Chapter 3. Core countries

3.1 Overview

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

1. Introduction

The global 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. In South America, this reporting period covered the grain-filling period of late (2nd crop) maize and its harvest. In Brazil, conditions for maize were unfavorable. The severe drought conditions in all major maize producing states of Brazil persisted throughout this monitoring period and below average production is to be expected. In Argentina, conditions had been favorable, as reported in the May CropWatch bulletin.

In the USA, the western and northern zones of the Corn Belt were affected by drought conditions as well. On the contrary, conditions in the southern and eastern zones were favorable. Hence, the situation for US maize production is mixed. In Europe, conditions so far have been favorable for maize production, although the temperatures in Western Europe, such as in France, were cooler than average, especially in April and May. Rainfall conditions in Romania and the Ukraine have been favorable and high production can be expected from eastern Europe.

In China, maize was off to a good start, helped by the generally above-average precipitation and favorable temperatures. Flooding conditions in late July caused some damage to maize in the Huanghuaihai plain.

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

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 generally favorable. Conditions for the other important rice producing countries and regions, such as the Philippines and Indonesia, were generally favorable during this monitoring period.

Rainy (monsoon) season rice production has been off to a good start in South and Southeast Asia, aided by average rainfall conditions, although the onset of the monsoon rains was a bit delayed in some states of India. Similarly, conditions in China have been favorable. Rice production in the Sacramento Valley of California is being negatively impacted by the severe drought conditions, whereas the conditions in the other rice producing regions of the USA have been much more favorable, as they received abundant rainfall. All in all, rice production is stable at a global level.

Wheat: This monitoring period covers the sowing of wheat in the Southern Hemisphere. Conditions were favorable in Argentina, Cape Province of South Africa and Australia. In Brazil, the wheat production region has been affected by a prolonged drought, which may cause a reduction in area planted and hamper crop establishment. In the East African Highlands, conditions for wheat sowing from April to June were generally favorable.

Most winter wheat sown in the Northern Hemisphere reached maturity by May, June or July. Spring wheat harvest typically starts in August. Conditions for winter wheat in the Central Plains and the South of the USA were generally favorable. However, the Pacific Northwest was affected by high temperatures and drier than normal conditions. Spring wheat production in the northern states of the USA and the Canadian Prairies has been affected by drought conditions and hot temperatures, which will cause a yield reduction. Winter wheat production in the Maghreb had benefitted from above average rainfall, and production was above average for Morocco, Algeria and Tunisia. In Europe, moisture conditions were generally favorable for wheat production. However, severe storms caused lodging in some areas and the abundant rainfall posed challenges for wheat harvest in some places. Eastern Europe and Russia generally benefitted from above average rainfall as well, and prospects are favorable. Kazakhstan, as most of Central Asia, however, suffered from drought conditions, which will cause a significant yield reduction as compared to last year. In Turkey, Iran, Iraq, Syria and Afghanistan, the crops also suffered from severe drought conditions which reduced yields.

In India and Pakistan, where wheat was harvested in late March and April, the crop had benefitted from generally favorable weather conditions. Winter wheat in the North China Plain reached maturity in late May/early June. Conditions were generally favorable and good yields were obtained. Some of the grains stored on the farms got damaged during the floods in the Huanghuaihai plain in late July. Conditions for spring wheat production in northern China have been favorable so far.

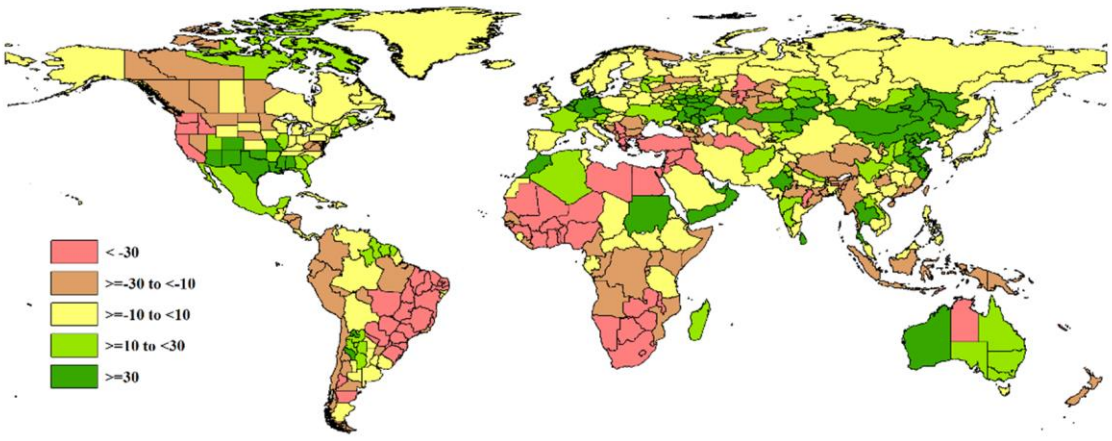
Soybean: In North America, production has benefitted from sufficient rainfall in most production regions, such as the Midwest in the USA and Ontario in Canada. However, the Dakotas had been affected by drought conditions. In the Ukraine, another main exporter of soybean, growing conditions have been favorable during this monitoring period. Conditions for soybean production in China have been favorable so far as well, mainly due to above-average rainfall. In South America, most of the soybeans had been harvested during the previous monitoring period.

3. Weather anomalies and biomass production potential changes

(1) Rainfall (Figure 3.1)

The severe drought conditions in the west of the USA impacted wheat production in the Pacific North West, although most of it is irrigated. However, the lack of rainfall was combined with record setting temperatures, which in turn can shorten the grain-filling period of wheat. Rainfed spring wheat production in the Canadian Prairies and the northern USA was also impacted by below average rainfall. Winter wheat production in Ontario, as well as in Kansas, Colorado, Oklahoma and Texas experienced normal to above average rainfall. Maize and soybean production in the northern USA, including the western and northern regions of the Corn Belt was also affected by drier than usual weather, whereas for the other regions of the Midwest, as well as for the South and East Coast of the USA, favorable rainfall conditions had been observed. Production of summer crops in Mexico benefitted from above average rainfall, putting an end to the prolonged drought. In Central America, as well as the entire west coast of South America, the rainfall deficit ranged from between 10 to 30%, which has a negative impact on maize production in Central America. In Brazil, the severe drought conditions continued, causing challenges for wheat planting in the South. In Argentina, on the other hand, rainfall conditions were more favorable. Wheat production in the Maghreb in North Africa benefitted from above average rainfall. In Morocco, it was 30% above average. Conditions in East Africa, especially in Sudan and Ethiopia were favorable for planting of wheat and maize. In West Africa, a delay of the onset of the rainy season as well as below average rainfall caused generally unfavorable conditions for the sowing of summer crops. In southern Africa, rainfall had been predominantly normal during the previous monitoring period. Most crops reached maturity between April and June. The drier than normal weather created favorable conditions for harvest. Most of the wheat that is grown during the winter months in the southern hemisphere is irrigated. Thus, there is limited impact of the drought conditions (rainfall deficit is greater than -30%) on the establishment of the wheat. Wheat and maize production in Europe, as well as in most of Russia, generally benefitted from normal to above average rainfall. Rainfall was also abundant in the center and north of China, favoring wheat, maize and rice production. The south of China, as well as Myanmar and most of the Middle East and parts of Central Asia were affected by below average rainfall. Most of the countries in the Middle East and Central Asia are suffering from prolonged drought conditions that already started in the previous monitoring period. Especially in Turkey, Lebanon, Syria, Palestine, Iraq and Afghanistan, the severe drought is causing additional hardships for the local population. Good rainfall in Australia has been creating favorable conditions for its wheat production.

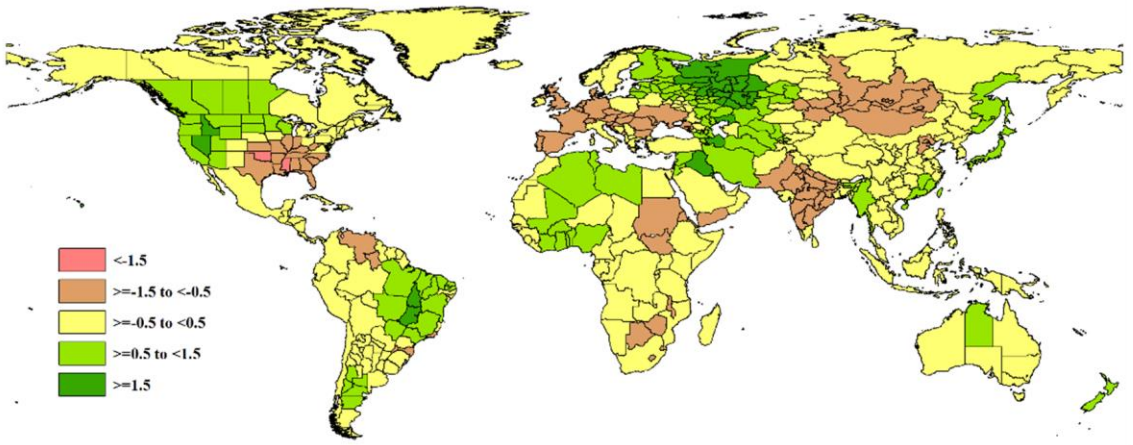
Figure 3.1 National and subnational rainfall anomaly (as indicated by the RAIN indicator) of April to July 2021 total relative to the 2006-2020 average (15YA), in percent



(2) Temperature anomalies (Figure 3.2)

The drought plagued the West of the USA as well as the Canadian Prairies and the northern states of the USA were affected by several heat waves during this monitoring period. The heat, in combination with the drought, will have a negative impact on crop production in those regions. The cooler, below average, temperatures in the Southeast of the USA are not expected to have an impact on crop production in that region. The cooler than usual temperatures in Western and Central Europe slowed the growth of the crops in the spring, but should not have an effect on yield levels. Similarly, the warmer than usual temperatures in Russia will not impact yield levels. Temperature departures from average are expected to have a very limited impact on crop production in the other regions of the world.

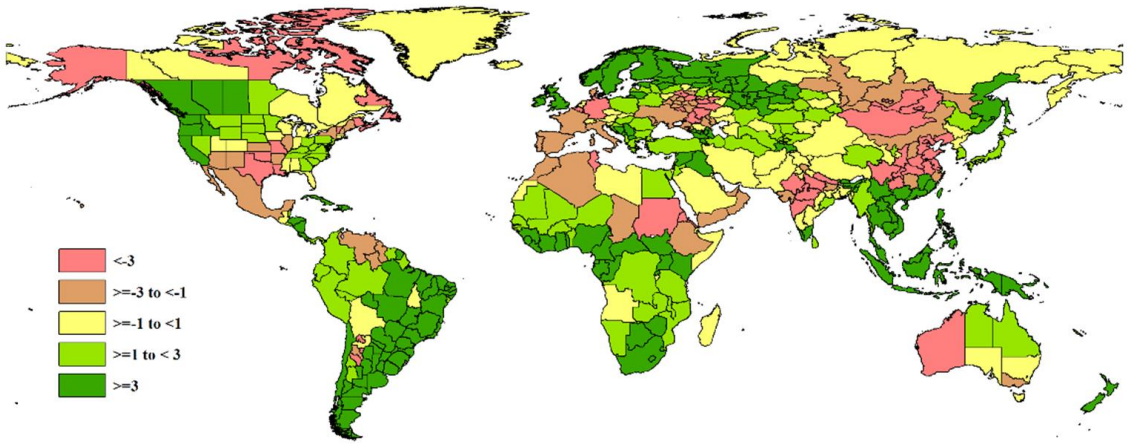
Figure 3.2 National and subnational temperatute anomaly (as indicated by the TEMP indicator) of April to July 2021 average relative to the 2006-2020 average (15YA), in °C



(3) RADPAR anomalies (Figure 3.3)

The higher than normal radiation in the drought affected regions of the USA, Canada and South America, West- Central and Southern Africa increases evapotranspiration and thus exacerbates the drought conditions. The below average radiation in East Asia will have a limited impact on crop production in that region, as radiation levels are generally high during summer.

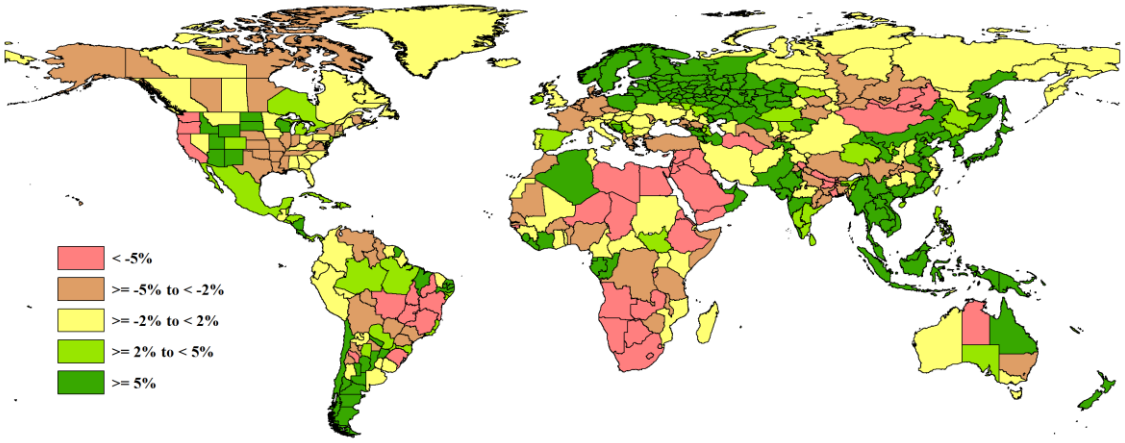
Figure 3.3 National and subnational sunshine anomaly (as indicated by the RADPAR indicator) of April to July 2021 total relative to the 2006-2020 average (15YA), in percent



(4) Biomass accumulation potential BIOMSS (Figure 3.4)

The biomass accumulation map shows favorable prospects for most of the USA, although drought might have reduced the production potential in some regions. Above average biomass estimates had been calculated for the most of Russia, southern India and Southeast Asia.

Figure 3.4 National and subnational bionass production potential anomaly (as indicated by the BIOMSS indicator) of April to July 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 April-July 2021 period to the previous season and the five-year average (5YA) and maximum; (c) Maximum Vegetation Condition Index over arable land (VCIx) for April-July 2021 by pixel; (d) Spatial NDVI patterns up to April-July 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 April-July 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 April-July 2021.

[AFG] Afghanistan

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

Afghanistan was affected by severe drought conditions during the previous monitoring period. Apart from early May, rainfall was below average for most of the current monitoring period. The cropped arable land is mainly located in Badghis, Faryab, Balkh, Kunduz, Takhar, Badakhshan, and Nuristan. The cropped arable land fraction (CALF) decreased by 34% from the 5YA. This also directly led to the low VCI, which is only 0.4. According to the maximum vegetation condition index (VCIx) map, the vegetation in the east was better than in the west. As to the spatial distribution of NDVI profiles, crop conditions in some areas (about 16.5% of total cropped areas) were above average or close to average from April to July, mainly distributed in Mahajer and Kunduz. The proportion of areas with crop growth slightly lower than the average level was 41.9%, mainly distributed in the east, south and northeast of Afghanistan. In addition, the growth of crops in 41.6% of the cultivated land area was significantly lower than the average level. This was mainly in the northwest, especially in the north of Herat province and Qala-e-naw province. The rainfall increased suddenly in the first ten days of May, reaching 80 mm, which is 2 to 3 times of the precipitation in other periods. According to the meteorological data, the precipitation mainly occurred in Herat, Badghis and Faryab provinces. The flooding caused by the precipitation directly reduced CALF. This bulletin believes that the war also had a great impact on agriculture, causing a decline in CALF. During the monitoring period, most parts of Afghanistan were at war, and the prospect for crop production is far below normal.

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.

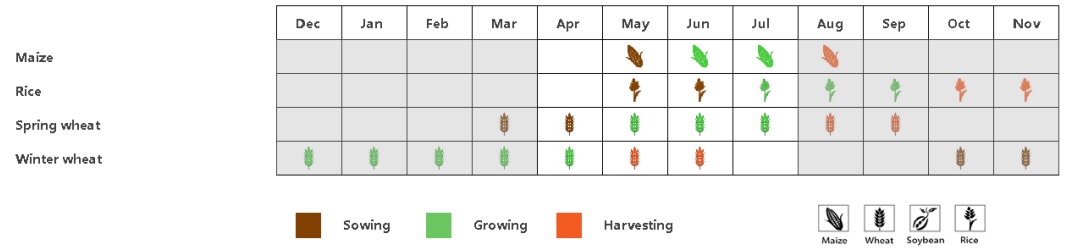
The RAIN in the Central region with sparse vegetation was 183 mm (+23%). The TEMP was 14.4°C (-0.1°C), and the RADPAR was 1630 MJ/m^2, at an average level. According to the NDVI-based crop condition development graph, the NDVI was lower than the average level between April and July. BIOMSS increased by 1%, CALF had increased by 3% and VCIx was 0.56.

The Dry region recorded 95 mm of rainfall (RAIN +27%), TEMP was higher than average at 22.7°C (+0.1°C), and RADPAR was 1651 MJ/m^2 (-1%). According to the NDVI-based development graph, crop conditions were lower than the five-year average in the monitoring period. CALF in this region decreased by 16% and VCIx was 0.24.

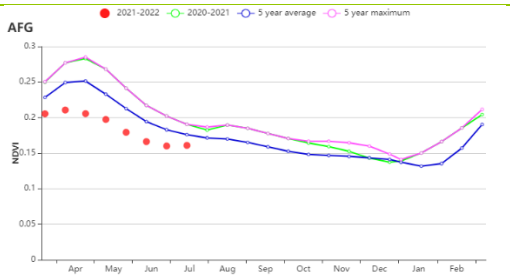
In the Mixed dry farming and irrigated cultivation region, the following indicator values were observed: RAIN 334 mm (+11%); TEMP 17.4°C (+0.1°C); RADPAR 1595 MJ/m^2 (+2%). BIOMSS was 420 g DM/m^2 (-4%) and CALF was 22% below average. According to the NDVI-based crop condition development graph, NDVI was lower than the average level and VCIx was 0.59.

The Mixed dry farming and grazing region recorded 62 mm of rainfall (RAIN -8%). TEMP was 21.5°C (+0.6°C) and the RADPAR was 1647 MJ/m^2, at an average level. CALF was 87% below the 5YA. VCIx was 0.25 and BIOMSS decreased by 1%. According to the crop condition development graph, the NDVI was much lower than the 5YA throughout the monitoring period.

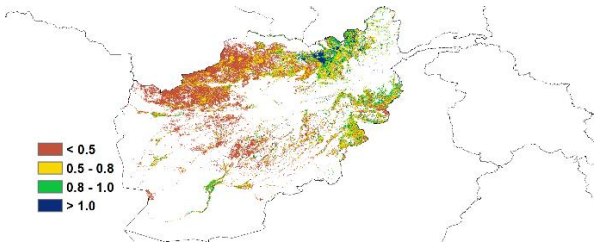
Figure 3.5 Afghanistan's crop condition, April - July 2021



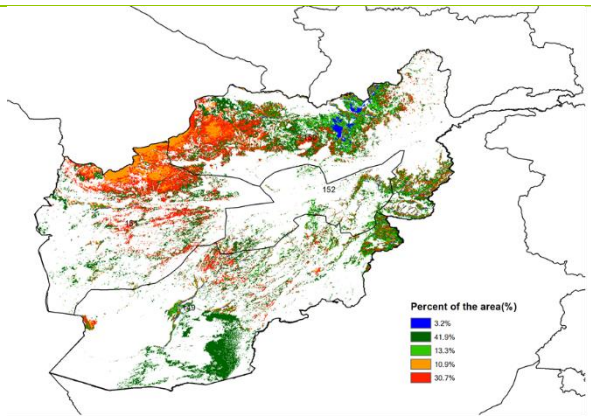
(a). Phenology of major crops



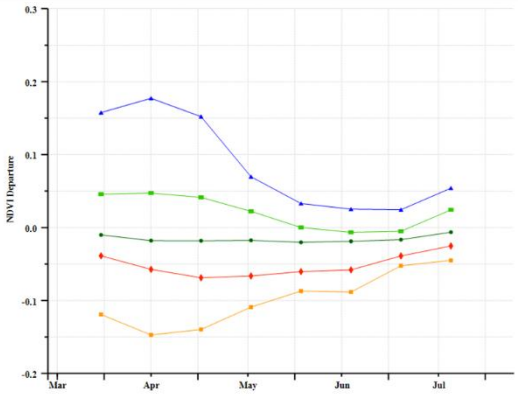
(b) Crop condition development graph based on NDVI



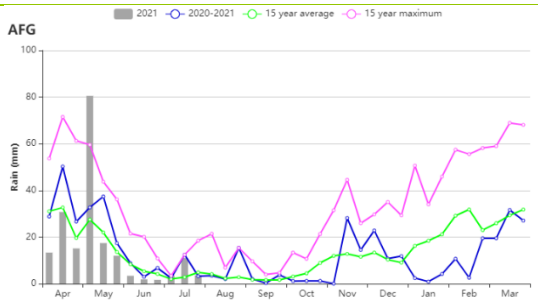
(c) Maximum VCI



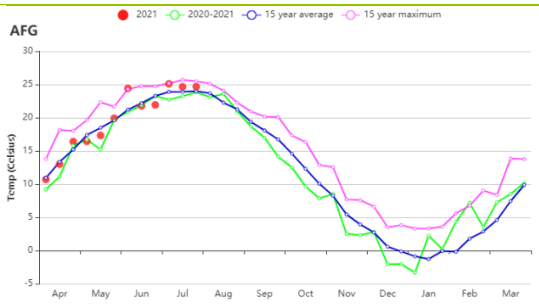
(d) Spatial NDVI patterns compared to 5YA



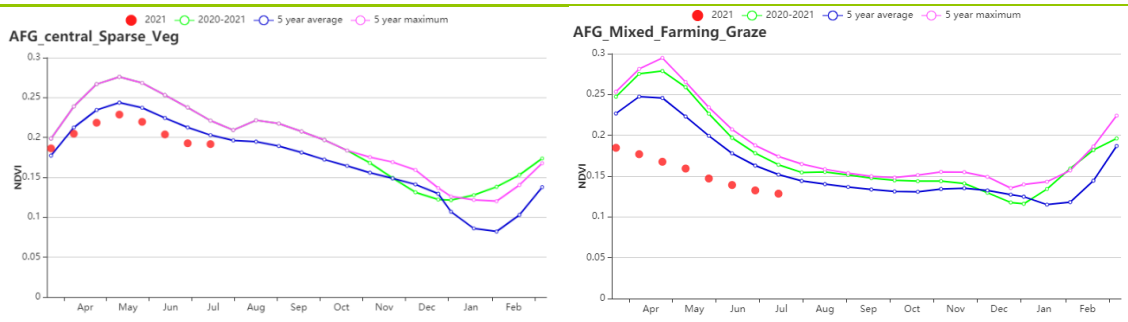
(e) NDVI profiles



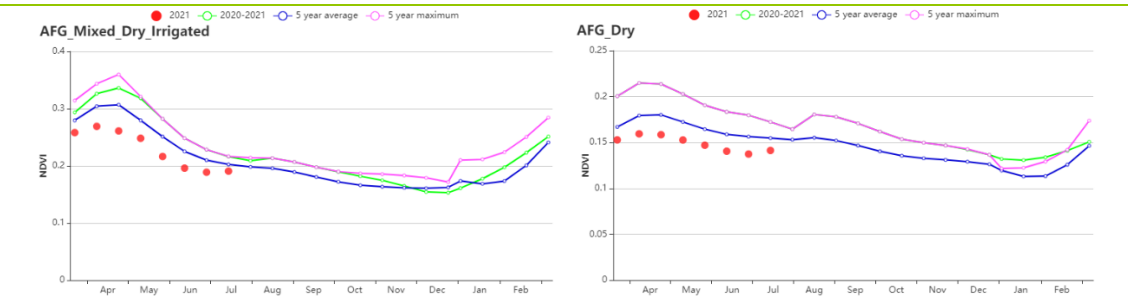
(f) Rainfall profiles



(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, April – July 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Central region with sparse vegetation	183	23	14.4	-0.1	1630	0	378	1
Dry region	95	27	22.7	0.1	1651	-1	397	0
Mixed dry farming and irrigated cultivation region	334	11	17.4	0.1	1595	2	420	-4
Mixed dry farming and grazing region	62	-8	21.5	0.6	1647	0	342	-1

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current
Central region with sparse vegetation	10	3	0.56
Dry region	4	-16	0.24
Mixed dry farming and irrigated cultivation region	18	-22	0.59
Mixed dry farming and grazing region	1	-87	0.25

[AGO] Angola

During this reporting period, the harvest of maize and rice in Angola was concluded by mid-May. Meanwhile, wheat which was sown in May was in its main growth period. Wheat harvest is expected to be in October. Even with no drought recorded for almost 85% of the country, the agroclimatic indicators during this period were characterized by a drop in rainfall (RAIN -16%) and temperature (TEMP -0.1ºC). The radiation recorded for this period was 1228 MJ/m^2, an increase of about 1% compared with the past 15 years' average. According to the rainfall profile graph, the 10-day cumulative rainfall was above the 15YA in late April and early May. Estimated biomass was below the 15YA (BIOMSS -16%).

