	457	-41
Assam	55	-87	19.4	0.7	1123	8	211	-23
Bihar	1	-98	22.9	0.2	1237	3	359	-50
Chhattisgarh	3	-92	23.9	-0.4	1285	2	64	-79
Daman and Diu	2	43	27.2	0.9	1341	-3	265	-31
Delhi	26	-54	21.3	0.7	1129	-1	101	-61
Gujarat	2	-46	26.9	0.8	1299	-2	34	-49
Goa	43	290	27.2	0.5	1329	-5	261	-18
Himachal Pradesh	237	-27	10.7	0.3	1066	2	116	28
Haryana	23	-67	21.2	0.8	1120	0	48	-44
Jharkhand	1	-97	23.1	0.2	1250	3	290	100
Kerala	512	80	25.8	-0.2	1291	-1	420	-10
Karnataka	76	22	26.0	0.0	1305	-2	252	-22
Meghalaya	32	-90	20.0	1.0	1164	7	77	-72
Maharashtra	31	131	27.0	0.4	1280	-4	942	25
Manipur	42	-84	15.9	0.3	1185	2	335	10
Madhya Pradesh	9	-58	24.6	0.6	1230	-1	277	-56
Mizoram	12	-93	18.4	-0.1	1238	1	211	19
Nagaland	98	-78	15.0	0.3	1122	4	284	-53
Orissa	3	-93	24.2	-0.3	1271	2	130	-37
Puducherry	166	40	27.0	-0.1	1351	-2	216	-58
Punjab	87	-38	20.0	0.9	1054	0	417	-45
Rajasthan	7	-62	24.2	1.2	1196	-2	112	-61
Sikkim	15	-81	10.2	0.2	1297	3	643	23
Tamil Nadu	363	73	25.5	-0.4	1293	-2	380	-15
Tripura	9	-96	22.6	0.6	1189	2	143	-24
Uttarakhand	59	-54	13.4	0.0	1155	2	124	-51
Uttar Pradesh	9	-80	22.7	0.7	1184	1	713	17
West Bengal	2	-97	24.1	0.4	1238	3	230	-60

Table A.8 Kazakhstan, Jan - Apr 2021 agroclimatic indicators (by oblast)

	RAIN Current (mm)	RAIN 15YA Departure (%)	TEMP Current (°C)	TEMP 15YA Departure (°C)	RADPAR Current (MJ/m²)	RADPAR 15YA Departure (%)	BIOMSS Current (gDM/m²)	BIOMSS 5YA Departure (%)
Akmolinskaya	167	15	-6.4	0.2	567	-7	252	-8
Karagandinskaya	130	5	-6.2	0.3	667	-4	266	-5
Kustanayskaya	177	9	-6.0	0.4	530	-5	262	-5
Pavlodarskaya	134	12	-7.0	-0.1	575	-3	250	-8
Severo kazachstanskaya	166	4	-7.3	-0.1	498	-4	234	-8
Vostochno kazachstanskaya	190	5	-6.2	-0.1	704	-1	255	-6
Zapadno kazachstanskaya	250	26	-2.6	0.3	523	-9	343	-3

Table A.9 Russia, Jan - Apr 2021 agroclimatic indicators (by oblast, kray and republic)

	RAIN Current (mm)	RAIN 15YA Departure (%)	TEMP Current (°C)	TEMP 15YA Departure (°C)	RADPAR Current (MJ/m²)	RADPAR 15YA Departure (%)	BIOMSS Current (gDM/m²)	BIOMSS 5YA Departure (%)
Bashkortostan Rep.	240	-3	-6.3	0.1	446	-2	240	-4
Chelyabinskaya Oblast	166	-6	-7.1	-0.1	482	-2	234	-6
Gorodovikovsk	323	41	2.4	-0.3	502	-17	466	-5
Krasnodarskiy Kray	300	18	-2.8	-0.5	513	-9	318	-7
Kurganskaya Oblast	155	-13	-7.4	-0.3	428	-4	228	-6
Kirovskaya Oblast	294	3	-7.0	-1.0	324	-5	218	-8
Kurskaya Oblast	318	23	-1.8	-0.7	402	-10	327	-11
Lipetskaya Oblast	305	22	-2.5	-0.2	407	-9	317	-7
Mordoviya Rep.	297	14	-4.3	-0.4	362	-14	277	-7
Novosibirskaya Oblast	210	11	-8.8	-0.4	423	-7	201	-12
Nizhegorodskaya O.	307	16	-5.2	-0.8	345	-10	255	-9
Orenburgskaya Oblast	237	3	-5.0	0.3	495	-7	273	-6
Omskaya Oblast	192	3	-8.3	-0.2	409	-5	212	-8
Permskaya Oblast	266	-4	-7.3	-0.3	337	-4	216	-4
Penzenskaya Oblast	313	19	-3.8	-0.1	379	-14	289	-5
Rostovskaya Oblast	318	31	1.2	0.0	495	-13	426	-6
Ryazanskaya Oblast	358	38	-3.4	-0.4	359	-13	296	-8
Stavropolskiy Kray	292	14	2.5	-0.1	570	-10	473	-3
Sverdlovskaya Oblast	187	-13	-8.1	-0.8	390	2	216	-4
Samarskaya Oblast	271	9	-4.6	0.1	432	-8	283	-3
Saratovskaya	311	30	-2.9	0.1	446	-12	321	-4

	RAIN Current (mm)	RAIN 15YA Departure (%)	TEMP Current (°C)	TEMP 15YA Departure (°C)	RADPAR Current (MJ/m²)	RADPAR 15YA Departure (%)	BIOMSS Current (gDM/m²)	BIOMSS 5YA Departure (%)
Oblast								
Tambovskaya Oblast	312	20	-2.6	0.0	412	-10	320	-4
Tyumenskaya Oblast	166	-16	-8.1	-0.4	383	-3	214	-5
Tatarstan Rep.	277	8	-5.7	-0.3	368	-8	248	-6
Ulyanovskaya Oblast	290	20	-4.9	-0.4	383	-13	268	-7
Udmurtiya Rep.	276	-2	-6.8	-0.5	340	-4	224	-5
Volgogradskaya O.	300	36	-0.9	0.3	483	-12	374	-4
Voronezhskaya Oblast	269	6	-1.5	0.1	472	-7	353	-5

Table A.10 United States, Jan - Apr 2021 agroclimatic indicators (by state)

	RAIN Current (mm)	RAIN 15YA Departure (%)	TEMP Current (°C)	TEMP 15YA Departure (°C)	RADPAR Current (MJ/m²)	RADPAR 15YA Departure (%)	BIOMSS Current (gDM/m²)	BIOMSS 5YA Departure (%)
Arkansas	516	-2	8.4	-0.9	757	-3	764	-3
California	230	-41	8.9	0.0	968	8	397	-23
Idaho	296	-20	-0.7	0.0	743	4	367	-1
Indiana	357	-24	3.3	-0.1	706	3	543	0
Illinois	387	-8	3.1	-0.2	704	0	545	0
Iowa	303	-2	0.5	0.1	652	-7	455	2
Kansas	256	22	5.3	-0.8	851	-2	527	9
Michigan	261	-28	-0.6	0.8	610	0	378	6
Minnesota	263	3	-2.7	1.1	566	-10	338	6
Missouri	431	10	4.8	-0.6	745	-1	616	0
Montana	186	-23	-1.8	0.0	724	2	336	-5
Nebraska	254	24	2.0	-0.6	799	-2	500	9
North Dakota	129	-32	-2.3	1.2	638	-4	349	7
Ohio	335	-26	2.9	0.1	691	3	518	1
Oklahoma	316	8	8.2	-1.2	846	-3	618	5
Oregon	407	-19	3.4	-0.1	716	9	466	-1
South Dakota	185	-14	-0.2	0.3	723	-2	412	4
Texas	244	-4	12.5	-1.3	866	-7	561	-1
Washington	447	-12	3.0	0.1	621	7	450	-2
Wisconsin	274	-11	-1.7	1.0	605	-5	364	8