The crop condition development graph for Angola presented below-average crop conditions in early April, mostly influenced by the below-average precipitation recorded during the period. However, these conditions improved in early May till the end of the reporting period. According to the NDVI departure clustering map and profiles, almost 23% of the cropland presented below-average crop conditions throughout the entire monitoring period. Most of these areas are located in Uíge, Huila and Benguela. However, 17% of the croplands showed above-average crop conditions. Provinces such as Cuando Cubango, Cuanza Sul and Bengo are the regions where the better crop conditions were verified. Despite these conditions as well as the decreases in the cropped arable land fraction (CALF -1%), high VCIx values were recorded across the country (0.87), indicating favorable prospects for the wheat planting regions.

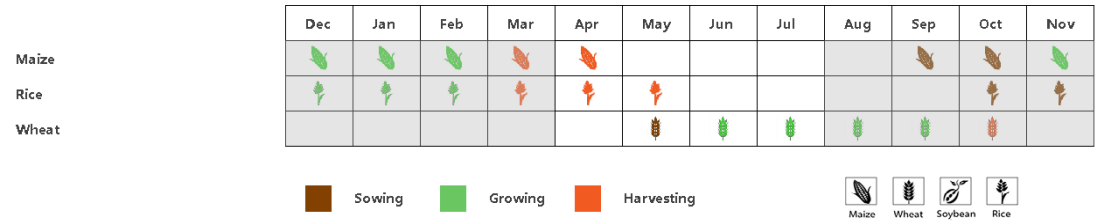
Regional Analysis

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.

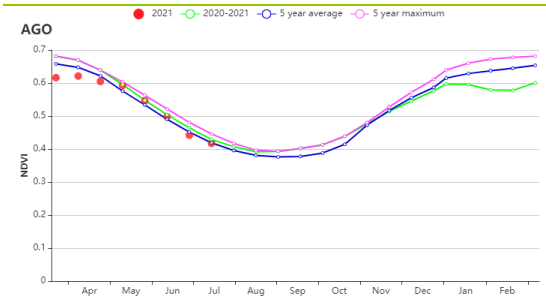
During the reporting period, the agroclimatic indicators reveal that three regions, including the Humid, Semi-arid, and Sub-humid zones, recorded lower rainfalls compared to the past fifteen years' average (about 6%, 23% and 16% lower, respectively). In these regions, the temperature also recorded a drop by 0.1ºC in the Semi-arid and Sub-humid zones and by about 0.3ºC in the Humid zone. Radiation increased by 1% in both Semi-arid and Sub-humid zones while the Humid zone recorded a decrease by 1%. Influenced mostly by the drop in the total precipitation received, the potential biomass in these regions all decreased as expected, by 37%, 23% and 11% in the Humid, Semi-arid, and Sub-humid zones, respectively. Rainfall increased in the Arid zone (RAIN +16%) and Central Plateau (+3%). However, only the Arid zone recorded an increase in temperature by about 0.5ºC while the temperature in the Central Plateau decreased by about 2ºC. Radiation decreased by 2% in the Arid zone and it was near average in the Central Plateau. The potential biomass in both regions was below average, minus 14% in the Arid zone and 13% in the Central Plateau.

Except for the Humid zone, the crop conditions based on NDVI in the remaining zones indicate favourable crop conditions from early May throughout almost the entire monitoring period. Decreases in the cropped arable land fraction (CALF) were recorded in the Arid zone (-1%), Central Plateau (-10%) and Sub-humid zone (-2%). In the Humid zone, CALF was near average of the past five years, while it increased by 1% in the Semi-arid zone. The lower VCIx of 0.77 was recorded in Central Plateau, a region where a significant drop in CALF was observed.

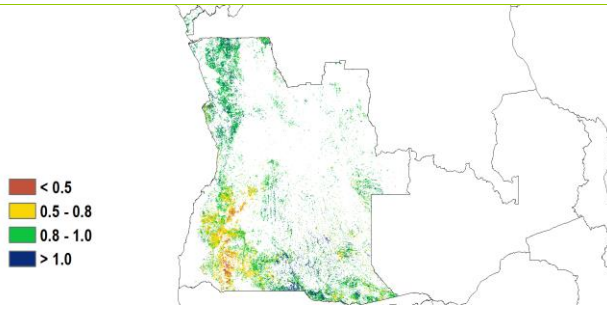
Figure 3.6 Angola's crop condition, April–July 2021



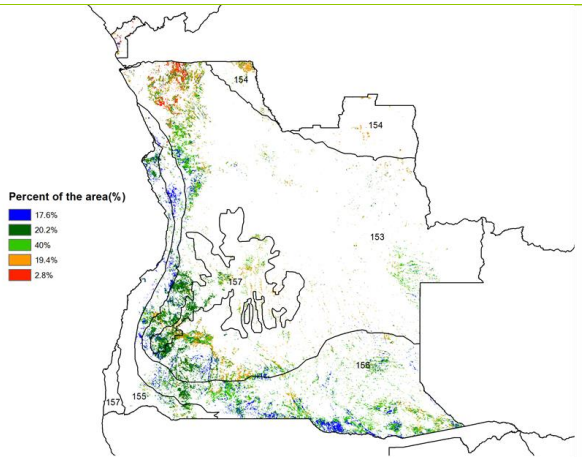
(a) Phenology of major crops



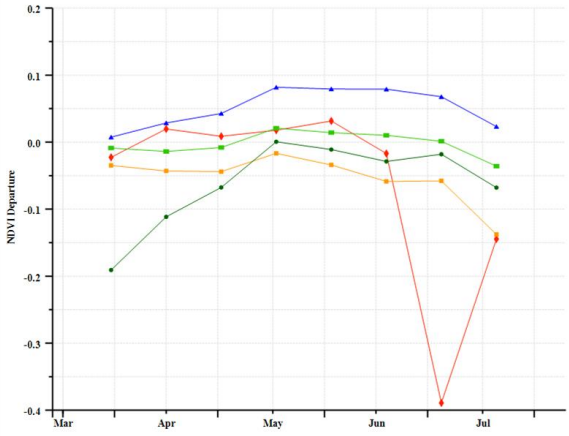
(b) Crop condition development graph based on NDVI



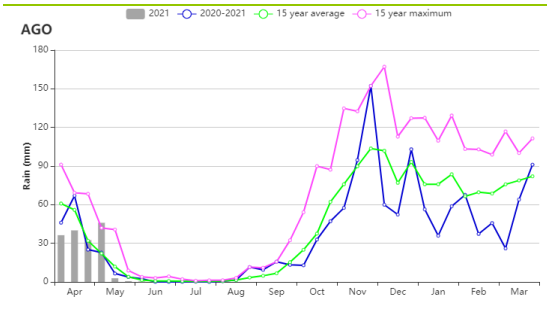
(c) Maximum VCI



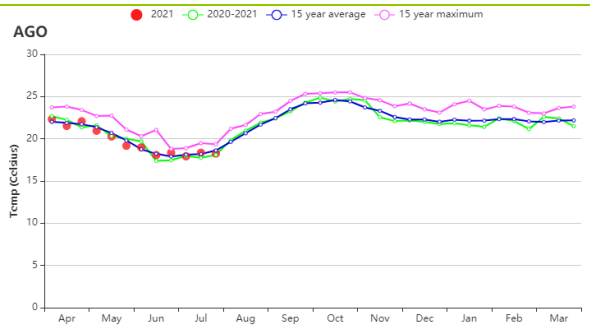
(d) Spatial NDVI patterns compared to 5YA



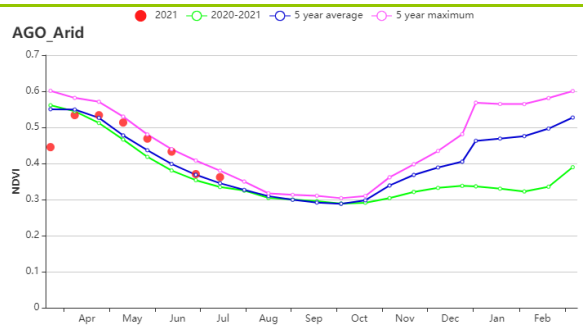
(e) NDVI profiles

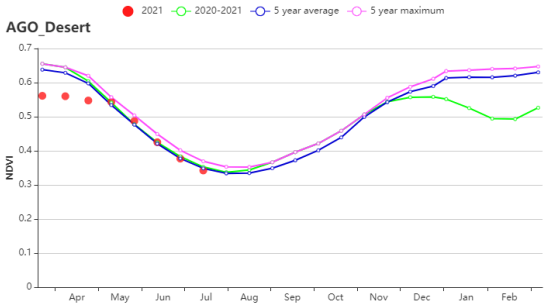


(f) rainfall profiles

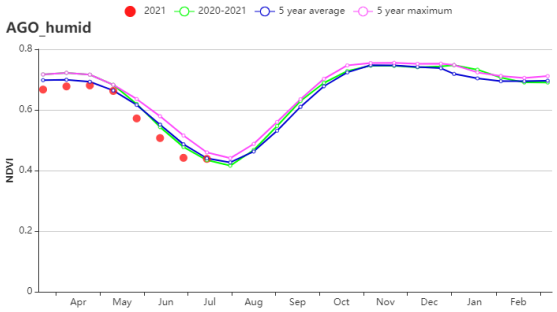


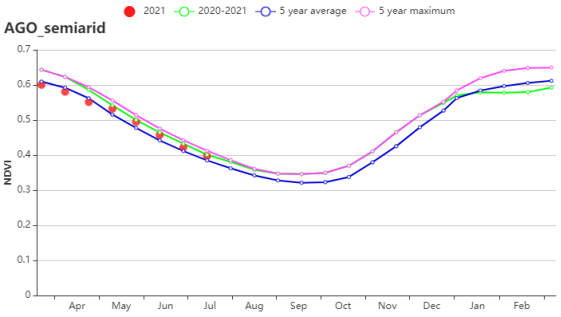
(g) temperature profiles



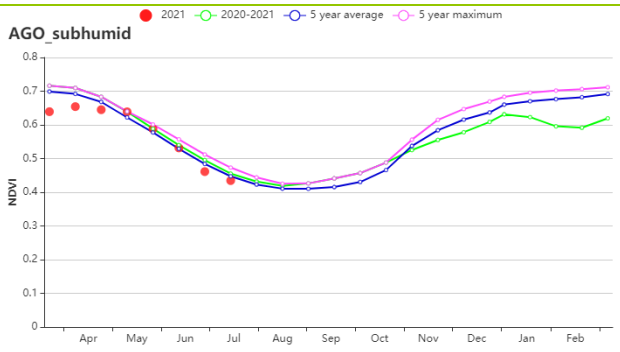


(h) Crop condition development graph based on NDVI - Arid zone (left), and Central Plateau (right)

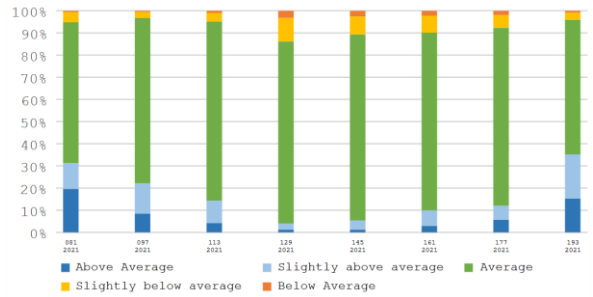


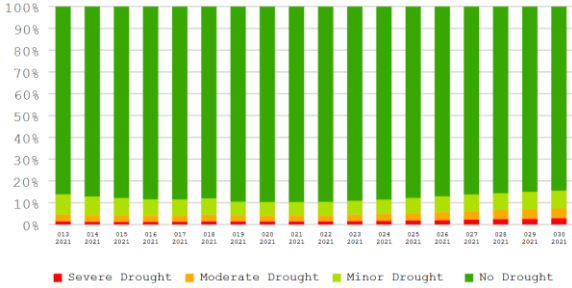


(i) Crop condition development graph based on NDVI - Humid zone (left), and Semi-arid zone (right)



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





(k) Proportion of NDVI anomaly categories compared with 5YA (l) Proportion of VHIm categories compared with 5YA

Table 3.3 Angola's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April – July 2021

Region	RAIN		TEMP		RADPAR		BIOMASS	
	Current (mm)	Departure (%)	Current (℃)	Departure (℃)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Arid Zone	173	26	22.8	0.5	1177	-2	370	-14
Central Plateau	131	3	16.1	-0.2	1250	0	191	-13
Humid zone	395	-6	22.3	-0.3	1212	-1	338	-37
Semi-Arid Zone	58	-23	18.8	-0.1	1201	1	181	-23
Sub-humid zone	209	-16	20.0	-0.1	1228	1	325	-11

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

Region	CALF		Maximum VCI
	Current(%)	Departure from 5YA (%)	Current
Arid Zone	79	-1	0.81
Central Plateau	90	-10	0.77
Humid zone	100	0	0.93
Semi-Arid Zone	96	1	0.99
Sub-humid zone	97	-2	0.86

[ARG] Argentina

This reporting period covers mainly the fallow period following the harvest of the summer crops (late maize, soybean and rice). Wheat planting started in June. For the whole country, rainfall showed a 10% negative anomaly, TEMP was close to average, RADPAR and BIOMSS showed positive anomalies of +7% and +8%, respectively. CALF showed a 2% increment and maximum VCI value was at 0.88. Argentina generally benefitted from favorable conditions for crop production.

For the whole country, rainfall profiles showed some temporal variability around the 15YA. Stronger negative anomalies were observed in June and July. The TEMP profile also showed variability, changing between positive and negative anomalies over the reporting period.

For the whole country, the crop condition development graph based on NDVI showed no anomalies during April and negative anomalies starting in May. The spatial distribution of NDVI profiles showed a mixed pattern. A more homogeneous pattern was observed in Center South Pampas, which showed positive anomalies starting at the end of April. North Pampas was dominated by two similar temporal profiles but with different absolute NDVI departure values, both with a decreasing NDVI departure tendency along the period. The dominating pattern, mainly concentrated in eastern Pampas (dark green) showed almost no anomaly during the monitoring period, while light green areas showed a quite stable pattern with negative anomalies near -0.1. Most areas in Argentina showed VCIx values higher than 0.8. Lower values were observed in South West and Center Pampas and in East Subtropical Highlands.

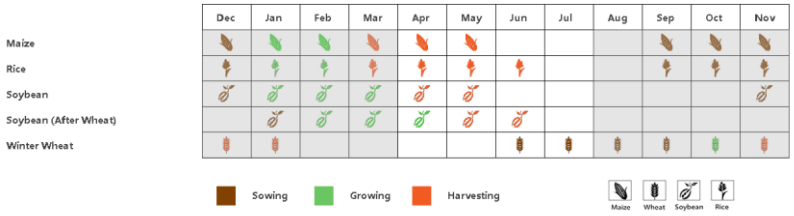
Subregions

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 agro-ecological zones were less relevant for this period.

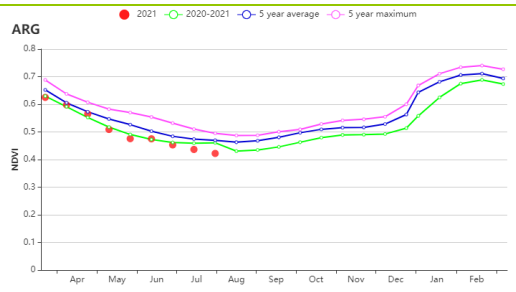
Humid Pampas and Subtropical Highlands showed positive anomalies in RAIN (+2% and +18% respectively); while Chaco and Mesopotamia showed negative anomalies (-9% and -21%, respectively). TEMP showed no anomaly in Subtropical Highlands, positive anomaly in Humid Pampas (+0.2°C), and negative anomalies in Mesopotamia (-0.4°) and Chaco (-0.2°). RADPAR showed positive anomalies in Chaco (+13%), Mesopotamia (+11%) and Humid Pampas (+5%), and negative anomaly in Subtropical Highlands (-1%). BIOMSS showed positive anomalies in Chaco (+11%), Mesopotamia (+8%) and Humid Pampas (+10%), and negative anomaly in Subtropical Highlands (-3%). CALF was almost complete in Chaco (99%), Mesopotamia (100%) and Subtropical Highlands (99%), while the Humid Pampas showed a lower value (95%), but it was 3% higher than the five-year average value. Maximum VCI showed general good conditions, with the highest value observed in Mesopotamia (0.92), followed by Subtropical Highlands (0.91), Chaco (0.90) and Humid Pampas (0.88).

Several differences in NDVI trends were observed among the regions. Pampas and Mesopotamia showed positive anomalies during April and nearly no anomalies during the rest of the reporting period. Chaco showed no anomalies up to June, and negative anomalies during July, while Subtropical Highlands showed negative anomalies since April.

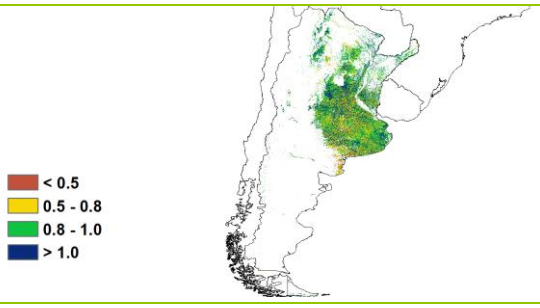
Figure 3.7 Argentina´s crop condition, April-July 2021



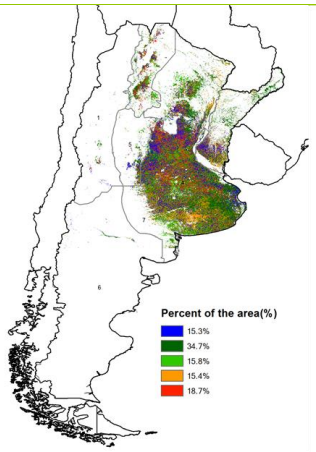
(a). Phenology of major crops



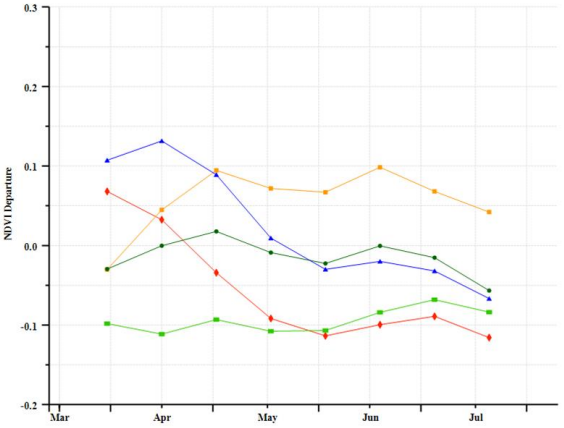
(b) Crop condition development graph based on NDVI



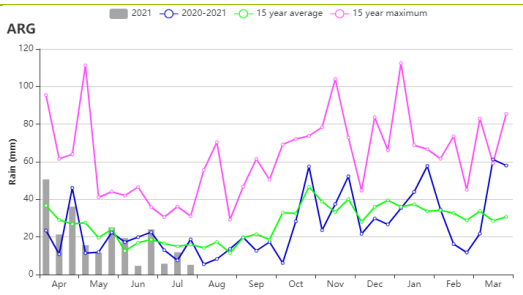
(c) Maximum VCI



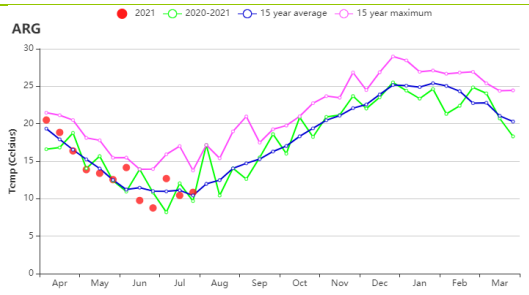
(d) Spatial NDVI patterns compared to 5YA



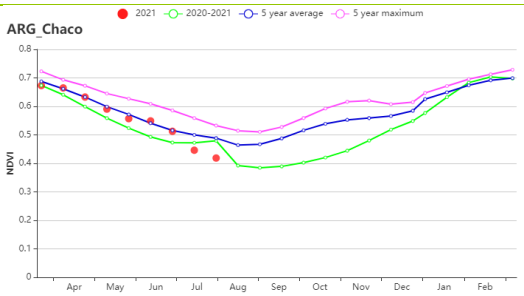
(e) NDVI profiles



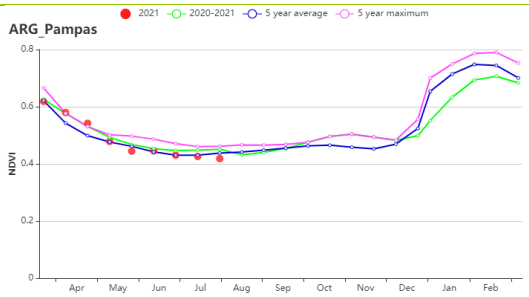
(f) Rainfall time series profile



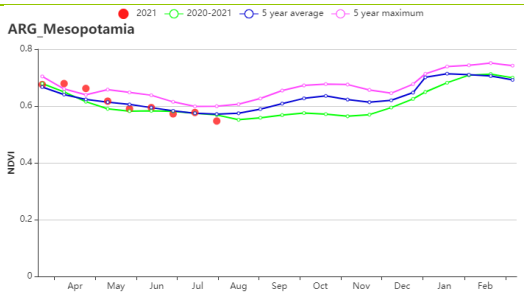
(g) Temperature time series profile



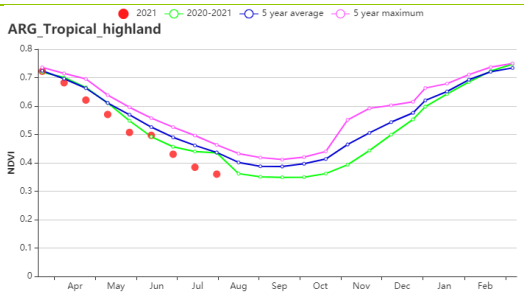
(h) Crop condition development graph based on NDVI (Chaco)



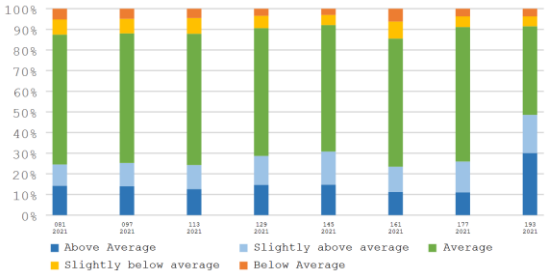
(i) Crop condition development graph based on NDVI (Pampas)



(j) Crop condition development graph based on NDVI (Mesopotamia)



(k) Crop condition development graph based on NDVI (Subtropical Highlands)



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

Table 3.5 Argentina's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April–July 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 (%)
Chaco	241	-9	16.2	-0.2	722	13	295	11
Mesopotamia	351	-21	14.8	-0.4	680	11	264	8
Humid Pampas	196	2	12.6	0.2	640	5	218	10
Subtropical highlands	194	18	13.8	0.0	793	-1	265	-3

Table 3.6 Argentina's agronomic indicators by sub-national regions, current season's values and departure from 15YA/5YA, April–July 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current
Chaco	99	0	0.90
Mesopotamia	100	1	0.92
Humid Pampas	95	3	0.88
Subtropical highlands	99	-1	0.91

[AUS] Australia

Australia's wheat and barley were sown in May. These crops are grown during the Australian winter season. At the national scale, Australia received sufficient rainfall, which was 22% above average. The other agro-climatic indicators were close to the 15YA, including TEMP (0.0°C), RADPAR (0%), BIOMSS (0%). The agronomic indicators were also positive, with a VCIx of 0.82 and an increased CALF (+6%).