Table A.11 China, Jan - Apr 2021 agroclimatic indicators (by province)

	RAIN Current (mm)	RAIN 15YA Departure (%)	TEMP Current (°C)	TEMP 15YA Departure (°C)	RADPAR Current (MJ/m²)	RADPAR 15YA Departure (%)	BIOMSS Current (gDM/m²)	BIOMSS 5YA Departure (%)
Anhui	318	-4	9.6	1.2	735	-9	663	6
Chongqing	431	25	9.6	0.5	627	-14	711	10
Fujian	317	-49	13.3	1.4	821	17	770	-10
Gansu	147	14	1.0	0.6	890	-9	767	-15
Guangdong	332	-40	17.6	1.8	881	26	331	6
Guangxi	403	-11	15.5	1.3	666	8	790	-4

	RAIN Current (mm)	RAIN 15YA Departure (%)	TEMP Current (°C)	TEMP 15YA Departure (°C)	RADPAR Current (MJ/m^2)	RADPAR 15YA Departure (%)	BIOMSS Current (gDM/m^2)	BIOMSS 5YA Departure (%)
Guizhou	426	7	9.8	0.5	515	-18	746	4
Hebei	66	33	1.3	0.5	874	-6	254	21
Heilongjiang	130	27	-7.5	0.9	708	-5	497	24
Henan	200	44	8.3	0.9	819	-9	271	21
Hubei	388	16	9.0	0.8	686	-14	697	9
Hunan	469	-11	10.9	1.1	609	-6	783	0
Jiangsu	218	-6	9.1	1.3	789	-8	292	22
Jiangxi	458	-26	12.3	1.5	714	6	585	5
Jilin	111	6	-4.4	1.3	785	-5	833	-1
Liaoning	102	32	-1.5	0.4	829	-5	309	31
Inner Mongolia	83	46	-6.0	0.9	824	-5	226	22
Ningxia	86	32	1.0	0.5	935	-7	294	19
Shaanxi	180	36	4.9	0.8	840	-10	557	3
Shandong	134	62	6.5	0.9	860	-8	393	30
Shanxi	78	21	1.8	1.1	900	-6	398	15
Sichuan	312	10	7.4	0.6	806	-7	276	9
Yunnan	207	-5	11.6	0.3	1023	-1	539	-1
Zhejiang	411	-21	10.5	1.5	736	-1	811	5

Annex B. Quick reference to CropWatch indicators, spatial units and methodologies

The following sections give a brief overview of CropWatch indicators and spatial units, along with a description of the CropWatch production estimation methodology. For more information about CropWatch methodologies, visit CropWatch online at www.cropwatch.com.cn**.**

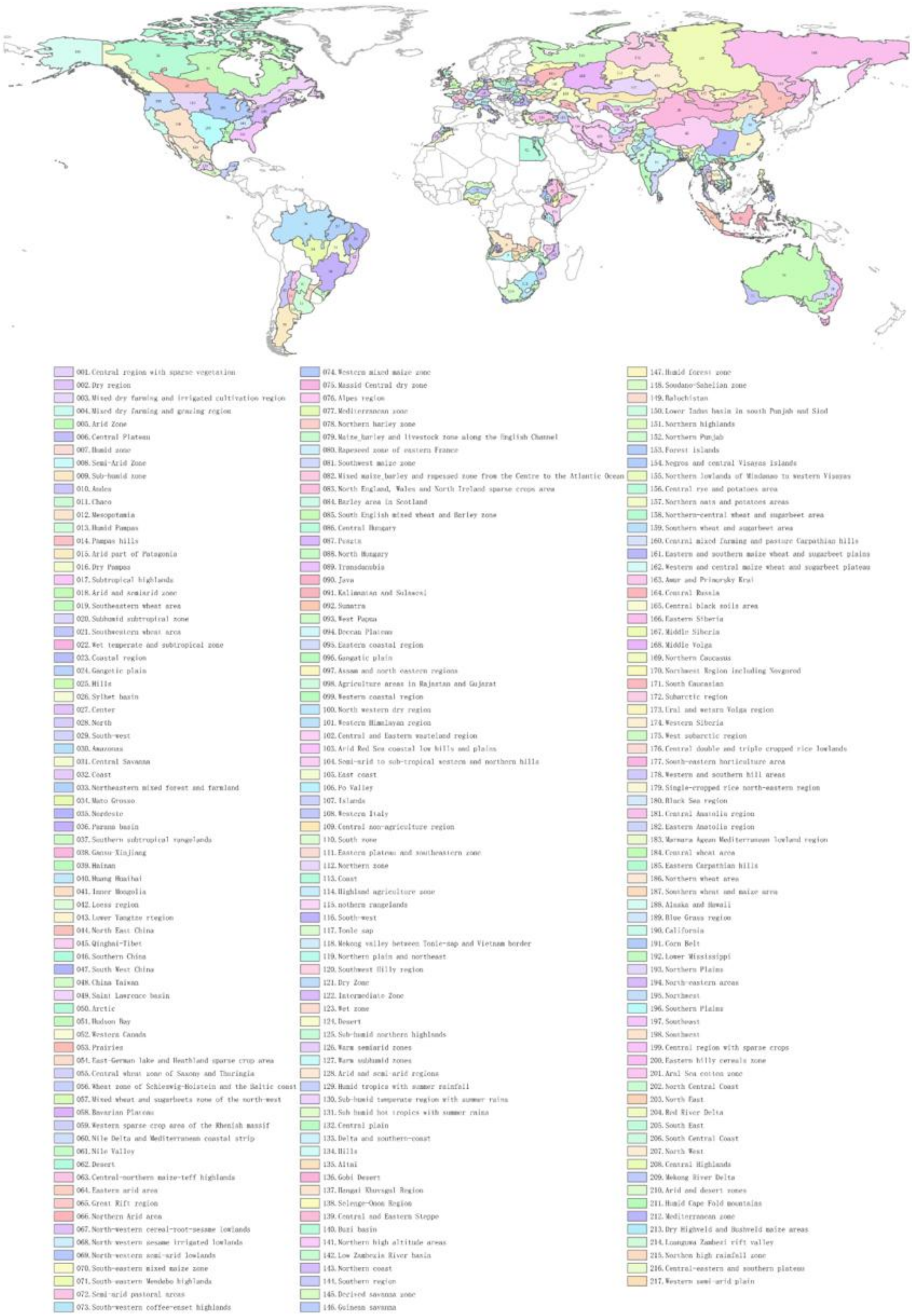
Agroecological zones for 43 key countries

Overview

217 agroecological zones for the 43 key countries across the globe

Description

43 key agricultural countries are divided into 217 agro-ecological zones based on cropping systems, climatic zones, and topographic conditions. Each country is considered separately. A limited number of regions (e.g., region 001, region 027, and region 127) are not relevant for the crops currently monitored by CropWatch but are included to allow for more complete coverage of the 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 (2014-2018), 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 (2014-2018), 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 (2014-2018), 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 (2004-2018), 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 16km/week for MPZs and 1km/dekad for China.