The national NDVI profile shows that overall crop conditions were better than the 5-year average, but lower than the maximum. From the VCI map, the crop condition in Western Australia were better than in the southeast states. The lowest VCIs were found in the west Victoria and New South Wales. The NDVI departure clustering also showed the same spatial pattern. Above-average NDVI was observed on 29% of the cropland, while 24.9% remained below average throughout this monitoring period.

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

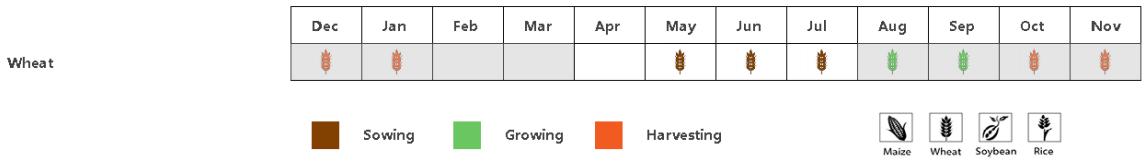
Regional analysis

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.

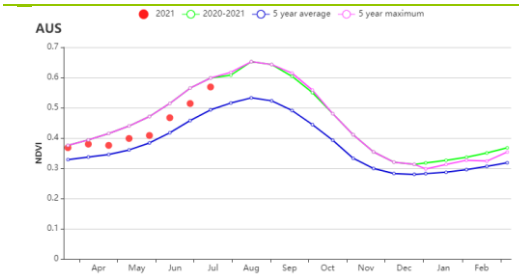
The agro-climatic indicators show that the 4 AEZs could be assigned into two groups. Group 1 includes Southeastern wheat zone, Subhumid subtropical zone, and Wet temperate and subtropical zone, which had the same departure patterns. Group 1 experienced above-average rainfall (+12%, +24%, +14%), slightly below-average temperature (-0.1°C, -0.4°C, -0.1°C), average sunshine (0%, +1%, +2%), and average biomass (0%, 0%, +4%). However, the CALF values in these 3 AEZs were different, in where the Southeastern wheat area and Wet temperate and subtropical zones were average, while the Subhumid subtropical zone was 30% greater than the 5YA. Accordingly, the NDVI profiles also showed the Subhumid subtropical zone had favorable crop conditions, while the other two zones were close to average. The VCIx were 0.68, 0.86 and 0.86, respectively. Only the Southeastern wheat area was not favorable.

The Southwestern Wheat Zone, representing the 2nd group, had significantly above-average rainfall (+67%), slightly above-average temperature (+0.2°C), below-average sunshine (-6%) and average biomass (+2%). The CALF was 94%, 12% above average. The VCIx was 1.02, which indicated that the crop condition in this AEZ are excellent. This is further confirmed by the NDVI profile showing values that were mostly close to last 5 years' maximum.

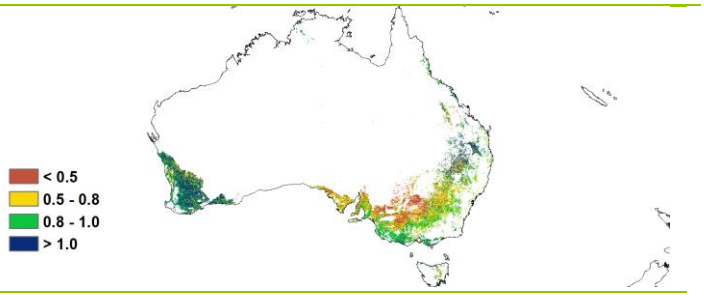
Figure 3.8 Australia crop condition, April - July 2021



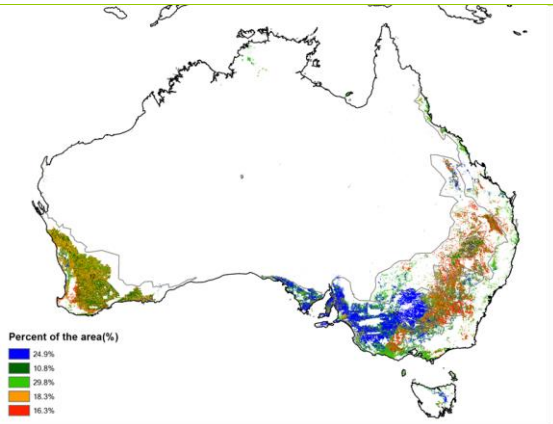
(a). Phenology of major crops



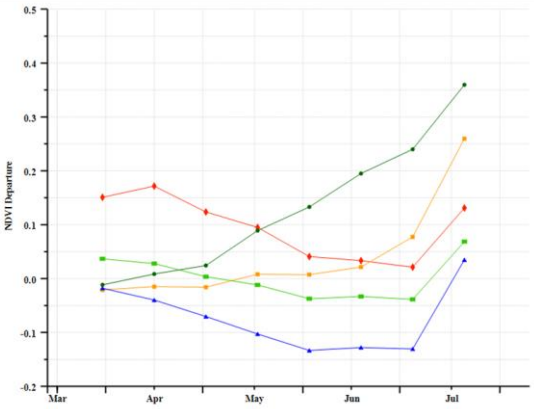
(b) Crop condition development graph based on NDVI



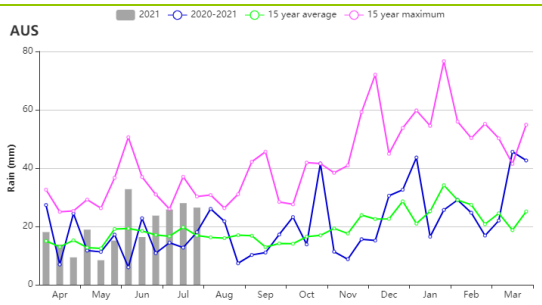
(c) Maximum VCI

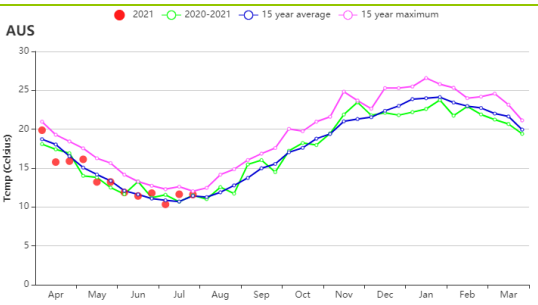


(d) Spatial NDVI patterns compared to 5YA

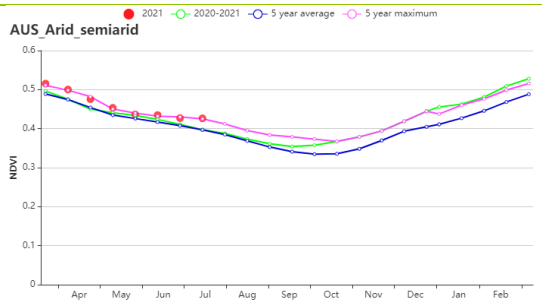


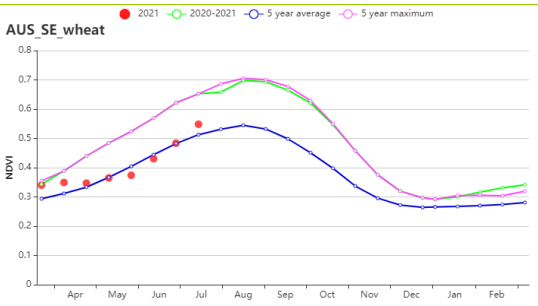
(e) NDVI profiles



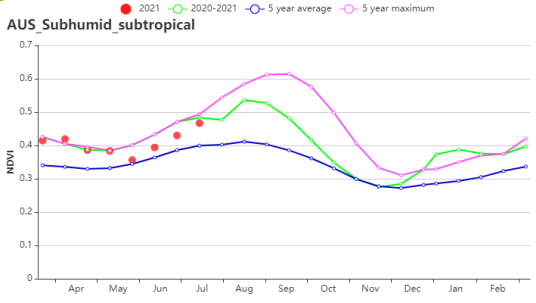


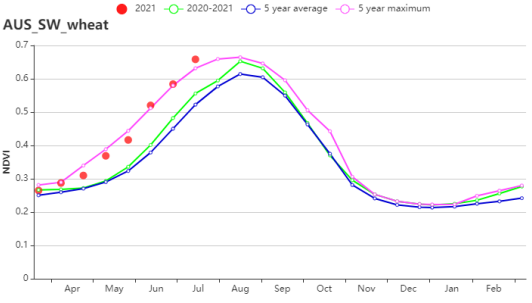
(f) Time series rainfall profile (left) and temperature profile (right))



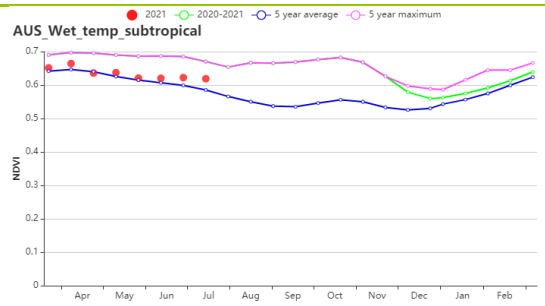


(g) Crop condition development graph based on NDVI (Arid and semiarid zone (left) and Southeastern wheat area (right))





(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, April - July 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Arid and semiarid zone	89	-30	22.0	0.6	1032	2	309	-5
Southeastern wheat area	226	12	11.9	-0.1	564	0	194	0
Subhumid subtropical zone	169	24	13.8	-0.4	788	1	267	0
Southwestern wheat area	365	67	14.2	0.2	588	-6	242	2
Wet temperate and subtropical zone	267	14	12.6	-0.1	675	2	244	4

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Arid and semiarid zone	75	5	0.91
Southeastern wheat area	90	-2	0.68
Subhumid subtropical zone	76	30	0.86
Southwestern wheat area	94	12	1.02
Wet temperate and subtropical zone	99	1	0.86

[BGD] Bangladesh

During the reporting period, the sowing of the main rice crop (Aman) started in June. Boro (winter) rice harvest ended in May and Aus rice harvest was mostly completed in July. Wheat harvest was completed in April. Rainfall was below average (-7%), TEMP was higher (+0.4℃) and RADPAR was close to the 15-year average. The potential biomass decreased by 5%. The national NDVI development graph shows that crop conditions across the country were lower than the 5-year average during the whole monitoring period. They started to recover at the end of this period. The spatial NDVI pattern shows that 30.2% of the cultivated area was close to average, mainly distributed in Sylhet basin. 51.1% had a big drop in June and recovered to below-average levels in July in Coastal region and Hills and 18.7% had a big drop in July dispersed over the country. These drops might have been due to cloud cover in the satellite images. The maximum Vegetation Condition Index (VCIx) was 0.90, with most areas higher than 0.8 and CALF was the same as the 5-year average (96%). Conditions for the main rice crop (Aman) which was planted in June and July are favorable, due to sufficient rainfall during those months. Overall, the crop conditions in most parts of Bangladesh were near average.

Regional analysis

Bangladesh can be divided into four agro-ecological zones (AEZ): Coastal region, the Gangetic plain, the Hills, and the Sylhet basin.

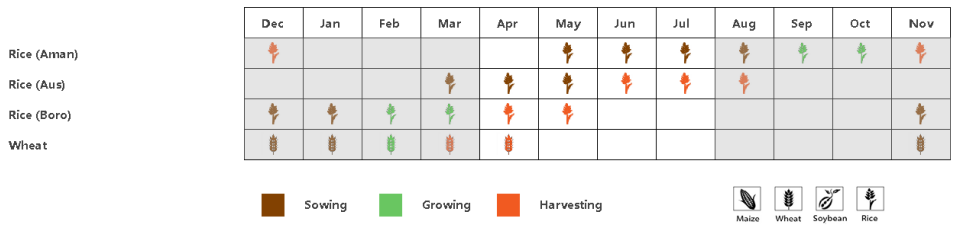
In the Coastal region, both RAIN and TEMP were above average (+12% and +0.2°C, respectively) while RADPAR was below average (-2%). The crop condition development graph based on NDVI shows that crop conditions were below but near the 5-year average from April to July. CALF was at 85% and VCIx at 0.84. BIOMSS was lower than average by 9%. Conditions were below average.

The Gangetic plains received the least precipitation amount of 1188 mm (10% below average). Both TEMP and RADPAR was above average (+0.3°C and +1%). The crop condition development graph based on NDVI shows crop conditions were close to the 5-year average at the end of May and then dropped sharply. During the monitoring period, CALF (97%) was the same as average and VCIx (0.91) indicated average prospects, but the below-average BIOMSS (-3%) indicated slightly unfavorable crop conditions.

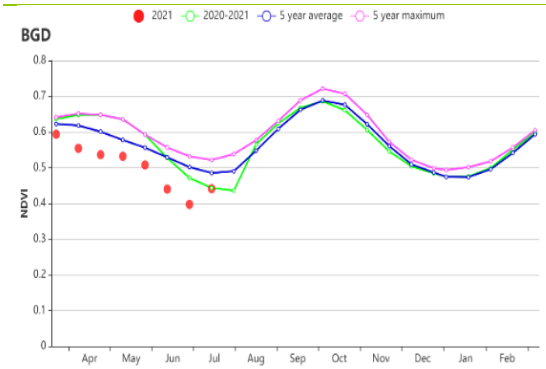
In the Hills, rainfall was 5% below average. TEMP was above average (+0.3°C) and RADPAR was close to average. The crop condition started recovering from June and reached close to average levels at the end of the July, as shown by the NDVI development profiles. But the unfavorable condition before July resulted in a below-average BIOMSS (-9%). CALF (96%) was the same as average and VCIx (0.88) indicate average crop prospects.

The Sylhet Basin experienced the largest drop in rainfall (-14%). TEMP was 0.7°C above average and RADPAR was 1% above. The crop condition development graph based on NDVI shows that crop conditions were below average in the reporting period, and they increased to average levels only at the end of July. The BIOMSS was near average and a high CALF at 99% and VCIx of 0.93 indicated average crop conditions.

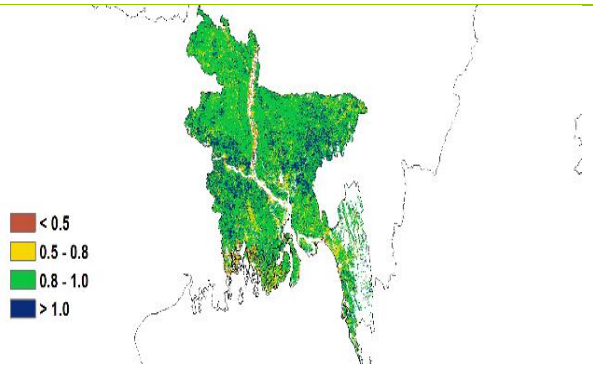
Figure 3.9 Bangladesh's crop condition, April - July 2021



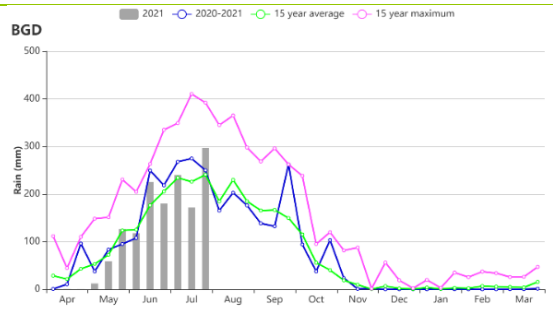
(a). Phenology of major crops



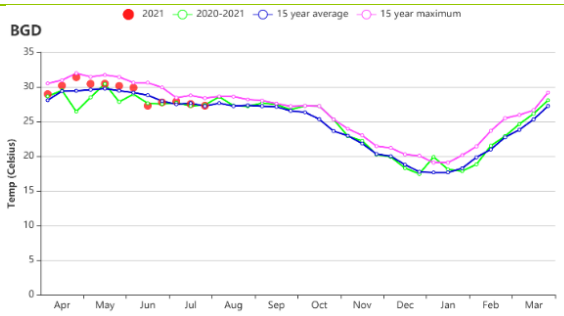
(b) Crop condition development graph based on NDVI



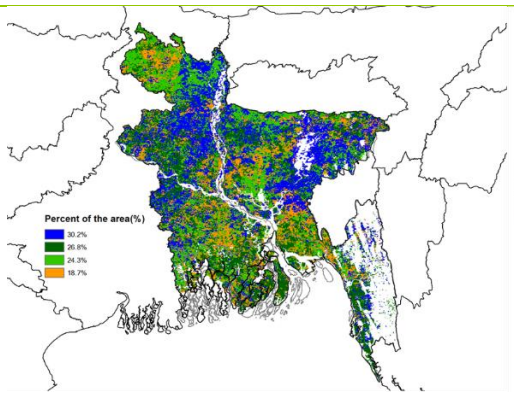
(c) Maximum VCI



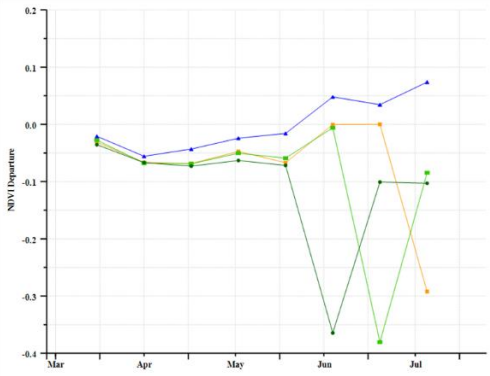
(d) Rainfall Index



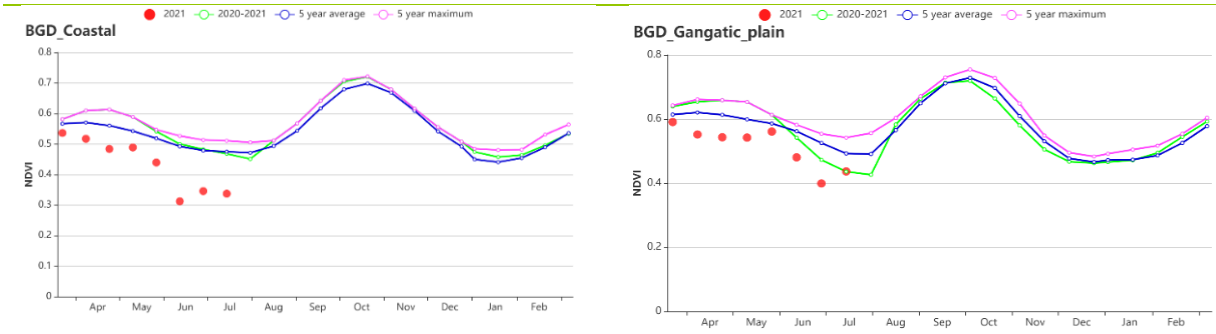
(e) Temperature Index



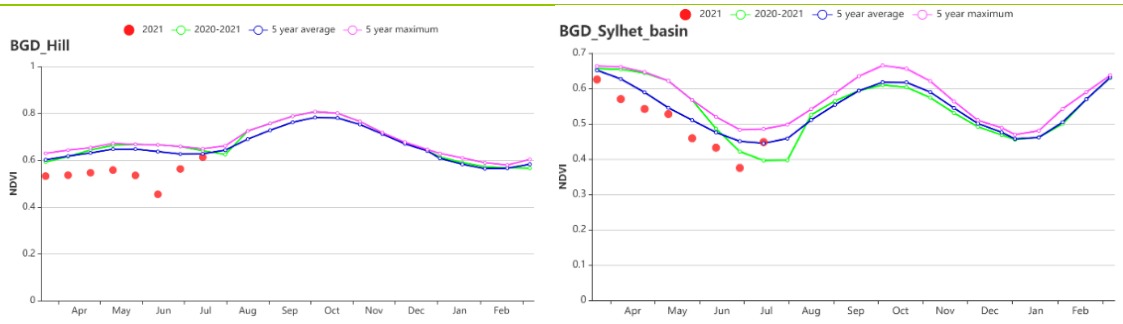
(f) Spatial NDVI patterns compared to 5YA



(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, April - July 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	1637	12	29.6	0.2	1294	-2	784	-9
Gangetic plain	1188	-10	29.8	0.3	1254	1	796	-3
Hills	1875	-5	27.6	0.3	1275	0	765	-9
Sylhet basin	1344	-14	29.0	0.7	1237	1	827	0

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

Region	CALF		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current
Coastal region	85	-1	0.84
Gangetic plain	97	0	0.91
Hills	96	0	0.88
Sylhet basin	99	2	0.93

[BLR] Belarus

In Belarus the reporting period includes the planting of spring wheat and summer crops until June and the harvest of winter wheat from July. The nationwide rainfall amount reached 317 mm, which was about the same as average. Solar radiation (RADPAR 2%) and temperature (0.4°C) were slightly above the 15YA, the potential biomass was increased by 13% and higher than average. Agronomic conditions were shown as favorable: very good values of VCIx (0.94) and cropped arable land fraction (CALF, 100%) were observed.

The NDVI development graph was generally below 5-year average from Apirl to early May and recovered in June. The spatial pattern showed diverse patterns. In about 42.1% of cropped area crop condition was close to or above 5-year average. About 57.9% of cropped areas were 0.1 NDVI units below the average, mostly scattered in the south-east and along the southern-western border. Average national VCIx exceeded 0.94, indicating fair crop prospects in most crop area. Overall, solar radiation deficit due to snow cover in previous months during spring have not constrained crop growth, and agronomic conditions were satisfactory in current monitoring period representing good winter wheat production and summer crop development.

Regional analysis

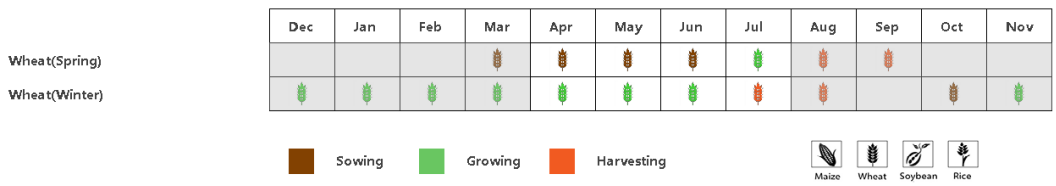
Based on cropping system, climatic zones and topographic conditions, regional analyses are provided for three agro-ecological zones (AEZ), including Northern Belarus (028, Vitebsk, northern area of Grodno, Minsk and Mogilev), Central Belarus (027, Grodno, Minsk and Mogilev and Southern Belarus (029)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

North Belarus (Vitebsk, northern area of Grodno, Minsk and Mogilev) recorded a minor radiation increase (1%) and temperature (0.6°C) as well as rainfall (1%). BIOMSS increased 15% above average. The VCIx had reached 0.94, and CALF had reached 100%. The NDVI development curve was close to average in April, early May and June. Crop overall condition is normal.

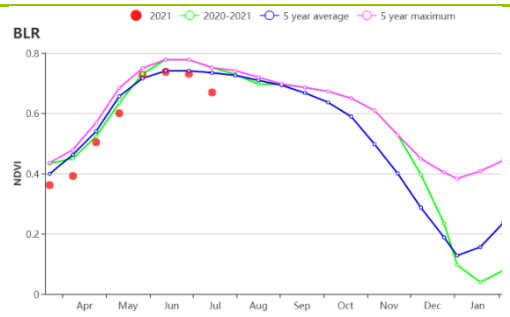
Central Belarus (Grodno, Minsk and Mogilev) also experienced a minor rainfall increase (1%) and temperature (+0.3°C) as well as sunshine (+2%). Potential biomass increased about 12%. High CALF (100%) and VCIx (0.94) were also recorded. Similar to northern Belarus, the NDVI growth curve remained close to the average trend from April to June.

Precipitation in **Southern Belarus** was lower by -7%, while temperature and radiation were slightly higher by 0.1°C and 3%, respectively. Potential biomass was expected to increase by 10%. The CALF and the VCIx were 100% and 0.95 respectively. Agronomic indicators showed that crop growth was generally favorable, the impact of radiation deficit in previous period did not have adverse impact on crops growth. The average NDVI development curve suggests that from April to June, crop condition was general close to average for most of the time.