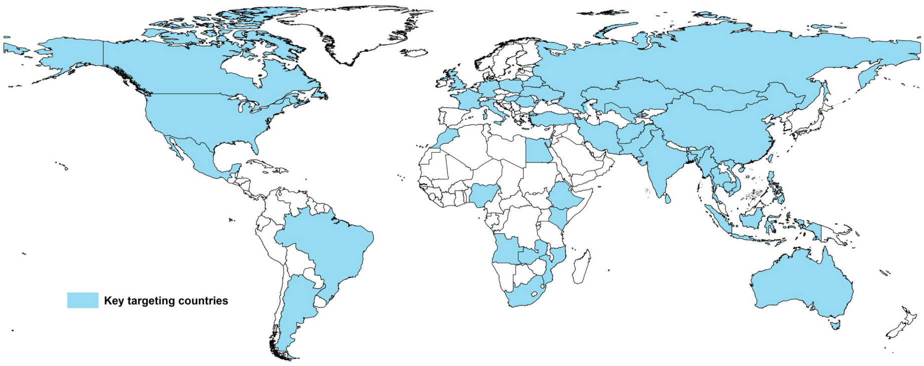
Note: Type is either "Weather" or "Crop"; source specifies if the indicator is obtained from ground data, satellite readings, or a combination; units: in the case of ratios, no unit is used; scale is either pixels or large scale CropWatch spatial units (CWSU). Many indicators are computed for pixels but represented in the CropWatch bulletin at the CWSU scale.

CropWatch spatial units (CWSU)

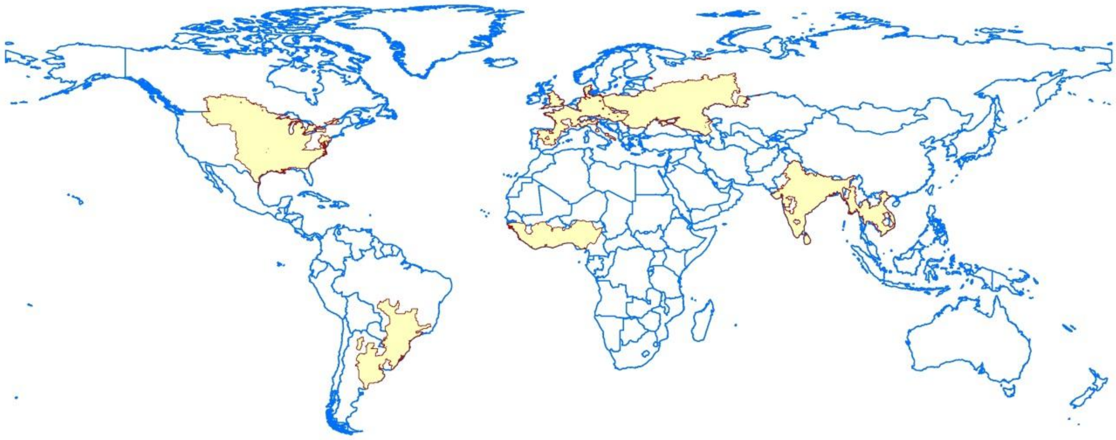
CropWatch analyses are applied to four kinds of CropWatch spatial units (CWSU): Countries, China, Major Production Zones (MPZ), and global crop Monitoring and Reporting Units (MRU). The tables below summarize the key aspects of each spatial unit and show their relation to each other. For more details about these spatial units and their boundaries, see the CropWatch bulletin online resources.

SPATIAL LUNITS	
CHINA	
Overview	*Description*
Seven monitoring regions	The seven regions in China are agro-economic/agro-ecological regions that together cover the bulk of national maize, rice, wheat, and soybean production. Provinces that are entirely or partially included in one of the monitoring regions are indicated in color on the map below.