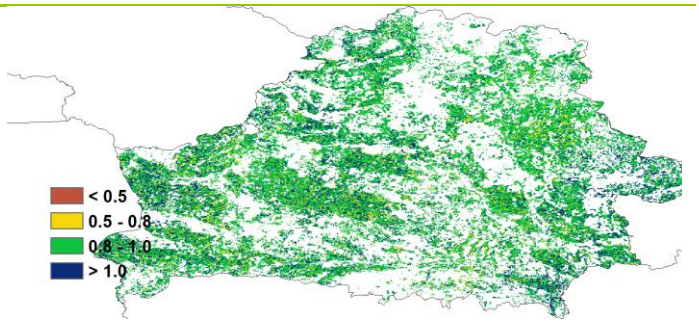
Figure 3.10 Belarus's crop condition, April – July 2021.



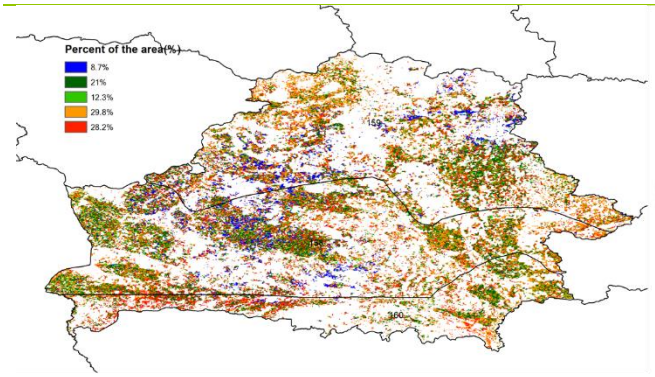
(a). Phenology of major crops



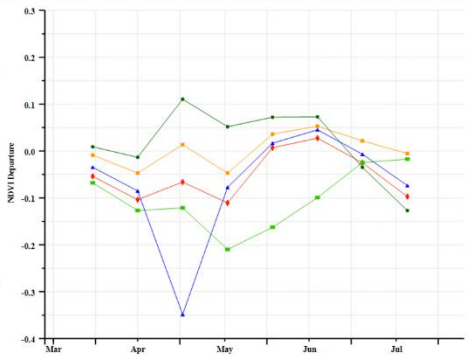
(b) Crop condition development graph based on NDVI



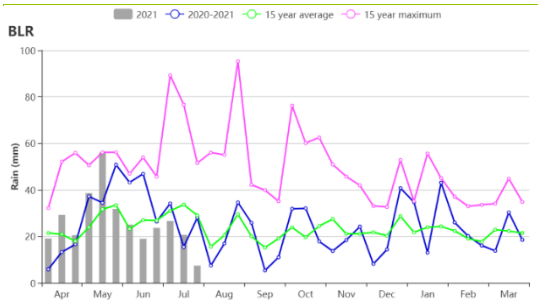
(c) Maximum VCI



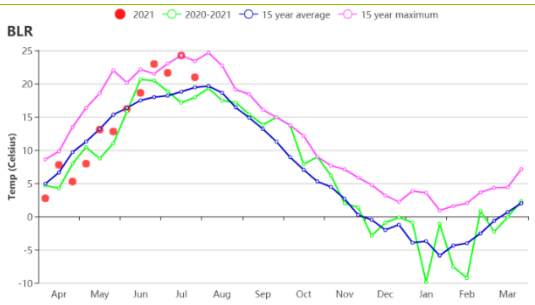
(d) Spatial NDVI patterns compared to 5YA



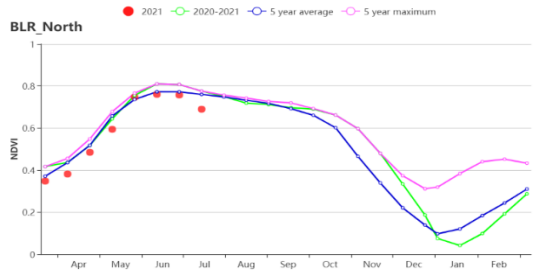
(e) NDVI profiles



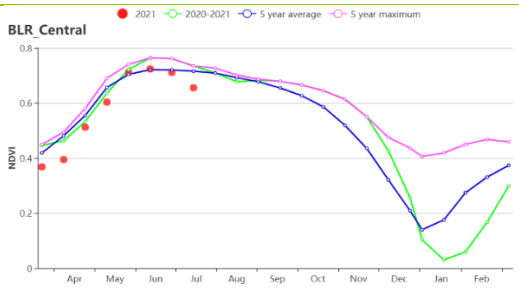
(f)Rainfall time series



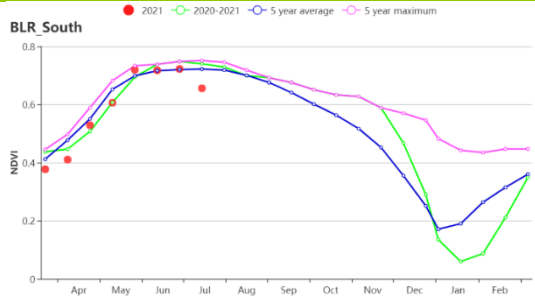
(g) Temperature time series



(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, April – July 2021.

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Center	320	1	14.8	0.3	1144	2	511	12
North	331	1	13.9	0.6	1111	1	483	15
South-west	282	-7	15.3	0.1	1180	3	537	10

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Center	100	0	0.94
North	100	0	0.94
South-west	100	0	0.95

[BRA] Brazil

During the monitoring period, the harvest of summer crops (maize, soybean, and rice) was almost concluded except for maize in the north-eastern regions which was still at peak growing stage in July. Wheat was sown in April to May and was approaching its peak growth phase by the end of July. Overall crop conditions in Brazil remained below the 5-year average.

The whole growing season of summer crops was dominated by dry and hot weather. Agro-climatic indicators at national scale present generally unfavorable conditions with 40% below average rainfall, 0.6°C higher temperature and 6% above average RADPAR. Shortage of rainfall together with the high temperature and radiation resulted in BIOMSS being 7% below the 15YA. Rainfall profiles illustrated that rainfall stayed below average for each ten-days throughout the four-month monitoring period. The entire country was affected by the hot and dry weather. Almost all states received well below average rainfall except for the northwest. Accordingly, high RADPAR was observed in all states except for Roraima where radiation was 3% below average. Dry and hot weather resulted in a dramatic drop of BIOMSS in some major agricultural producing states, including Goias (-48%), Mato Grosso (-19%), and Minas Gerais (-12%). As presented by the BIOMSS departure map, central Brazil presented larger than 20% negative departures while southern Brazil, Coastal areas, and northern Brazil presented above average BIOMSS. The CWAIs for all major agricultural states are listed in Annex A, table A.5. For detailed information, it is recommended to visit CropWatch Explorer (http://cropwatch.com.cn/newcropwatch/main.htm?language=en).

Due to the prolonged dry weather, NDVI profiles for Brazil presented below-average values throughout the reporting period. NDVI departure clustering map and profiles also show generally below average crop condition, except for the scattered areas (dark green color) in northern Brazil, Southern Brazil and Eastern Coastal areas. Crops in vast agricultural producing areas in Parana Basin remained in unfavorable conditions as a result of drought. The phenology of second maize in Central and Southern Brazil, mainly in Mato Gross and Mato Gross Do Sul was delayed by the dry weather as indicated by NDVI profiles. Irrigation of the second season crop helps reduce the negative impact of dry and hot weather conditions on crop growth. The NDVI was higher than average at peak growing season in June. According to the bar graph depicting drought proportions, the percentages of cropland suffering from moderate to severe drought remained high since May 2021, indicating that the drought situation has not eased. Although VCIx map showed overall high values across the country, the continuously insufficient water supply negatively affected the crops and the national VCIx was at 0.87, which was much lower compared with the previous monitoring period. It seems that the dry weather did not affect the crop cultivation and the CALF was at 99%, comparable with the 5YA.

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

Regional analysis

Considering the differences of cropping systems, climatic zones and topographic conditions, eight agro-ecological zones (AEZ) are identified for Brazil. These include the Central Savanna, the east coast, Parana River, Amazon zone, Mato Grosso zone, Southern subtropical rangelands, mixed forest, and farmland and the Nordeste.

Similar to the dry and hot weather pattern at the national level, all AEZs received below average rainfall ranging from -8% in Amazonas to -81% in Central Savanna. Above average temperatures were recorded in most AEZs except for Coast (at average level) and Southern subtropical rangelands (-0.3ºC). Central savanna was also the zone with the largest positive departure of temperature (+1.5ºC). Meanwhile, above average RADPAR was also observed in all AEZs with largest departure in Parana Basin at 11% above the 15YA. The prolonged dry, hot and sunny weather conditions in the Central savanna, Mato Grosso zone, Parana Basin and Nordeste hampered crop growth and resulted in lower BIOMSS. The other four AEZs received more than 200 mm rainfall and the BIOMSS was moderately above average from +2% to +7%.

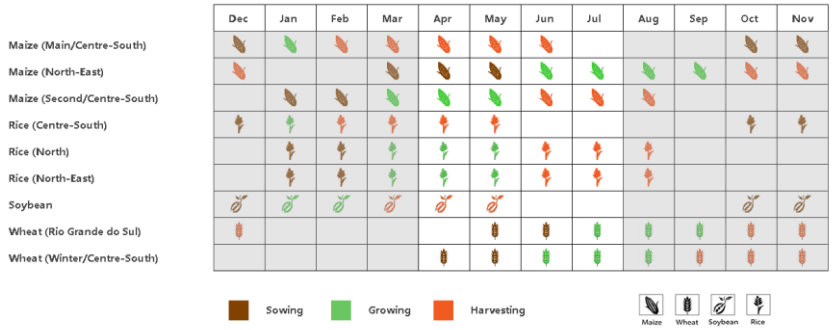
Adverse weather conditions resulted in generally below average crop development in all AEZs but at different levels.

Below average crop conditions were observed in Amazonas, Coast, Parana basin and Southern subtropical rangelands. The CALF remained at average level while VCIx varied across AEZs. Largest VCIx was observed in Amazonas at 0.94 while Parana Basin presented lowest VCIx at 0.83. As the first maize and soybean crops were already harvested by April, and the above mentioned AEZs are not the major producing regions for the second summer crops, the below average NDVI has limited impact on the output of the second summer crops. Growth of wheat in Southern subtropical rangelands was still in its early phase, but it was also affected by the dry weather.

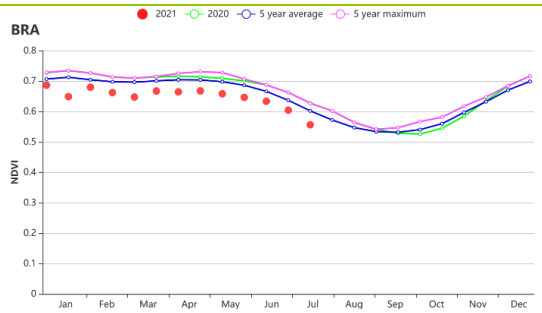
Crop conditions in Central Savanna and Nordeste were in general slightly below average but well below 2020 levels. These two AEZs received the least rainfall among all AEZs at 40 mm and 108 mm respectively. As compared to last year when these two regions were dominated by wet conditions, the shortage of rainfall caused much poorer crop conditions this year. Accordingly, VCIx was also much lower than in 2020.

Slightly below average crop condition was observed in Mato Grosso, and Northeastern mixed forest and farmland. The current monitoring period only covers the growing season of the second summer crops which is mainly cultivated in Mato Grosso Zone. Although dry and hot weather dominated the two AEZs, irrigation of the second season crop might reduce the negative impact of adverse weather conditions on crop growth. CALF for the two zones remained average and VCIx values were at 0.92 and 0.95 respectively. In general, second maize output is projected at close to average levels.

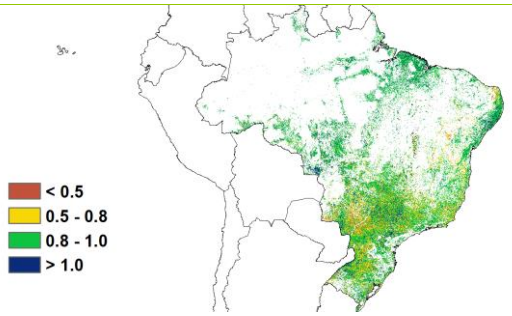
Figure 3.11 Brazil's crop condition, April - July 2021



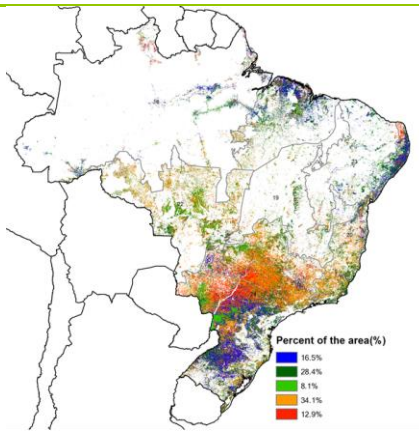
(a) Phenology of major crops



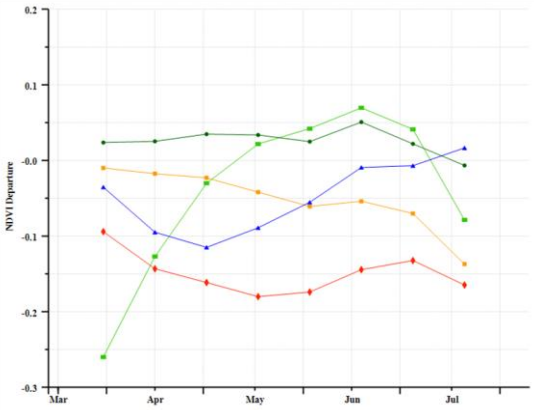
(b) Crop condition development graph based on NDVI of Brazil



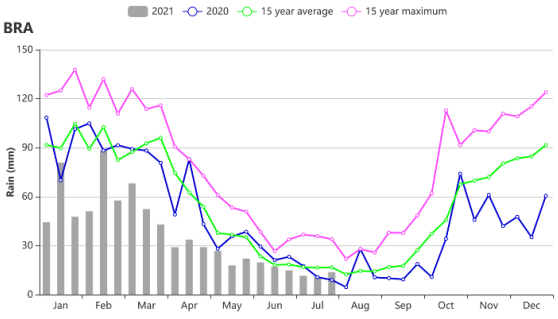
(c) Maximum VCI



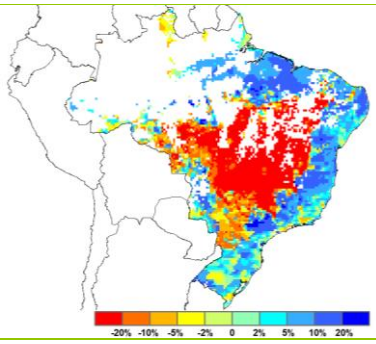
(d) Spatial distribution of NDVI departure from 5YA



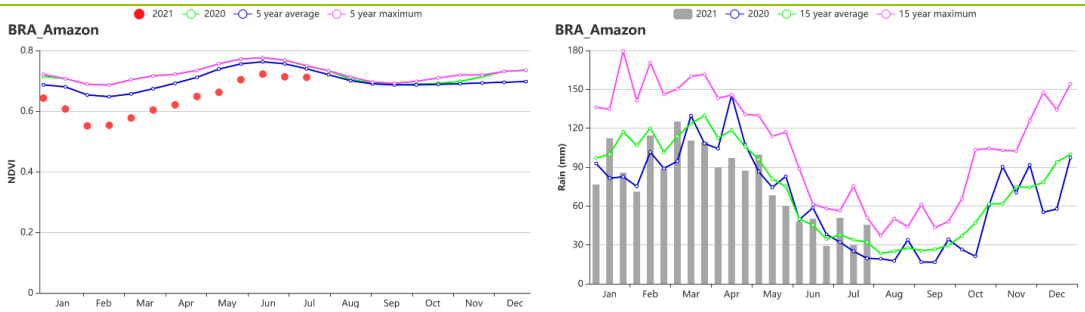
(e) NDVI departure profiles corresponding to the clusters



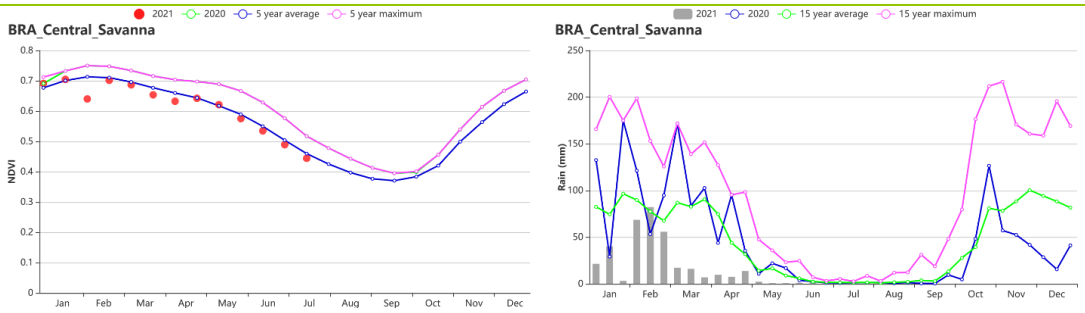
(f) Time series rainfall profile of Brazil



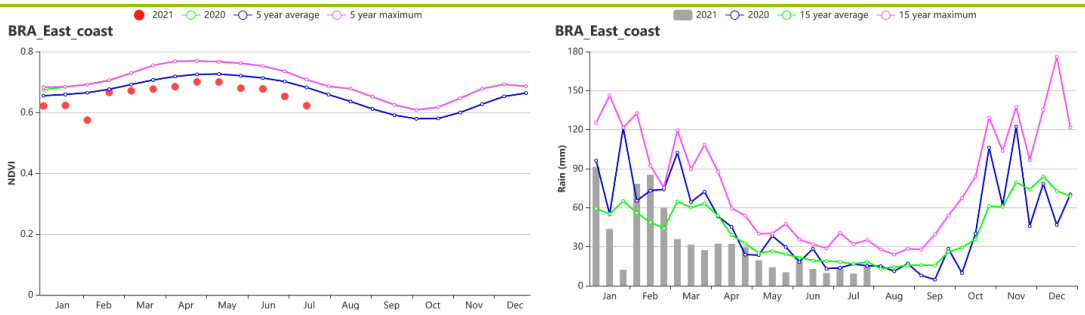
(g) Potential biomass departure from 15YA



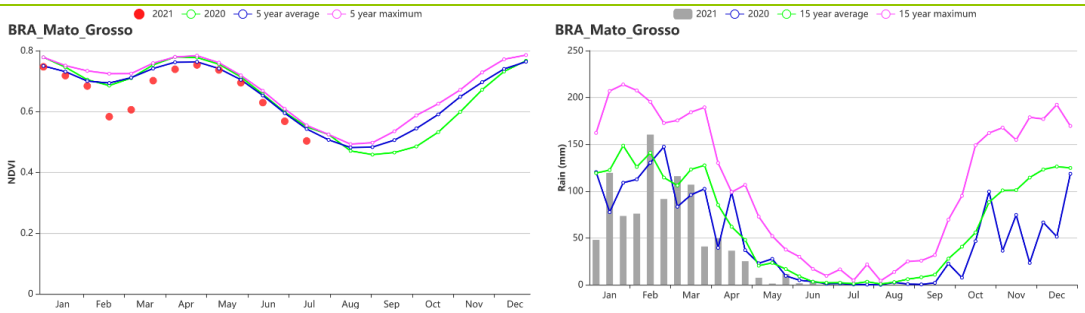
(h) Crop condition development graph based on NDVI (left) and rainfall profile (right) of Amazon



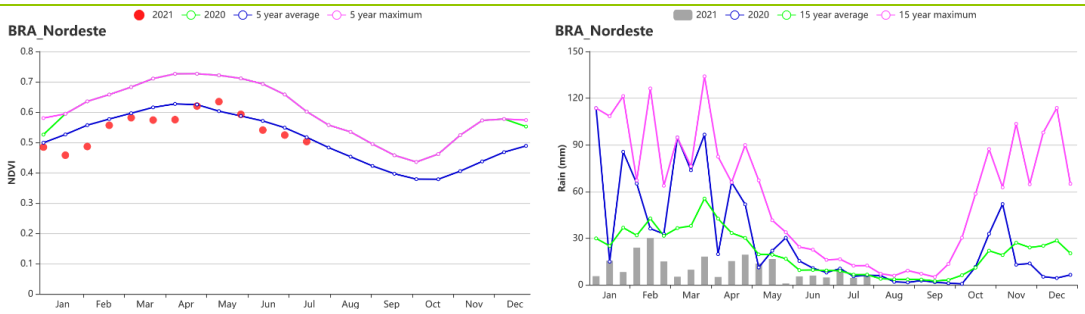
(i) Crop condition development graph based on NDVI (left) and rainfall profile (right) of Central Savanna



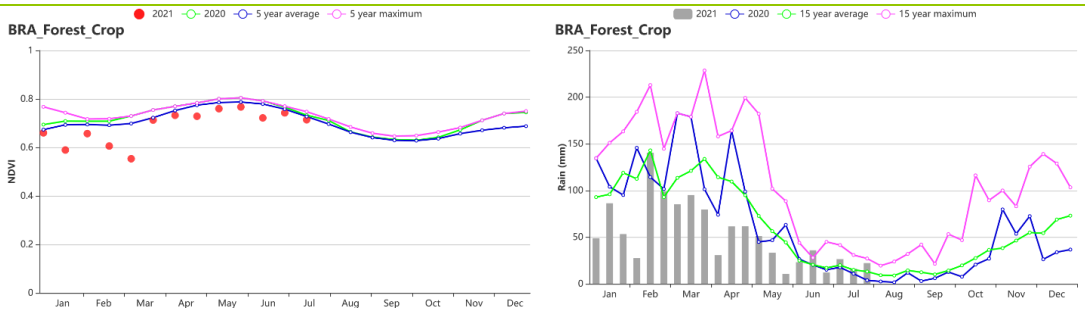
(j) Crop condition development graph based on NDVI (left) and rainfall profile (right) of Coast zone



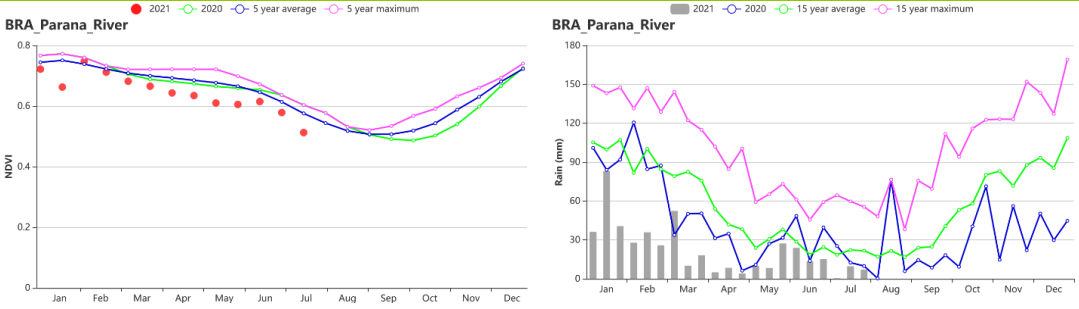
(k) Crop condition development graph based on NDVI (left) and rainfall profile (right) of Mato Grosso



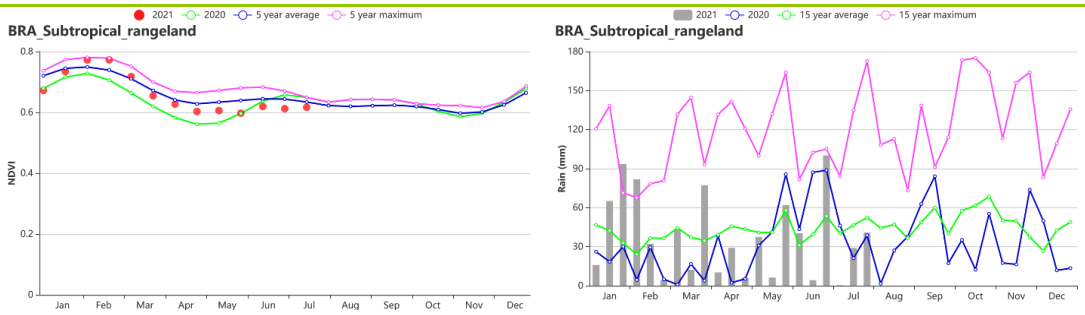
(L) Crop condition development graph based on NDVI (left) and rainfall profile (right) of Nordeste



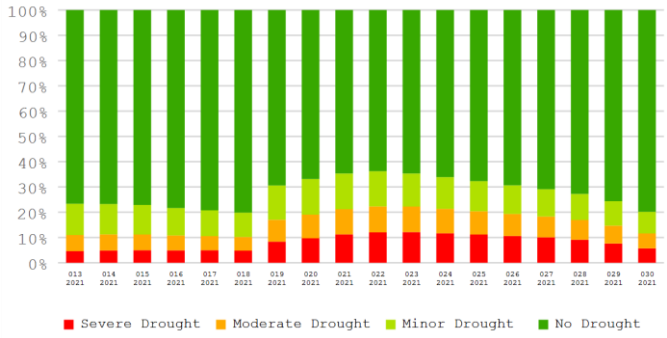
(m) Crop condition development graph based on NDVI (left) and rainfall profile (right) of Northeastern mixed forest and farmland



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



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



(p) Proportion of drought categories from April - July 2021

Table 3.13 Brazil's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 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 (%)
Amazonas	756	-8	24.9	0.1	1122	3	684	2
Central Savanna	40	-81	23.6	1.5	1117	4	348	-30
Coast	217	-31	20.5	0	943	7	530	7
Northeastern mixed forest and farmland	385	-36	25.8	0.7	1198	5	721	6
Mato Grosso	138	-50	24	0.6	1103	4	423	-15
Nordeste	108	-49	24.6	0.7	1109	5	585	-7
Parana basin	133	-63	18.8	0.5	940	11	337	-12
Southern subtropical rangelands	366	-30	14.7	-0.3	673	8	263	3

Table 3.14 Brazil's agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current
Amazonas	100	0	0.94
Central Savanna	98	3	0.86
Coast	100	0	0.87
Northeastern mixed forest and farmland	100	0	0.95
Mato Grosso	100	0	0.92
Nordeste	97	3	0.85
Parana basin	99	0	0.83
Southern subtropical rangelands	99	0	0.86

[CAN] Canada

During the monitoring period from April to July 2021, the harvest of winter wheat had started in July. Maize, soybean, and spring wheat had been sown in April and May and were reaching the grainfilling period in the 2nd half of July. According to the CropWatch agroclimatic indicators, Canada experienced hot and dry conditions starting from June. Crop conditions were slightly below average in the Prairies, but good or excellent crop conditions were observed in the Saint Lawrence basin.

The temperature (TEMP +0.5°C) and radiation (RADPAR +2%) were above the 15-year average while the rainfall (RAIN -8%) was below average. The temperature profile depicts those temperatures were above average in June and July. The rainfall profile shows that the precipitation was below average after May. Correspondingly, crop conditions were above average at the beginning of this monitoring period, however, they deteriorated to be significantly below average after May according to the NDVI development graph. As shown in the NDVI cluster map, the crop condition was always above average in 13.6% of the cropped area, concentrated in the Saint Lawrence basin (including the middle of Ontario and patches in the south of Quebec). 33.2% of total cropped land was below average after April. In the remaining parts, crop conditions fluctuated around the average level. The national maximum VCI value was 0.86, and the CALF was slightly below the recent 5-year average (CALF -1%).

The overall conditions of winter wheat, which is predominantly grown in the Saint Lawrence basin is assessed as slightly above average, and the prospects for the summer crops, including spring wheat may have been affected by the dry weather in May and June.

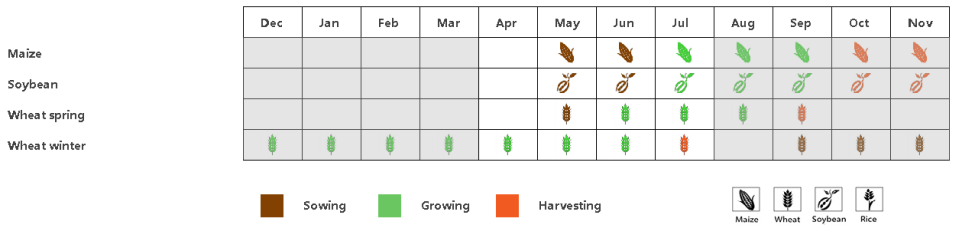
Regional analysis

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

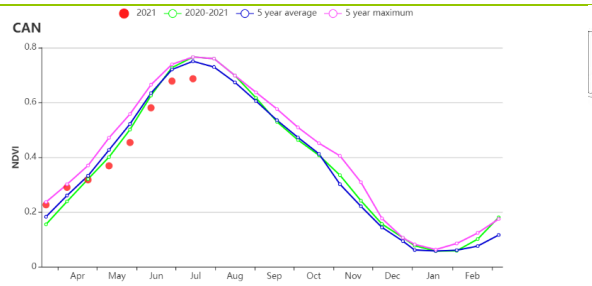
The rainfall in **the Prairies**, the main food production area in Canada, was below average (RAIN 291 mm, -18%), while the temperature (TEMP +0.7°C) and radiation (RADPAR +4%) were above average. The major crops in this region are winter wheat and spring wheat. According to the NDVI development graph and NDVI profile, crop conditions were below average since May. The negative departures were due to the deficit of rainfall. Hence, crop conditions in the Prairies are unfavorable, mostly due to dry weather.

The conditions in **the Saint Lawrence basin** differed from the rest of the country as rainfall (RAIN +4%) and temperature (TEMP +0.3°C) were above average. Radiation was slightly below average (RADPAR -1%). Altogether, these agroclimatic conditions led to average potential biomass (BIOMSS -1%). According to the NDVI development graph, crop conditions reached the maximum level of the recent 5years. Overall, crop conditions were favorable for this region.

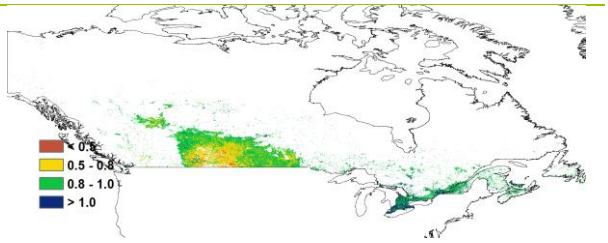
Figure 3.12 Canada's crop condition, April - July 2021



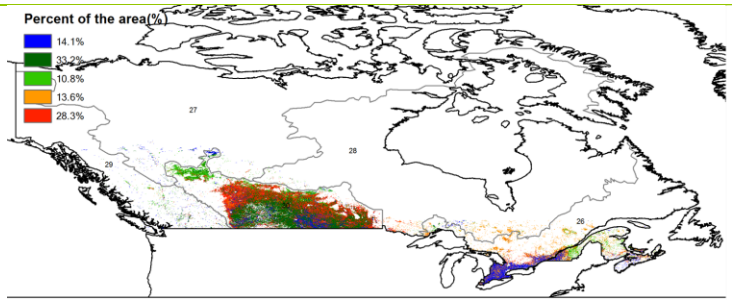
(a). Phenology of major crops



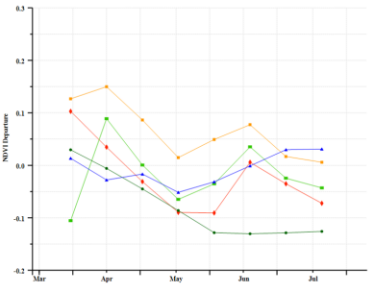
(b) Crop condition development graph based on NDVI



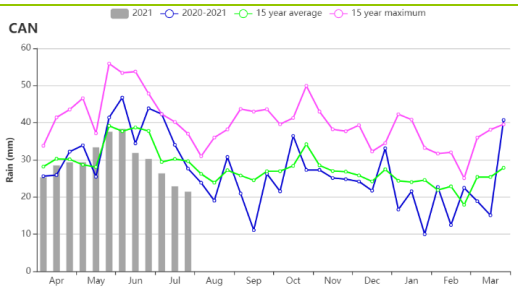
(c) Maximum VCI



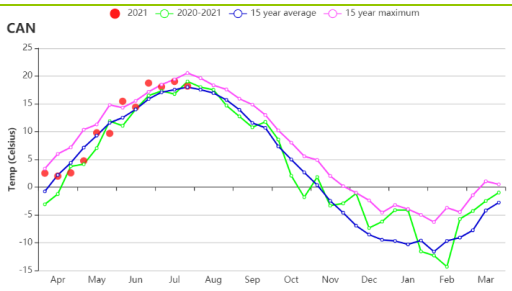
(d) Spatial NDVI patterns compared to 5YA



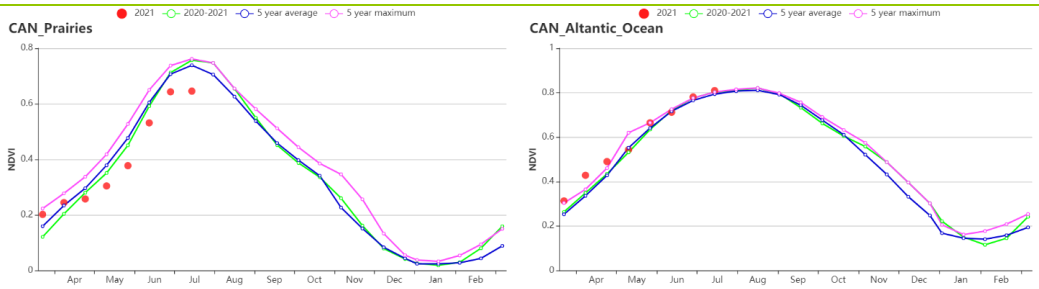
(e) NDVI profiles



f) Rainfall profile



g) Temperature profile



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

Table 3.15 Canada's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 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 (%)
Saint Lawrence basin	461	4	11.5	0.3	1100	-1	381	-1
Prairies	291	-18	12.4	0.7	1291	4	501	13

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current
Saint Lawrence basin	100	0	0.99
Prairies	97	-2	0.81

[DEU] Germany

During this monitoring period, winter wheat reached maturity in July. The planting of summer crops started in April and was completed by mid-May. Based on the agroclimatic and agronomic indicators, the crop conditions in Germany were generally below the 5-year average between April and early June in most regions, and then close to and even above average in July.

At the national level, total precipitation was significantly above average (RAIN +40%), temperature was significantly below average (TEMP -1.3°C) and radiation was also below average (RADPAR -4%). As can be seen from the time series rainfall profile for Germany, Hesse, Thuringia, Lower Saxony, Saxony-Anhalt, Saxony, Brandenburg, Schleswig-Holstein, Mecklenburg-Vorpomerania in Germany experienced above-average precipitation with the exception of late July and mid-June. Precipitation in Baden-Württemberg, southern Bavaria, southeastern North Rhineland-Westphalia, Rhineland-Palatinate in Germany showed a fluctuating trend above and below average until mid-June, with significant below-average departures in late April, late May and mid-June. Starting from late June onwards, those regions experienced heavy precipitation events. Most of the country experienced cooler-than-usual conditions during this reporting period, except for early and mid-June, in which a heatwave event swept across Germany. Due to the overall excessive precipitation combined with cooler-than-usual temperatures, the biomass production potential (BIOMSS) was 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 the 5YA and last year's average until mid-June, then close to average and above average from late June to July. These observations are confirmed by the clustered NDVI profiles: 58.8% of regional NDVI values were below average from April to mid-June. Subsequently, 77.9% of regional NDVI values increased to be above average. These observations were also confirmed by lower VCI values in the spatial distribution of maximum VCI map due to the combined effects of precipitation and temperature. Overall VCIx for Germany was 0.94. CALF during the reporting period was the same as for the recent five-year average.

Generally, the agronomic indicators show near and above-average conditions for most winter and summer crops in Germany. The July floods had devastating effects in some areas.

Regional analysis

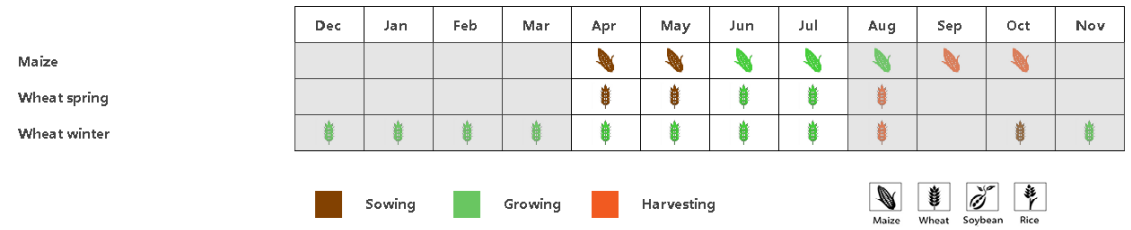
Based on cropping systems, climatic zones, and topographic conditions, six sub-national agro-ecological regions are adopted for Germany. They include: The Wheat Zone of Schleswig-Holstein and the Baltic coast, Mixed Wheat and Sugar beet Zone of the Northwest, Central Wheat Zone of Saxony and Thuringia,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

According to the CropWatch agroclimatic indicators, all six sub-national agro-ecological regions experienced the same trend of precipitation, temperature and RADPAR, compared to the average of the past 15 years. RAIN was significantly above average by 47%, 59%, 43%, 40%, 46% and 29%, respectively; Temperature was significantly below average by 0.8°C, 1.2°C, 1.2°C, 1.1°C, 1.4°C and 1.5°C, respectively; RADPAR was below average by 3%, 5%, 5%, 4%, 6% and 2%, respectively. Due to excessive precipitation and cooler-than-usual conditions, the biomass production potential (BIOMSS) in the six sub-national agro-ecological regions was below average by 3%, 8%, 8%, 7%, 10% and 8%, respectively.

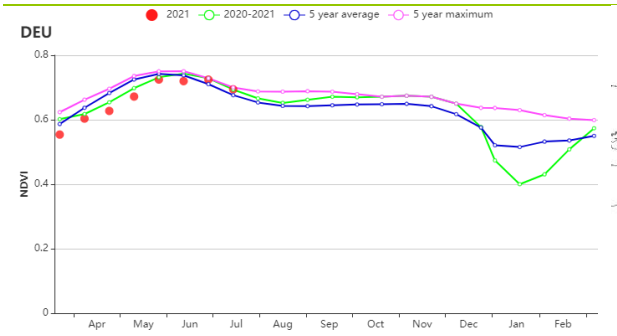
As shown in the crop condition development graph based on NDVI, all six sub-national agro-ecological regions had the same trend of change, that is, NDVI values were below the 5-year average between April and early June, and then close to average and above average during the remainder of this monitoring period.

CropWatch agronomic indicators show that CALF of all six regions reached 100%, with a zero departure from their 5YA. As mentioned above, they also recorded a favorable VCIx value at 0.92, 0.94, 0.93, 0.93, 0.93 and 0.96, respectively.

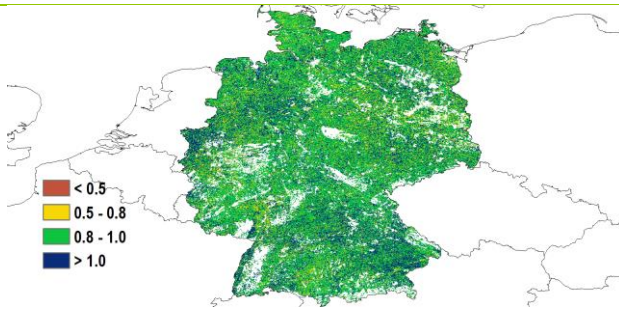
Figure 3.13 Germany's crop condition, April-July 2021



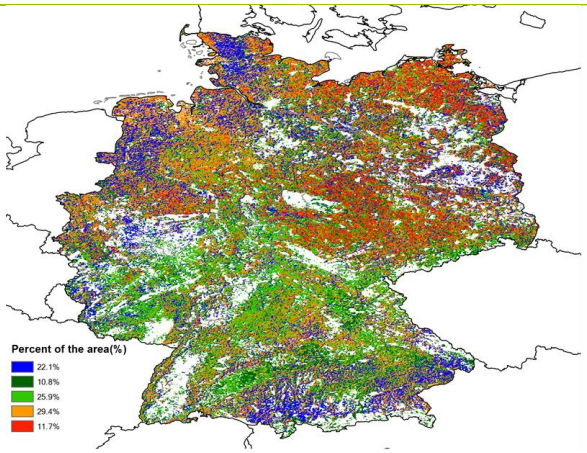
(a) Phenology of major crops



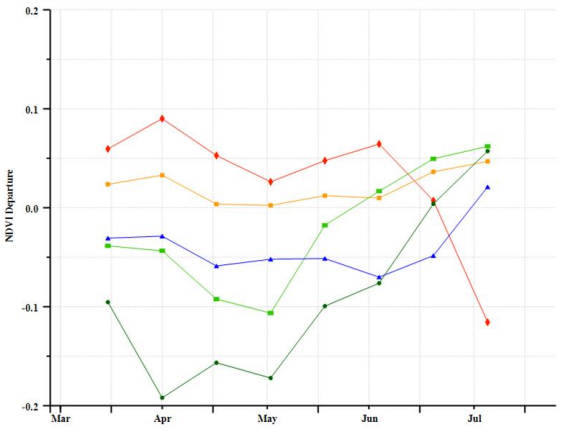
(b) Crop condition development graph based on NDVI



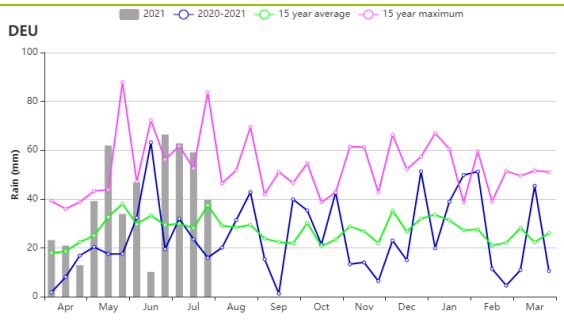
(c) Maximum VCI



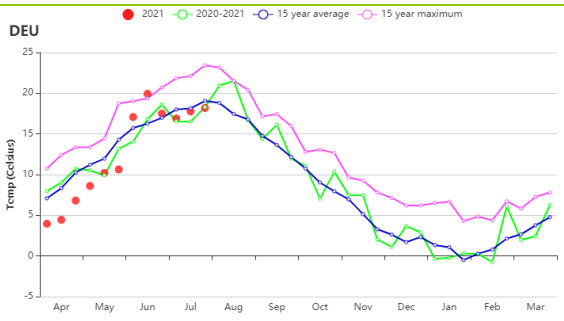
(d) Spatial NDVI patterns compared to 5YA



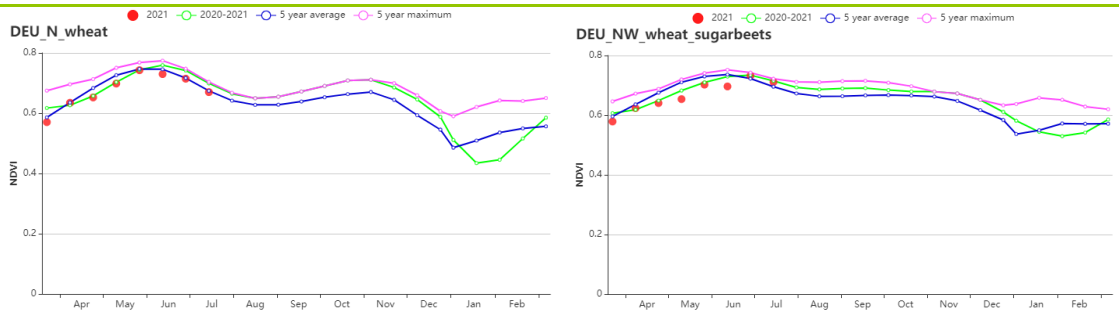
(e) NDVI profiles



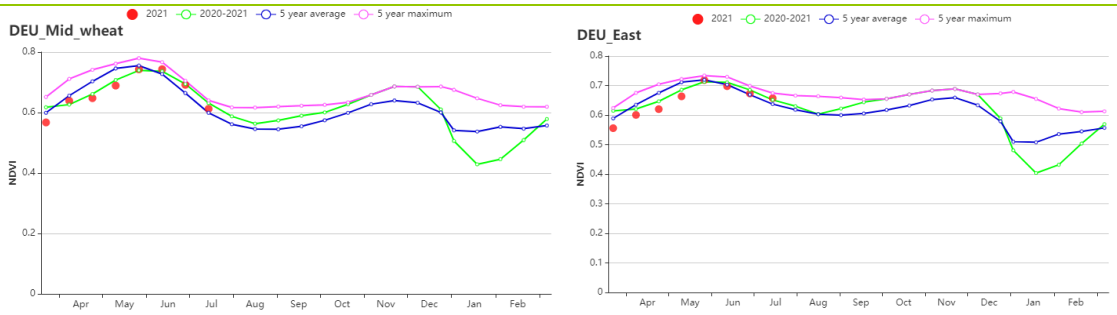
(f) Rainfall profiles



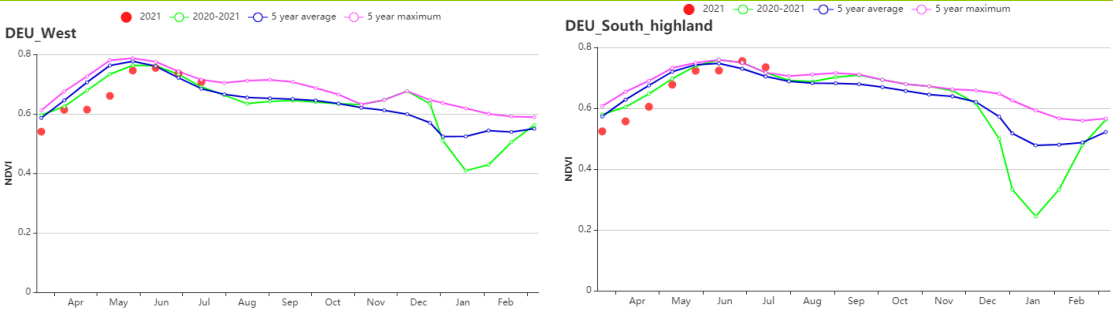
(g) Temperature profiles



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

Table 3.17 Germany agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April-July 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	416	47	13.1	-0.8	1118	-3	429	-3
Mixed wheat and sugarbeets zone of the north-west	449	59	12.8	-1.2	1089	-5	406	-8
Central wheat zone of Saxony and Thuringia	386	43	12.8	-1.2	1142	-5	433	-8
East-German lake and Heathland sparse crop area	409	40	13.4	-1.1	1139	-4	448	-7
Western sparse crop area of the Rhenish massif	420	46	12.4	-1.4	1134	-6	413	-10
Bavarian Plateau	592	29	12.1	-1.5	1214	-2	435	-8

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current
Wheat zone of Schleswig-Holstein and the Baltic coast	100	0	0.92
Mixed wheat and sugarbeets zone of the north-west	100	0	0.94
Central wheat zone of Saxony and Thuringia	100	0	0.93
East-German lake and Heathland sparse crop area	100	0	0.93
Western sparse crop area of the Rhenish massif	100	0	0.93
Bavarian Plateau	100	0	0.96

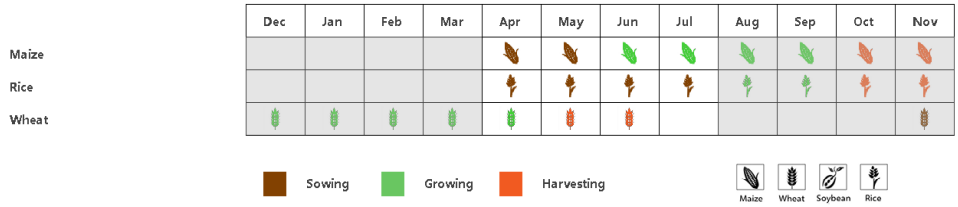
[EGY] Egypt

During the monitoring period (April-July), winter wheat reached maturity in April and was harvested in May and June. Rice and maize were planted in April and May. No rainfall was recorded during this monitoring period. The average temperature reached 23.8°C (+0.3°C). The temperature index graph shows that it fluctuated around the 15YA except for one pulse in early May. The RADPAR was above the 15YA by 1.5%, while BIOMSS was estimated to be below the 15YA by 60%, which can be attributed to the remarkable reduction of rainfall. The CALF was higher than the 5-year average (5YA) by 2%, with the whole country's medium VCIx value was at 0.68. The NDVI spatial pattern shows that only 9.6% of the cultivated area was above the 5YA, 60% fluctuated around the 5YA, and 30.3% was below the 5YA. Overall, the crop conditions were unfavorable.