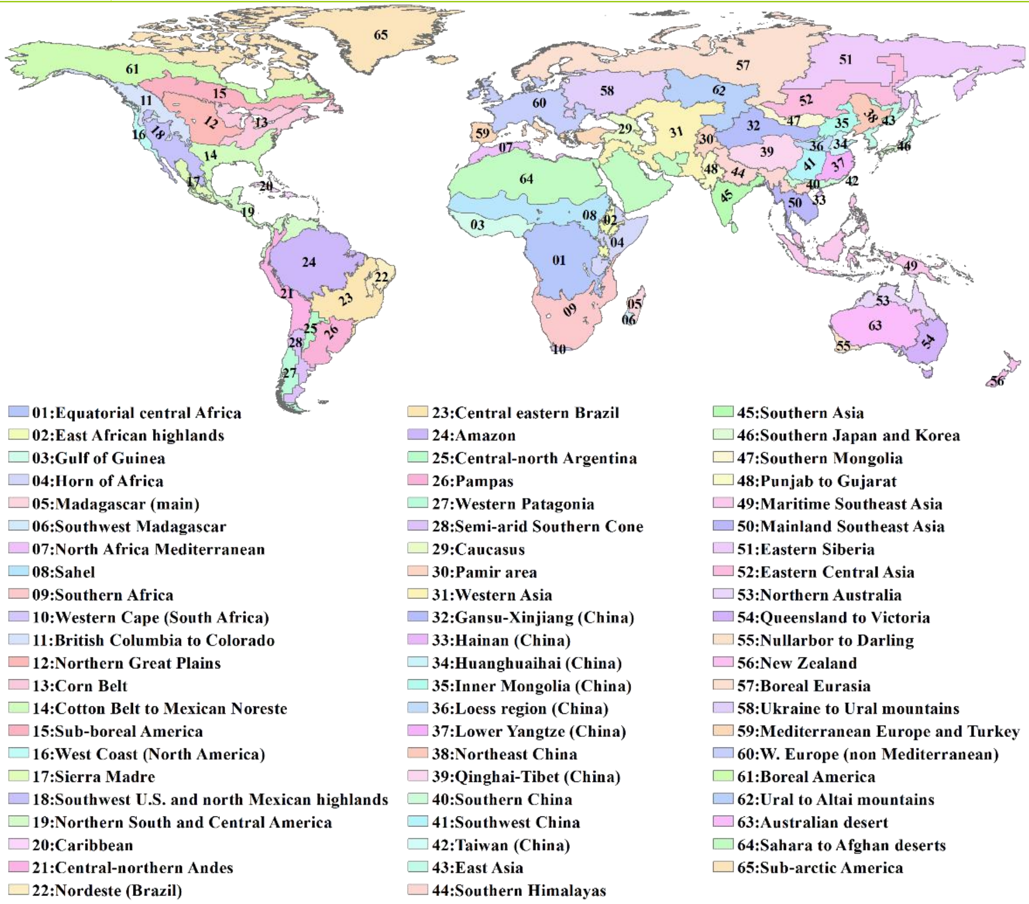
Countries (and first-level administrative districts, e.g., states and provinces)	
Overview	*Description*
43 countries to represent main producers/exporters and other key countries.	CropWatch monitored countries together represent more than 80% of the production of maize, rice, wheat and soybean, as well 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 Monitoring and Reporting Unit (MRU)	
Overview	*Description*
65 agro-ecological/agro-economic units across the world	MRUs are reasonably homogeneous agro-ecological/agro-economic units spanning the globe, selected to capture major variations in worldwide farming and crops patterns while at the same time providing a manageable (limited) number of spatial units to be used as the basis for the analysis of environmental factors affecting crops. Unit numbers and names are shown in the figure below. A limited number of units (e.g., MRU-63 to 65) are not relevant for the crops currently monitored by CropWatch but are included to allow for more complete coverage of global production. Additional information about the MRUs is provided online under **www.cropwatch.com.cn** .



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 43 CropWatch monitored countries) was estimated as the linear trend projection for 2020 of aggregated FAOSTAT data (using aggregated world production minus the sum of production by the 43 CropWatch monitored countries).

Data notes and bibliography

Notes

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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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