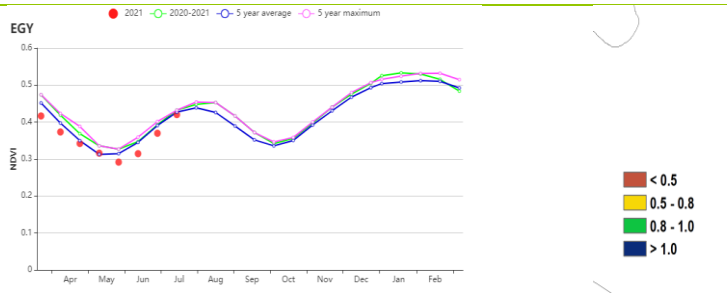
Regional analysis

Based on crop planting systems, climate zones, and topographical conditions, Egypt can be divided into three agro-ecological zones (AEZs), two of which are suitable for crop cultivation, namely **the Nile Delta and the southern coast of the Mediterranean and the Nile Valley.** Rainfall was nearly 0 mm, the temperature was above the 15YA by 0.4°C and 0.5°C, the RADPAR was above the 15YA by 1.5%, and 1.2%, while the BIOMSS was below the 15YA by 57%, and 74% for the Nile Delta and the southern coast of the Mediterranean and the Nile Valley, respectively. Generally, the NDVI development graph shows that crop conditions were below average in both regions, confirming unfavorable crop conditions.

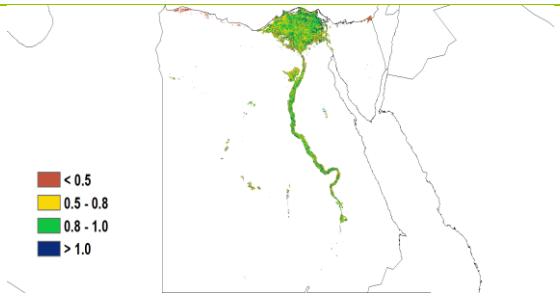
Figure 3.14 Egypt's crop condition, April-July 2021



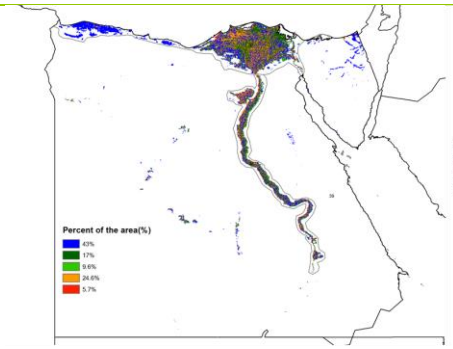
(a). Phenology of major crops



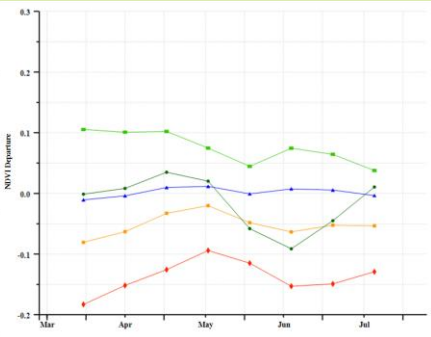
(b) Crop condition development graph based on NDVI



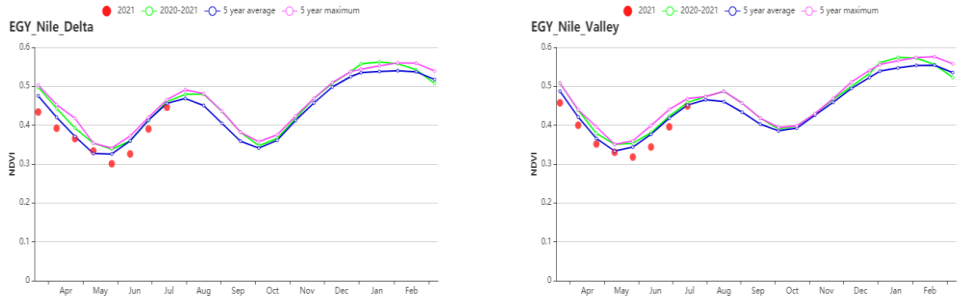
(c) Maxim0um VCI



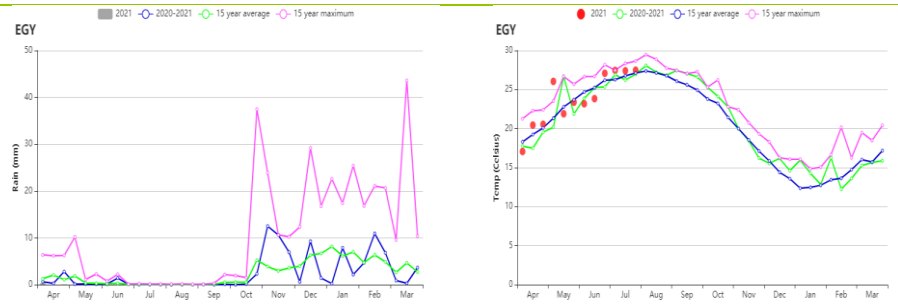
(d) Spatial NDVI patterns compared to 5YA



(e) NDVI profiles



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



(g) Time series profile of rainfall

(h) Time series profile of temperature

Table 3.19 Egypt's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April-July 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 (%)
Nile Delta and Mediterranean coastal strip	0	-94	23.8	0.4	1613	2	173	-57
Nile Valley	0	-96	27.1	0.5	1654	1	36	-74

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current
Nile Delta and Mediterranean coastal strip	65	2	0.69
Nile Valley	69	2	0.75

[ETH] Ethiopia

The report monitoring period is from April to July, which almost contains all of the Ethiopia Meher crops' planting seasons. Maize and wheat are the major cereal crops in the country.

In the country level, the cumulative precipitation (RAIN), average temperature (TEMP), solar radiation (RADPAR) decreased slightly by 4%, 0.5°C, and 3%, respectively, compared with the average levels in the past 15 years. Although this seems to be a good agroclimatic condition from the overall numerical value, the uneven distribution of accumulated precipitation over time and the war have reduced the accumulated potential biomass by 11%. The accumulated precipitation almost reached the 15-year maximum in late April and early May, and then there was a drought that lasted for nearly 20 days in late May and early June, which was extremely unfavorable for the sowing of maize and wheat. The crop condition development graph based on NDVI also confirms this fact. It can be seen that the NDVI values have two troughs due to excessive precipitation and drought that delayed crop planting. By the way, the abnormally low NDVI value in July may be caused by the cloud cover of satellite imagery during the rainy season. The Spatial NDVI patterns shows that 37.4% of the regions have NDVI values lower than the 15-year average, mainly in the eastern area.

Another factor is war. Due to the further escalation of the civil war between the government forces and the tigray armed forces in tigray State in northern Ethiopia, the agriculture was hit hard. According to data from the United Nations and the World Health Organization, the civil war has led to the desolation of farmland and economic crises in many areas. In Ethiopia's amhara and afar states, more than 300,000 people have fallen into famine. In the tigray area, the center of the war, at least 5.2 million people have fallen into or are about to fall into famine, and there is a huge food shortage. In the absence of the best planting season in the past three months, Ethiopia's food production in 2021 will also decline due to the war. The maximum VCI map clearly reflects the scope of the war's impact on Ethiopia: the VCIx of the northernmost tigray Region is less than 0.5, the VCIx of the adjacent central and eastern regions is between 0.5-0.8, and the western and southern regions are not affected.

In short, the overall crop condition in Ethiopia is slightly below average. In the east and southeast of the country, the growth and development of crops is negatively affected by the uneven distribution of precipitation over time. The closer to the north, the greater the impact of war on agriculture, in the northernmost tigray state, agriculture has been devastated. Crops in the western region are growing well. A more detailed regional analysis is as follows.

Regional analysis

In **the Semi-arid pastoral areas**, a typical livestock production zone, the accumulated precipitation is above average (+39%). The average temperature and solar radiation are close to average (TEMP -0.3°C, RADPAR -3%), and the cumulative potential biomass has dropped by 16%. At the same time, the NDVI value was lower than average in April and June. The value of VCIx is 0.65. Compared with the 5-year average, CALF has dropped by 34%. Overall, the prospects for livestock production are slightly unfavorable.

In **the Southeastern Mendebo highlands zone**, the CorpWatch indicators during the monitoring period of this report are as follows: RAIN (-17%), TEMP (-0.5°C), RADPAR (-2%), BIOMASS (-11%), CALF (-1%), VCIx (0.82). The crop condition development graph based on NDVI is slightly lower than the 5-year average. In general, the growth of maize in Southeastern Mendebo highlands zone remained at an average level.

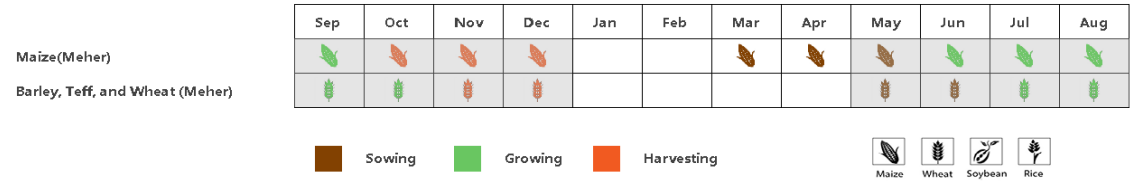
In **South-eastern mixed maize zone**, the accumulated precipitation is close to the 15-year average. The average temperature and light and effective radiation decreased slightly by 0.6°C and 2% respectively. Due to uneven precipitation, the cumulative potential biomass is lower than the average level (-13%). The crop

condition development graph based on NDVI is lower than the 5-year average. VCIx is 0.78 and CALF is reduced by 2%. The crops in this area are in general condition.

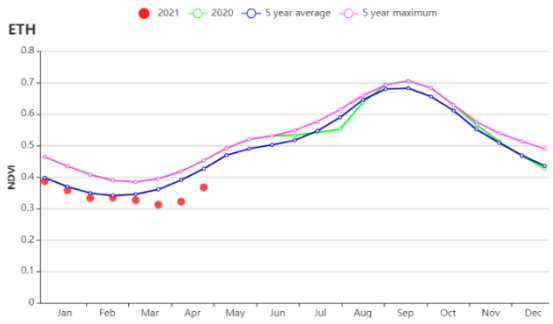
In **the Western mixed maize zone**, maize is the most important crop planted in the Meher season. The accumulated precipitation in the area remained unchanged. Combining the slightly lower average temperature (-0.5°C) and light and effective radiation (RADPAR +1%), the estimated cumulative biomass is close to the 15-year average (-3%). VCIx is 0.95 and CALF remains unchanged. According to CorpWatch indicators, crop conditions are favorable.

The **northern arid area** is an agricultural area in northern Ethiopia. Due to the war, the cropped arable land fraction was almost zero. In 2021, the crops in this area are facing the risk of no harvest, and the food supply problem of the local people is very worrying.

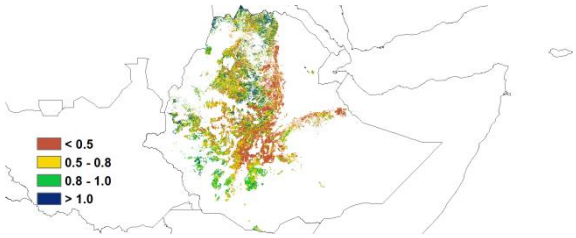
Figure 3.15 Ethiopia's crop condition, April - July 2021



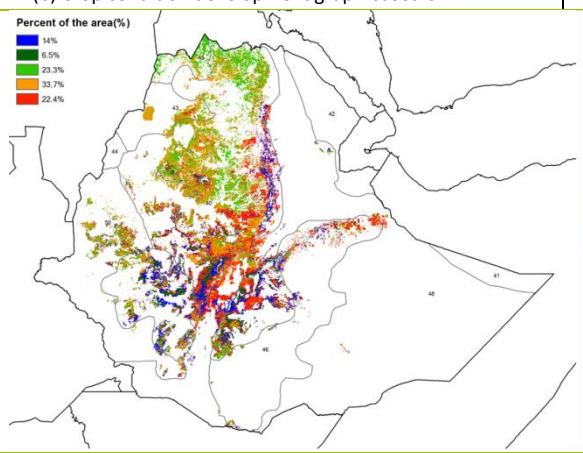
(a) Phenology of major crops



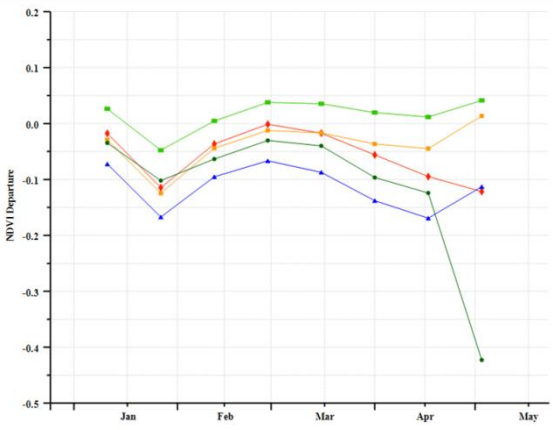
(b) Crop condition development graph based on NDVI



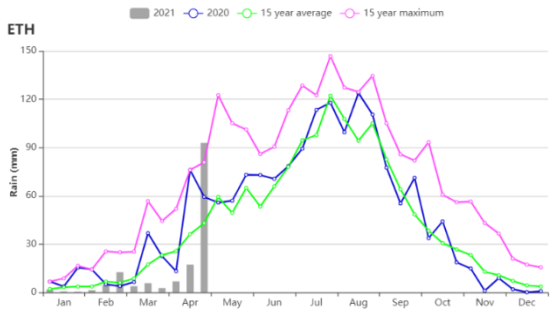
(c) Maximum VCI



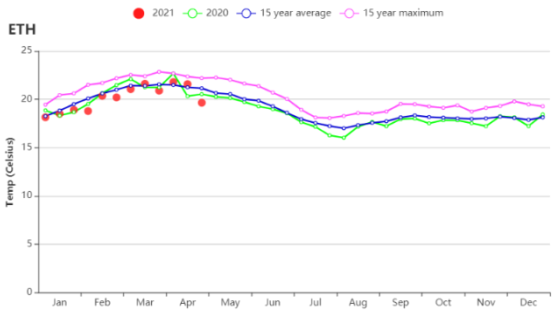
(d) Spatial NDVI patterns compared to 5YA



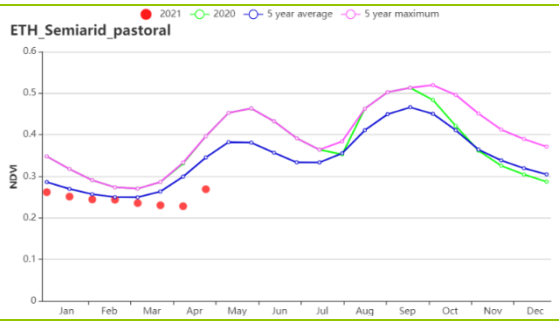
(e) NDVI profiles

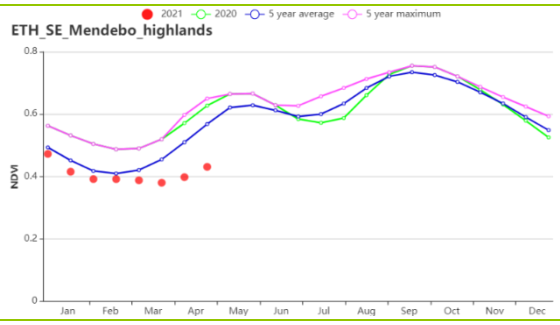


(f) Rainfall profiles

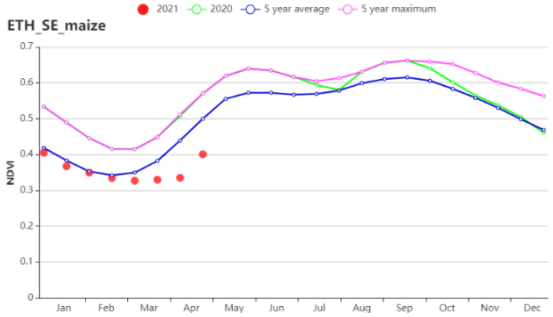


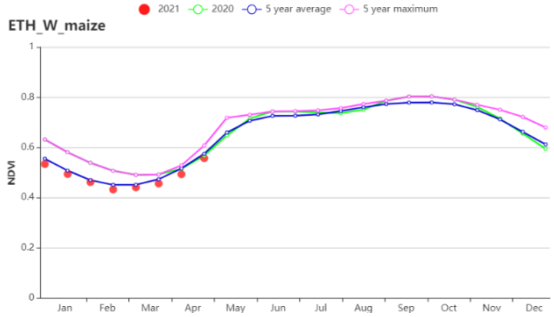
(g) Temperature profiles



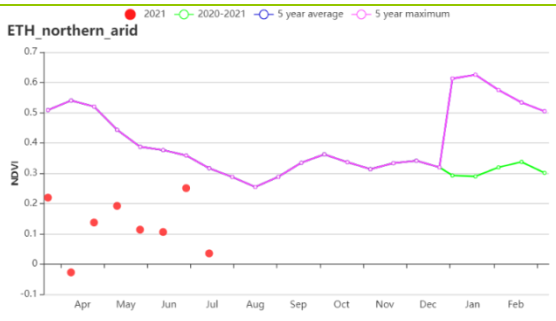


(h) Crop condition development graph based on NDVI (Semi-arid pastoral (left) South-eastern Mendebo highlands (right))

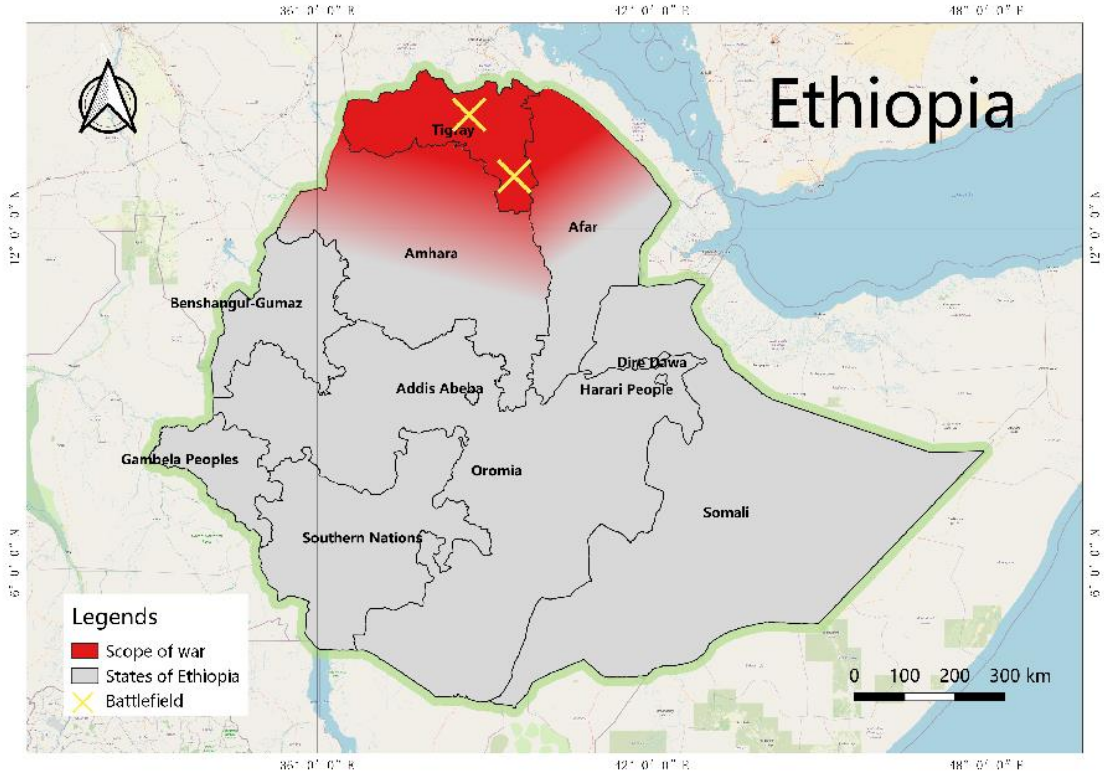




(i) Crop condition development graph based on NDVI (South-eastern mixed maize zone (left) and South-eastern mixed maize zone (right))



(j) Crop condition development graph based on NDVI (Northern arid area)



(k)Tigray war

(l)An aid distribution point in Mekelle in the Tigray region

Table 3.21 Ethiopia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April- July 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	278	39	23.3	-0.3	1351	-3	544	-16
South-eastern Mendebo highlands	461	-17	15.1	-0.5	1157	-2	418	-11
South-eastern mixed maize zone	488	1	18.2	-0.6	1184	-2	516	-13
Western mixed maize zone	1216	0	21.1	-0.5	1126	1	597	-3
Northern arid area	187	130	29.6	-1.0	1382	-4	534	-22

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Semi-arid pastoral areas	28	-34	0.65
South-eastern Mendebo highlands	98	-1	0.82
South-eastern mixed maize zone	93	-2	0.78
Western mixed maize zone	100	0	0.95
Northern arid area	0	-100	0.30

[FRA] France

The monitoring period covers winter wheat, which had reached maturity by July. The planting of maize and spring wheat was completed in May. The harvest of the summer crops including rice, potatoes and sunflower starts in August and extends into September. CropWatch agro-climatic indicators show below-average temperature (TEMP -1.1°C) over the period except for June. Significantly higher RAIN (+27%) as compared to the 15YA was recorded, which alleviated the drought conditions observed during the last monitoring period. RADPAR was 1% below average. Due to unfavorable temperature and sunshine, the biomass production potential (BIOMSS) is estimated to have decreased by 7% nationwide compared to the 15-year average. The national-scale NDVI development graph shows that the NDVI values were generally lower than in the 2020-2021 season and the 5YA. The crop conditions were above the 5-year average in July only. The spatial distribution of maximum VCI (VCIx) across the country reached an average of 0.92. Overall, below-average temperature and sunshine caused unfavorable growth conditions for most of the monitoring period in France expect for July, which had sufficient precipitation.

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 RADPAR were both above average (+51% and +2% respectively), while TEMP was below average (-1.3°C). The BIOMSS also decreased by 6% when compared to the 15YA. The CALF was average, and VCIx was relatively high at 0.95. Crop condition development based on NDVI for this region was below the 5-year average in April and May, but close to and then above the average in June and July.

In the **Mixed maize/barley and rapeseed zone** from the Center to the Atlantic Ocean, a cooler (TEMP -1.0°C) and humid (RAIN +22%) season was observed, with higher RADPAR (+2%). For the crops, BIOMSS was 4% lower than average, CALF was at the average level and VCIx was 0.93. The regional NDVI profile presented an overall below-average trend, but close to average levels starting in June.

In the **Maize-barley and livestock zone** along the English Channel, RAIN and RADPAR were above average by 29% and 3%. TEMP was lower than average (-0.9°C). BIOMSS decreased by 1%. CALF was average and VCIx was relatively high at 0.95. The regional NDVI profile also presented an overall lower than but close to average trend.

In the **Rapeseed zone** of eastern France, the NDVI profile also indicated below-average conditions but was close to and above average in June and July. Overall, RAIN in this period was 37% higher than the 15-year average, while TEMP decreased by 1.5°C and RADPAR dropped by 3%. BIOMSS was about 11% lower than average while CALF was at the average level, and VCIx was 0.92.

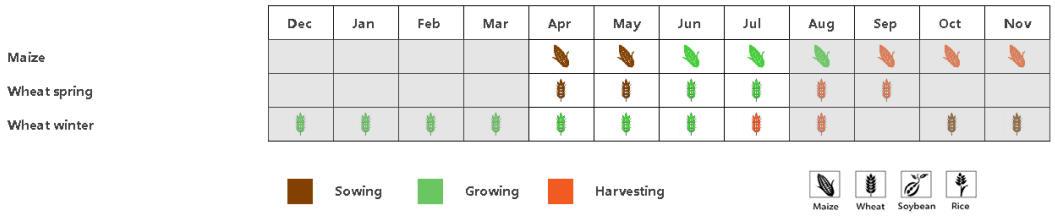
In the **Massif Central dry zone**, TEMP and RADPAR were 1.3°C and 3% lower than the average, respectively, while RAIN increased by 30%. The VCIx was 0.92 and BIOMSS decreased by 11% which indicated a below-average cropping season in the region. Crop conditions based on the NDVI profile were also showing below-average levels in April and May but close to and above average in June and July.

The **Southwestern maize zone** is one of the major irrigated regions in France. The regional NDVI profile presented a below-average trend in the first three month of the monitoring period but was above average in July. RAIN in the period was 7% higher than average, while TEMP was 1.0°C lower. RADPAR slightly decreased by 3%. BIOMSS was 9% lower than average, while CALF showed no significant change. The VCIx was recorded at 0.94, indicating slightly below-average crop conditions.

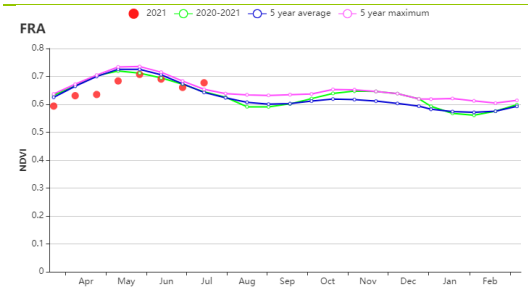
In the **Eastern Alpes region**, the NDVI profile also presented a below-average trend, but was close to average starting in June. RAIN in the region was 32% higher than average, while TEMP was lower than average (-1.3°C) and RADPAR was 4% lower than the 15YA. BIOMSS was 10% lower than the 15-year average. VCIx for the region was recorded at 0.93 and CALF was at the average level, indicating overall below-average crop conditions.

The **Mediterranean zone** aso indicated an overall lower NDVI profile but was close to average in June and July. The region recorded a relatively low VCIx (0.85). RADPAR and TEMP were 4% and 0.9°C lower than average, while RAIN was higher (10%) than average. BIOMSS and CALF decreased by 3% and 1%. This region is showing below-average crop conditions.

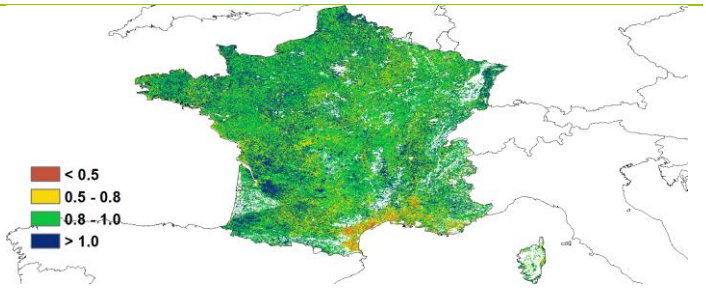
Figure 3.16 France's crop condition, April - July 2021



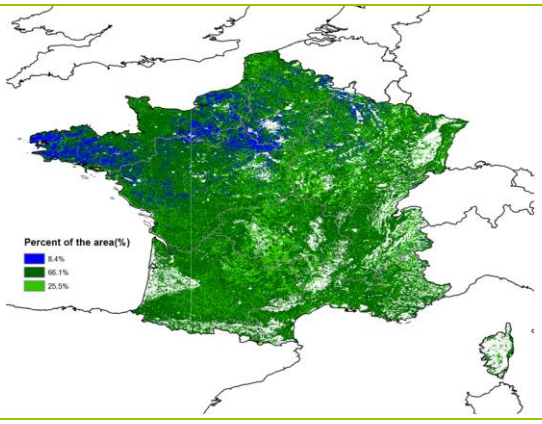
(a). Phenology of major crops



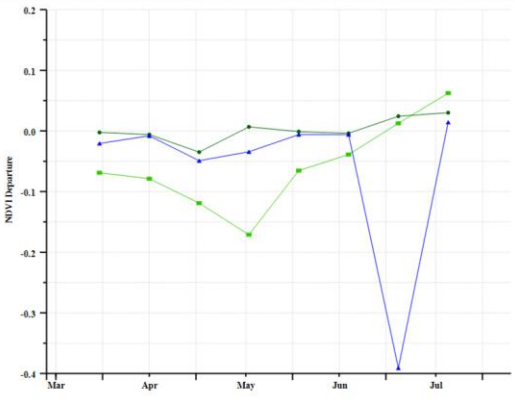
(b) Crop condition development graph based on NDVI



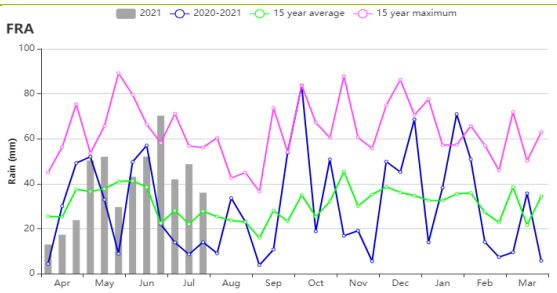
(c) Maximum VCI



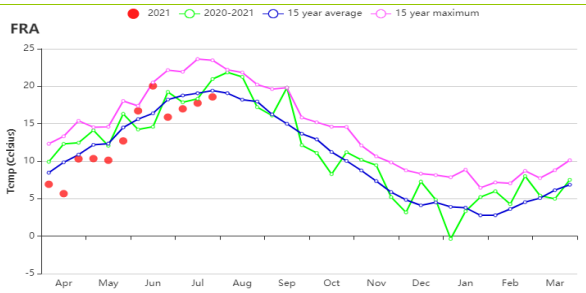
(d) Spatial NDVI patterns compared to 5YA



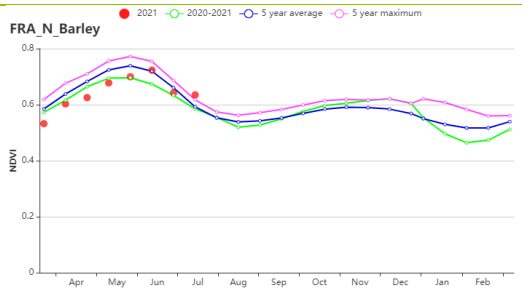
(e) NDVI profiles

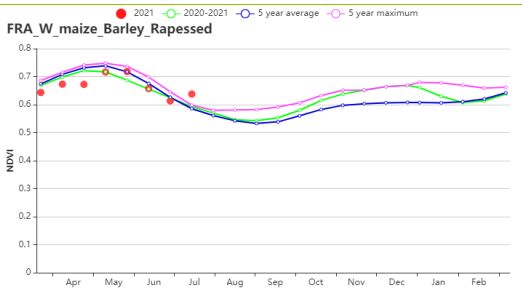


(f) Rainfall profiles

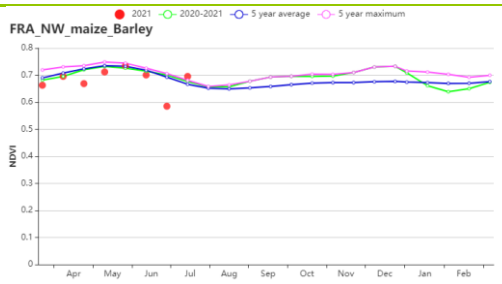


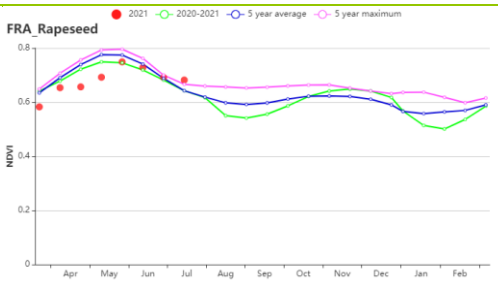
(g) Temperature profiles



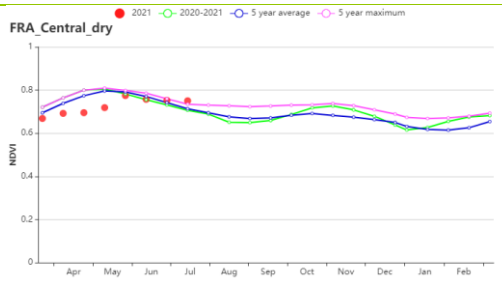


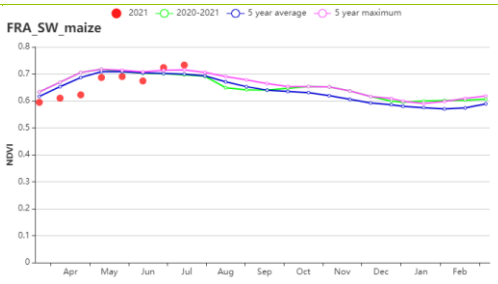
(h) Crop condition development graph based on NDVI (Northern barley region (left) and Mixed maize, Barley and Rapeseed zone (right))



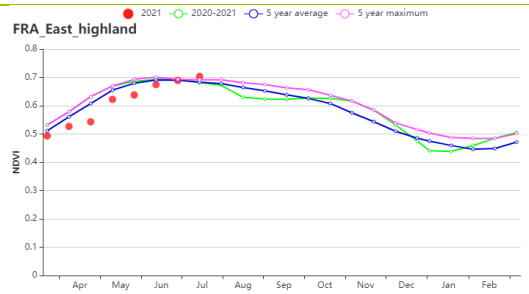


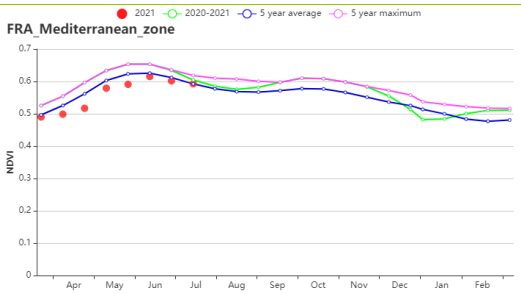
(i) Crop condition development graph based on NDVI (Maize, barley and livestock zone (left) and Rapeseed zone (right))





(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, April - July 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Northern Barley zone	462	51	13.0	-1.3	1182	2	429	-6
Mixed maize/barley and rapessed zone from the Centre to the Atlantic Ocean	397	22	14.2	-1.0	1234	2	481	-4
Maize barley and livestock zone along the English Channel	363	29	12.9	-0.9	1201	3	432	-1
Rapeseed zone of eastern France	585	37	13.0	-1.5	1176	-3	430	-11
Massif Central Dry zone	556	30	12.7	-1.3	1209	-3	433	-11
Southwest maize zone	458	7	14.5	-1.0	1233	-3	495	-9
Alpes region	708	32	12.2	-1.3	1263	-4	441	-10
Mediterranean zone	392	10	14.3	-0.9	1336	-4	553	-3

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Northern Barley zone	100	0	0.95
Mixed maize/barley and rapessed zone from the Centre to the Atlantic Ocean	100	0	0.93
Maize barley and livestock zone along the English Channel	100	0	0.95
Rapeseed zone of eastern France	100	0	0.92
Massif Central Dry zone	100	0	0.92
Southwest maize zone	100	0	0.94
Alpes region	98	0	0.93
Mediterranean zone	95	-1	0.85

[GBR] Kingdom

During this monitoring period, winter wheat reached the flowering stage in mid May. Subsequent grainfilling was completed by early July. According to the crop condition development graph, crop growth was delayed due to below-average temperatures in April and May. NDVI values were below average during that period and then recovered to average levels in June. Agro-climatic indicators show that rainfall and temperature were below average (RAIN, -6%; TEMP, -0.7°C), radiation was above average (RADPAR, +4%) and BIOMSS was close to average (+1%).

The national average VCIx was 0.95. CALF (100%) was unchanged compared to its five-year average. The NDVI departure cluster profiles indicate that: (1) 22.4% of arable land, scattered in East Midlands, West Midlands and east Scotland, experienced slightly above-average crop conditions. (2) 57.5% of arable land experienced slightly below-average crop conditions before June and then recovered to slightly above-average crop conditions in July, mainly in the east of England. (3) 20.0% of arable land experienced fluctuating crop conditions. The large negative departures were mostly likely due to cloud cover in the satellite images. Altogether, the conditions for wheat in the UK are assessed as average.

Regional analysis

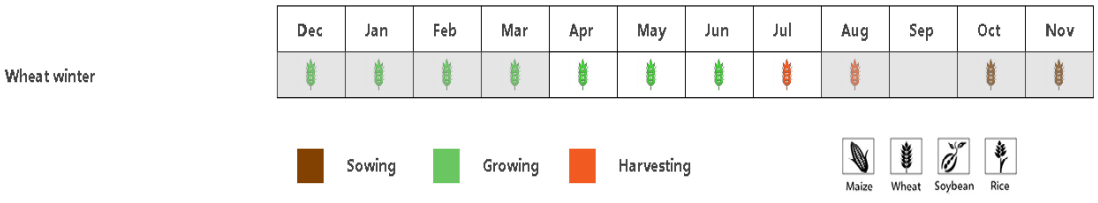
Based on cropping systems, climatic zones, and topographic conditions, three sub-national regions can be distinguished: Central sparse crop region, Northern barley region, and Southern mixed wheat and barley region. All three sub-regions were characterized by unchanged fractions of arable land (CALF)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

The **Central sparse crop region** is one of the country's major agricultural regions for crop production. Crop conditions were below or close to the five-year average according to the NDVI development graph. This region experienced the largest rainfall deficit (RAIN -24%). Temperature was below average (TEMP -0.4°C) and radiation was above average (RADPAR +4%). Biomass was above average (BIOMSS, +3%). The VCIx was at 0.95.

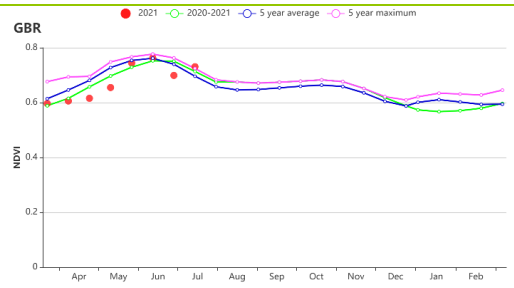
In the **Northern barley region**, NDVI was below average or close to average. Rainfall and temerature were below average (RAIN -10%, TEMP -0.6°C), and radiation was above average (RADPAR +6%). Biomass was above average (BIOMSS, +4%). The VCIx was at 0.94.

In the **Southern mixed wheat and barley zone**, NDVI was below average or close to average according to the crop condition graph except late July. Rainfall and temperature were significantly below average (RAIN -16%, TEMP -1.0°C), and radiation was above average (RADPAR +4%). Below-average temerature and rainfall resulted in below-average biomass (BIOMSS, -1%). The VCIx was at 0.95.

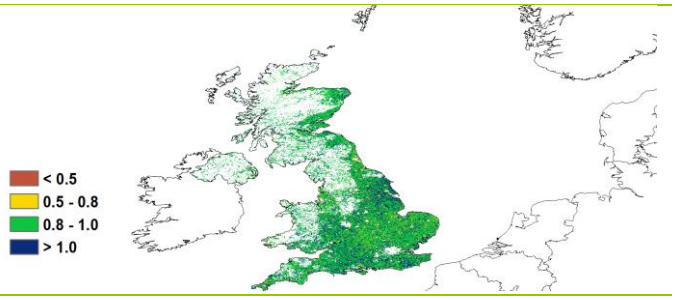
Figure 3.17 United Kingdom's crop condition, April - July 2021



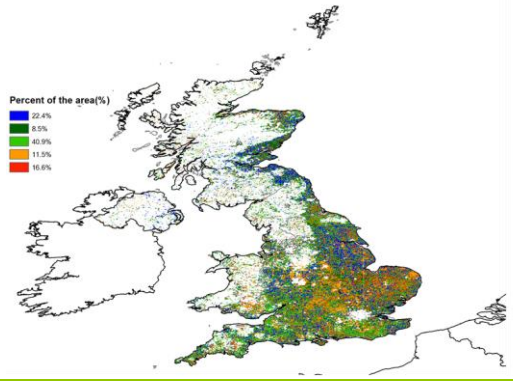
(a). Phenology of major crops



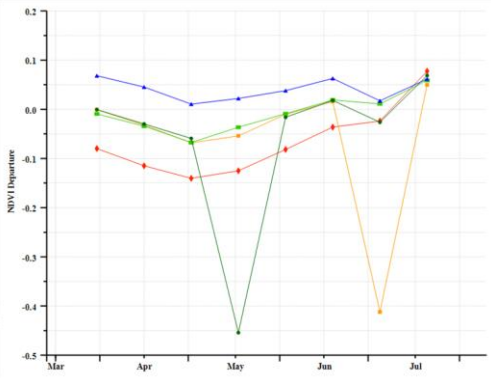
(b) Crop condition development graph based on NDVI



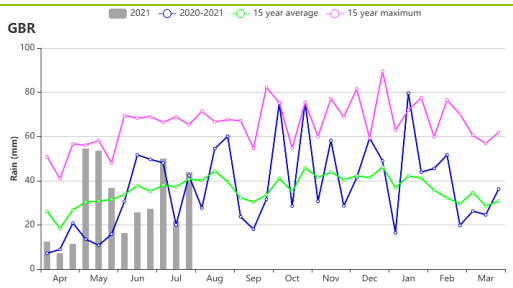
(c) Maximum VCI



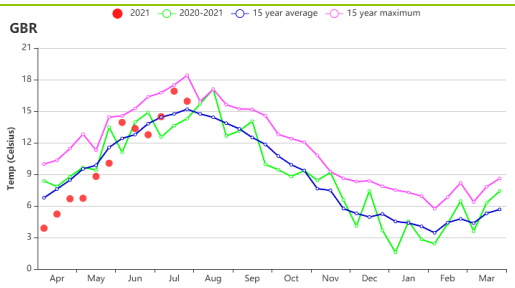
(d) Spatial NDVI patterns compared to 5YA



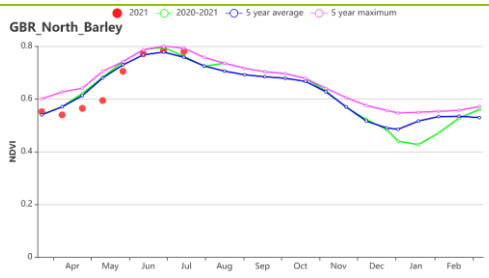
(e) NDVI profiles

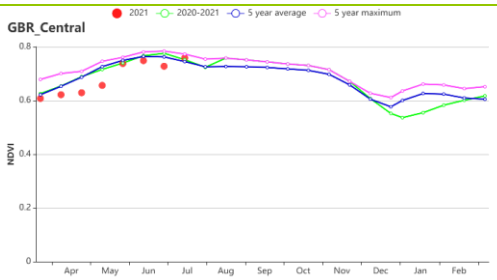


(f) Rainfall profiles

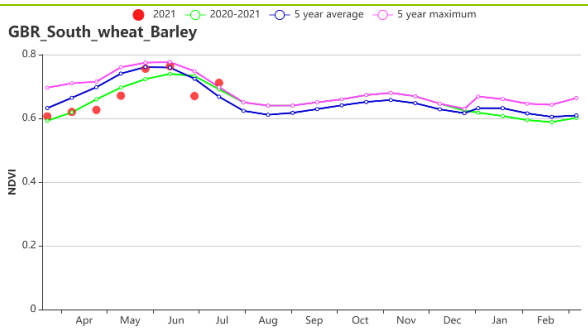


(g) Temperature profiles





(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, April - July 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 (%)
Northern Barley region(UK)	364	-10	10.6	-0.6	1013	6	319	4
Central sparse crop region (UK)	340	-24	9.7	-0.4	951	4	282	3
Southern mixed wheat and Barley zone (UK)	371	-16	11.5	-1.0	1083	4	360	-1

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current
Northern Barley region(UK)	100	0	0.94
Central sparse crop region (UK)	100	0	0.95
Southern mixed wheat and Barley zone (UK)	100	0	0.95
Northern Barley region(UK)	100	0	0.94

[HUN] Hungary

During this reporting period, winter wheat was harvested in June and July. According to the crop condition development graph, NDVI values were below average for most of the monitoring period, except for late June, when they reached the 15YA. Temperatures were below average (TEMP -0.8°C) and solar radiation was above average (RADPAR +1%) as compared to the 15YA. Conditions had been drier than usual during the previous monitoring period. The overall rainfall was below average (RAIN -5%), mainly due to the fact that the precipitation was much lower than average in June, early July and late July. Biomass was above average compared to the 15YA (BIOMSS +2%). These conditions illustrate that Hungary was much drier than usual, which had affected winter wheat crop growth. The national CALF was 100%. Winter wheat production is expected to be below but close to average.

The national average VCIx was 0.86. The NDVI departure cluster profiles indicate that: (1) 9.4% of arable land experienced above-average crop conditions from April to mid-June, scattered over the whole country. (2) 38% of arable land experienced below-average crop conditions during this reporting period, mainly distributed in Central Hungary. (3) 24.4% of arable land experienced below-average crop conditions from April to early June, mainly distributed in Eastern Hungary. (4) 28.2% of arable land experienced slightly below-average crop conditions from April to mid-May, and above average from late May to mid-June, mainly distributed in Western Hungary and Central Hungary.

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 100% for all the four subregions.

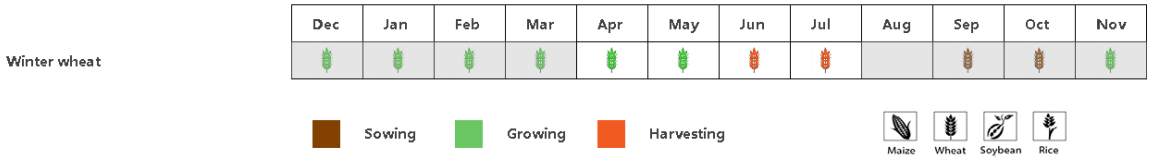
Central Hungary is one of the major agricultural regions in terms of crop production. A sizable share of winter wheat is planted in this region. According to the NDVI development graphs, NDVI values were below average in the entire monitoring period. Temperature and rainfall were below average (TEMP -0.8°C and RAIN -2% respectively). Radiation was above average (RADPAR +2%). Potential biomass was above average compared to the 15YA (BIOMSS +2%). The VCIx was 0.85. The crop conditions in this region are expected to be below but close to average.

The Puszta (The Great Plain) region mainly grows winter wheat, maize and sunflower, especially in the counties of Jaz-Nagykum-Szolnok and Bekes. According to the NDVI development graphs, NDVI values were below average in the entire monitoring period. Agro-climatic conditions include below-average rainfall (RAIN -18%), temperature (TEMP -0.7°C) and radiation (RADPAR -2%). Biomass was above average compared to the 15YA (BIOMSS +2%). The maximum VCI was 0.85. The crop conditions in this region are expected to be below but close to average.

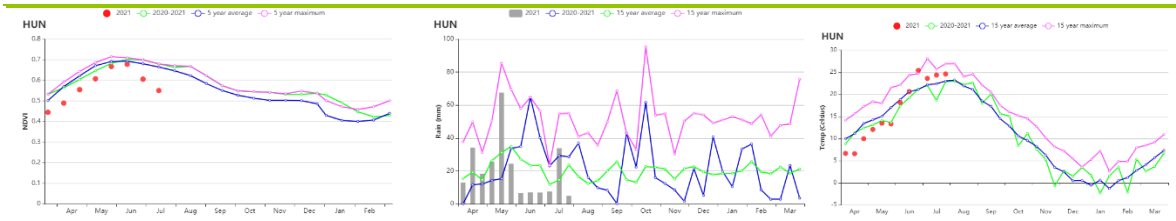
Northern Hungary is another important winter wheat region. According to the NDVI development graphs, NDVI values were below average in this all monitored period. Temperature and rainfall were below average (TEMP -1.0°C, RAIN -4%), and radiation was above average (RADPAR +1%). Estimated biomass was average. The maximum VCI was 0.90. The crop conditions in this region are near average.

Southern Transdanubia cultivates winter wheat, maize, and sunflower, mostly in Somogy and Tolna counties. According to the NDVI development graphs, NDVI values were below average throughout the monitoring period. Agro-climatic conditions include below-average temperature (TEMP -0.9°C) and above-average rainfall (RAIN +10%) and radiation (RADPAR +1%). Biomass was above average compared to the 15YA (BIOMSS +2%). The maximum VCI was favorable at 0.86. The crop conditions in this region are below but close to average.

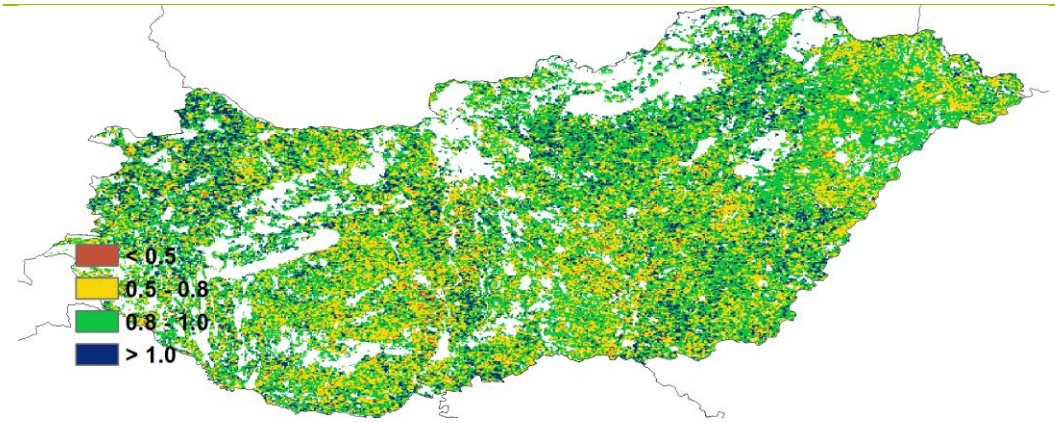
Figure 3.18 Hungary's crop condition, April -July 2021



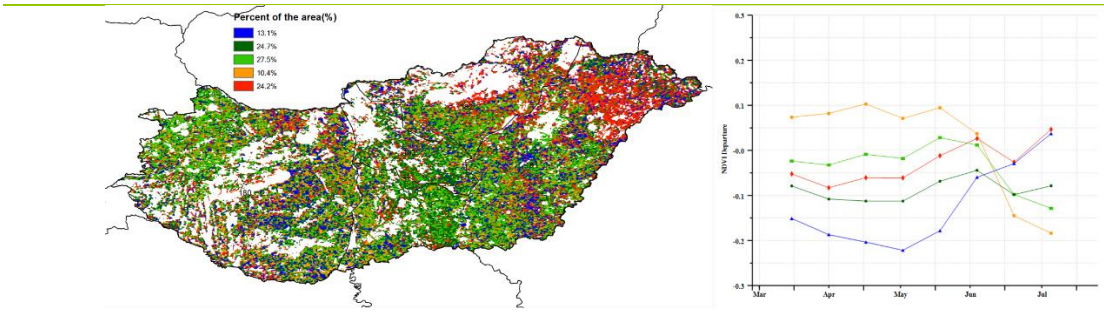
(a). Phenology of major crops



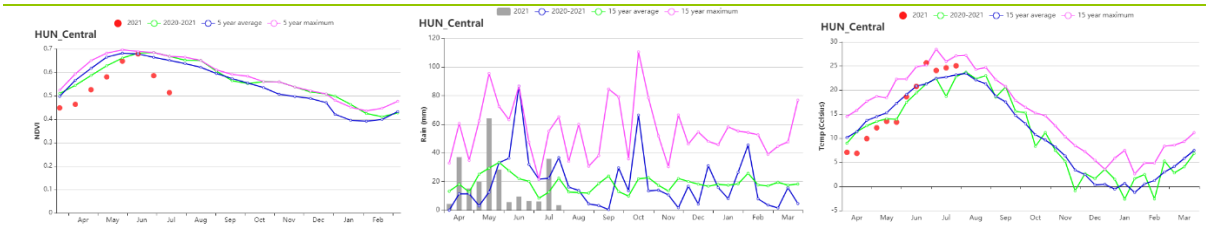
(b) Crop condition development graph based on NDVI, RAIN and TEMP



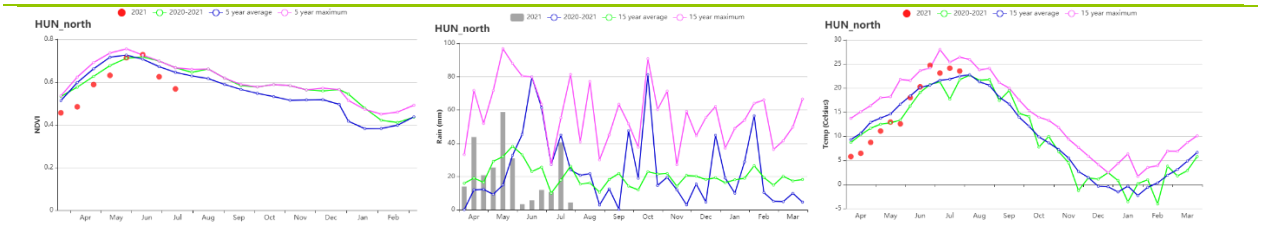
(c) Maximum VCI



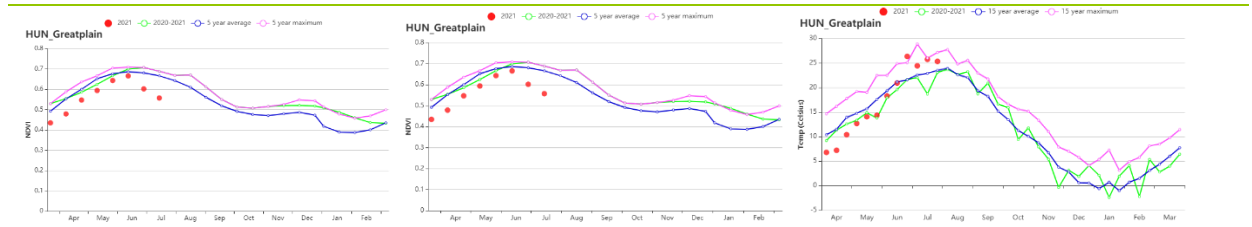
(d) Spatial distribution of NDVI profiles.



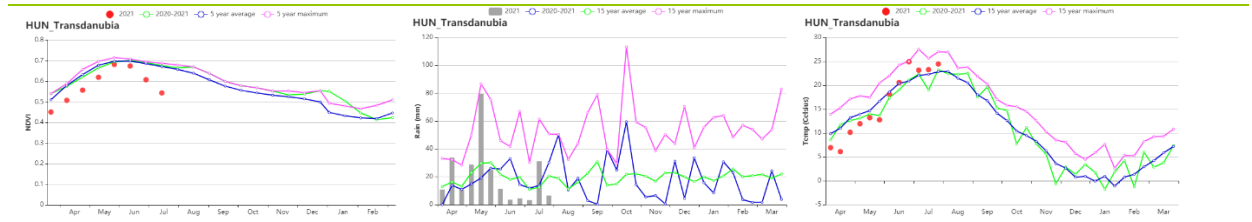
(e) Crop condition development graph based on NDVI, RAIN and TEMP



(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, April -July 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Central Hungary	236	-2	16.8	-0.8	1350	2	648	2
The Puszta	239	-18	17.2	-0.7	1329	2	646	2
North Hungary	269	-4	15.9	-1.0	1293	1	595	0
Transdanubia	248	10	16.3	-0.9	1345	1	636	2

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current (%)
Central Hungary	100	0	0.85
The Puszta	100	0	0.85
North Hungary	100	0	0.90
Transdanubia	100	0	0.86

[IDN] Indonesia

During the monitoring period, the harvest of the main rice and maize were completed, and secondary rice and maize were growing.

In general, conditions were relatively dry at the national scale. Precipitation was below the 15YA (RAIN -11%), but temperature (TEMP +0.3°C) and radiation (RADPAR +6%) were above the 15YA, resulting in a BIOMSS increase by 6% compared with 15YA.

According to the national NDVI development graph, the crop conditions were below the average throughout the reporting period but close to the average in July. According to the NDVI clusters and profiles, 62.4% of the arable land, mostly located in Sumatera, Java and the western of Kalimantan, crop conditions were close to average and even higher than the average in July. 14.4%, 9.8%, 7.5% of cultivated areas, located in the southern of Sumatera and the eastern of Kalimantan were below average in late-March, mid-May and early-July respectively, and then improved to average immediately. On the contrary, NDVI dropped to below average in July on 5.8% of the area, mostly concentrated in West Papua. Considering that CALF reached almost 100% and that the maximum VCI value was 0.95, the crop conditions were normal for Indonesia.

Regional analysis

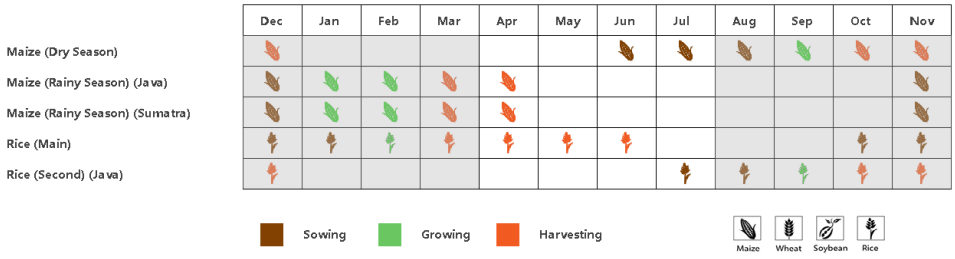
The analysis below focuses on four agro-ecological zones, namely **Sumatra** (92), **Java** (90), the main agricultural region in the country, **Kalimantan and Sulawesi** (91) and **West Papua** (93), among which the first three are relevant for crop production. The numbers correspond to the labels on the VCIx and NDVI profile maps. **Java** is the country's main agricultural region. In all regions, NDVI was below the 5YA in May but recovered to close to normal values by late June, except for Java.

Precipitation was below 15YA (RAIN -19%) in **Java** region, but with slightly higher average TEMP (+0.3°C) and RADPAR (+6%), which may have resulted in a slightly above-average potential biomass (BIOMSS +3%). The NDVI status at the end of the last monitoring period was below the 5YA, but during this period, the NDVI development graph recovered to near the 5YA.

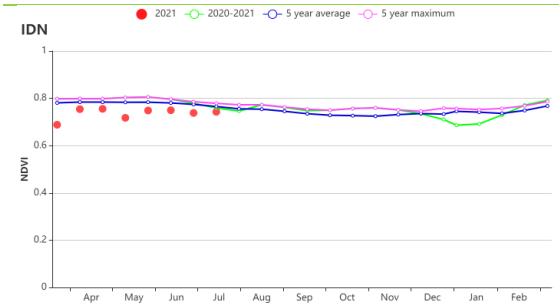
In **Kalimantan and Sulawesi**, precipitation was significantly below average (RAIN -12%) while temperature and radiation were both above the 15YA (TEMP +0.3℃, RADPAR +6%). BIOMASS (+6%) was higher than the average. According to the NDVI development graph, crop conditions were generally close to the 5YA in May. Overall, the crop conditions were close to average at the end of this monitoring period.

In **Sumatra**, precipitation was significantly lower than the 15YA (RAIN -19%) while temperature and radiation were above average (TEMP +0.2℃, RADPAR +5%). BIOMASS (+5%) was higher than average. According to NDVI development graph, despite the low rainfall, the crop conditions were close to the average in July. Overall, the crop conditions were normal for this monitoring period.

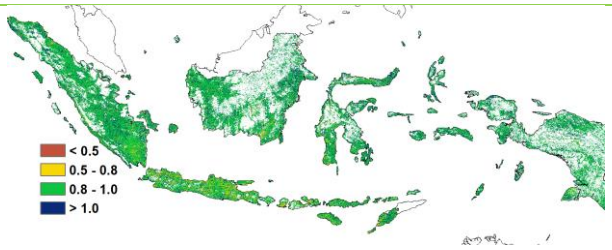
Figure 3.19 Indonesia's crop condition, April – July 2021



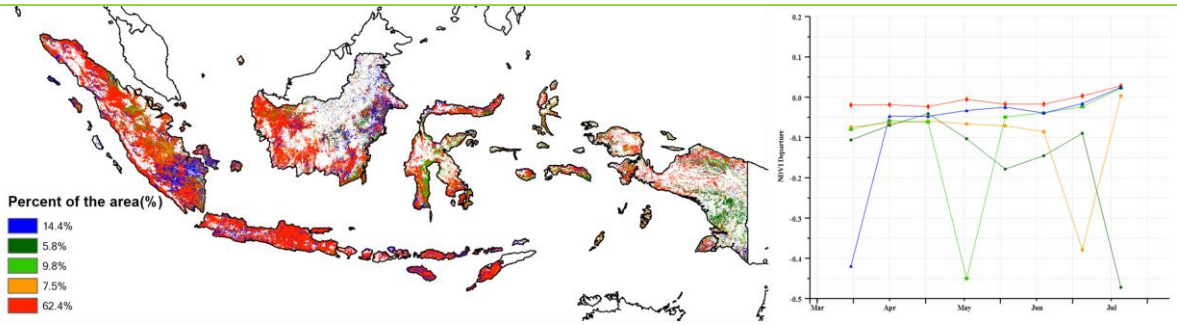
(a). Phenology of major crops



(b) Crop condition development graph based on NDVI

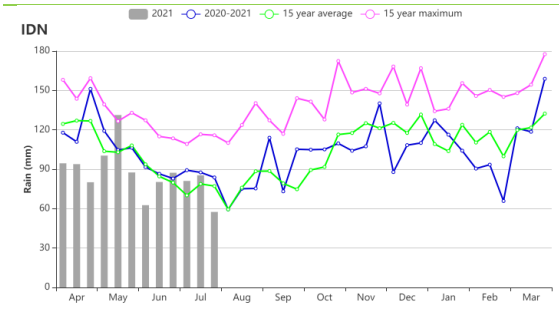


(c) Maximum VCI

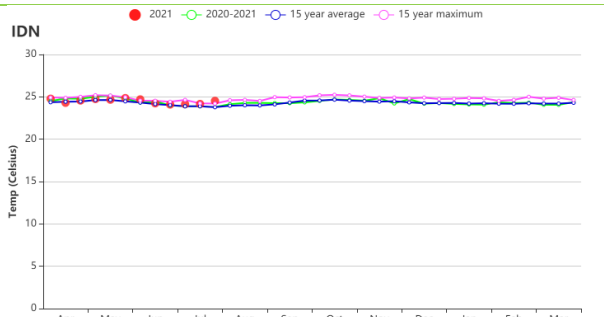


(d) Spatial NDVI patterns compared to 5YA

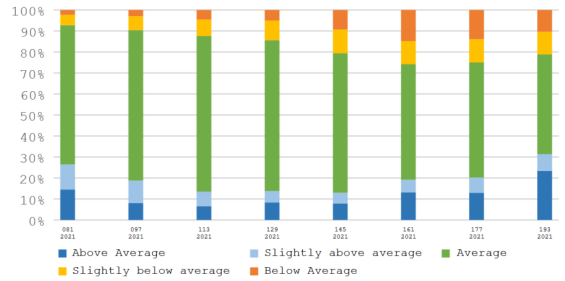
(e) NDVI profiles



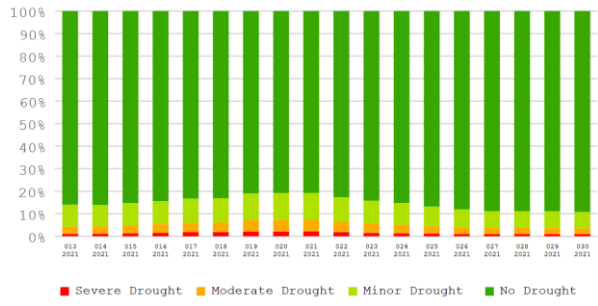
(f)Rainfall profiles



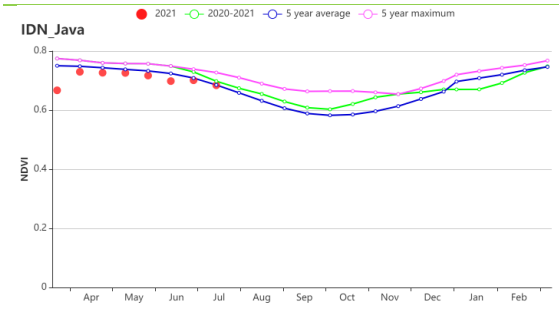
(g)Temperature profiles

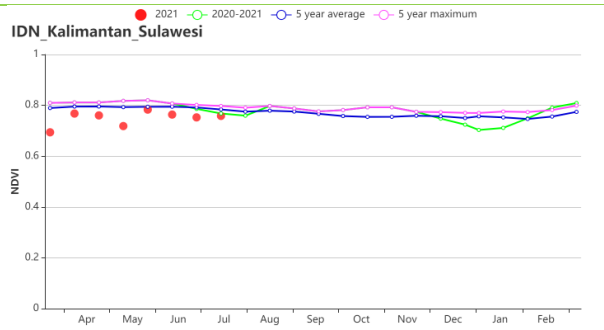


(h) Proportion of NDVI anomaly categories compared with 5YA

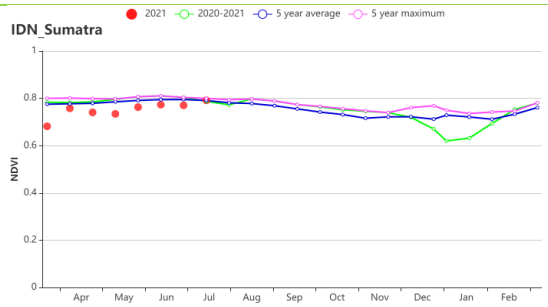


(i) Proportion of VHIn categories compared with 5YA





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



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

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

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Java	518	-19	25.1	0.3	1213	6	739	3
Kalimantan and Sulawesi	1038	-12	24.7	0.3	1179	6	773	7
Sumatra	806	-19	24.9	0.2	1195	5	786	5
West Papua	1573	-3	23.4	0.3	970	9	625	10

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Java	99	0	0.90
Kalimantan and Sulawesi	100	0	0.96
Sumatra	100	0	0.95
West Papua	100	0	0.97

[IND] India

The current monitoring period covers the harvest of rabi rice and wheat in April and May, as well as the sowing of maize, kharif rice and soybean. The graph of NDVI development shows that the crop conditions were close to or above the average in general, except in July, indicating that the crop conditions for rabi rice and wheat were favorable at the national level.

The CropWatch agroclimatic indicators show that nationwide TEMP (-0.6°C) and RADPAR was close to average, whereas RAIN was slightly below the 15YA (-7%). The average TEMP and RADPAR made up for the low rainfall, resulting in a BIOMSS increase by 4% compared with the 15YA. The overall VCIx was high, with a value of 0.86. As can be seen from the spatial distribution, only the Northwestern region 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 southwestern and northeastern regions showed above-average crop conditions while the conditions were slightly below average in the northwestern regions. The spatial distribution of NDVI profiles shows that after June, 61.2% of the areas showed above-average crop conditions in the eastern and southern regions. CALF increased by 9% compared to the 5YA. With the exception of a few areas, the crop conditions in all parts of India were favorable.

Regional analysis

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

The four agro-ecological zones of the Gangetic plain, the Agriculture areas in Rajastan and Gujarat, the Western coastal region and the North-western dry region showed similar trends in agricultural indices. Compared to the same period of previous years, RAIN had increased significantly, especially in the North-western dry region (+50%). The TEMP was slightly below average and RADPAR was lower, and the abundant rainfall caused BIOMSS to be much higher than the 15-year average. CALF showed different trends. The highest increases had been observed in Western coastal region (+28%), and the highest decreases in North-western dry region (-50%). The graph of NDVI development shows that the crop growth of these three 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.

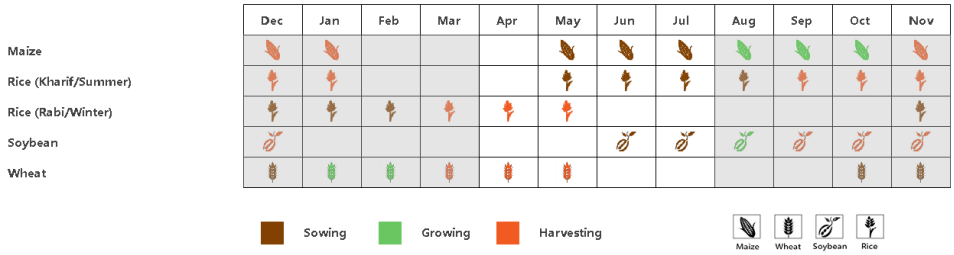
The **Eastern coastal region** and the **Western Himalayan region** recorded similar trends of agricultural indices in this monitoring period. Compared to the same period of the previous years, RAIN had decreased by 11% in the Eastern coastal region and by 20% for the Western Himalayan region. TEMP was slightly above average (+0.6°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. VCIx was above 0.87. The graph of NDVI development shows that the crop growth for both regions was generally above the 5-year average. The crop production is expected to be above average.

The **Assam and north-eastern regions** recorded 1534 mm of RAIN, which was 26% below average. TEMP was at 25.0°C (+0.6°C), and RADPAR was slightly above the 15YA at 1172 MJ/m² (+5%). BIOMSS was slightly above the 15YA (+1%). CALF reached 96% which was a slight decrease over the 5-year average, and VCIx was 0.91. The graph of NDVI development shows that the crop growth of this region during the monitoring period was below the 5-year average in most months. Generally, the crop production is expected to be below average.

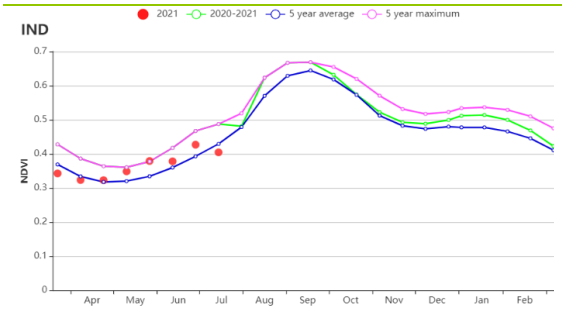
The **Deccan Plateau** recorded 561 mm of RAIN, which was slightly below average (-8%). TEMP was at 30.3°C (-0.9°C) and RADPAR was at 1221 MJ/m² (-3%). BIOMSS was above the 15YA (+3%). CALF reached 79% which was significantly above average (+15%), and VCIx was 0.84. The graph of NDVI development shows that the

crop growth of the region during the monitoring period exceeded the 5-year average in most months. The outlook of crop production in this region is favorable.

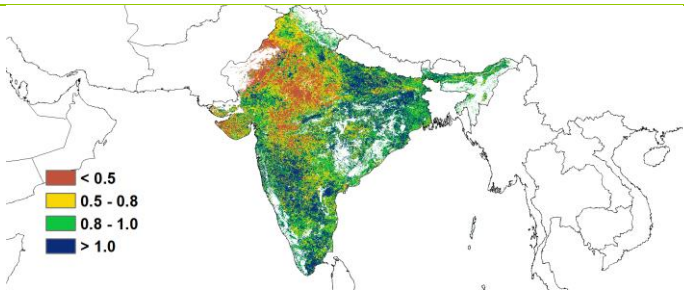
Figure 3.20 India's crop condition, April - July 2021



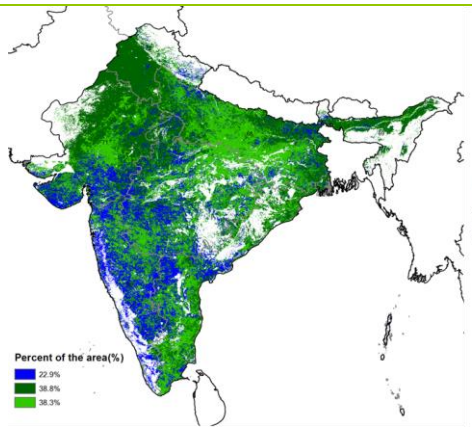
(a). Phenology of major crops



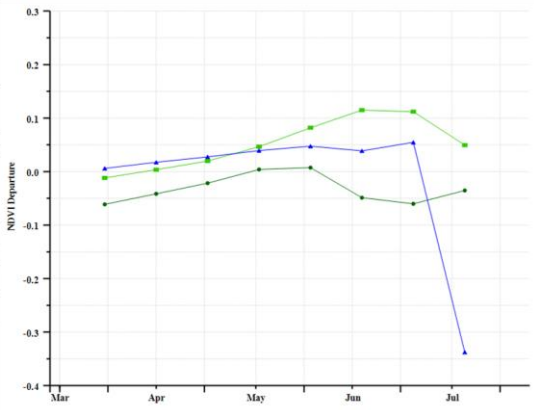
(b) Crop condition development graph based on NDVI



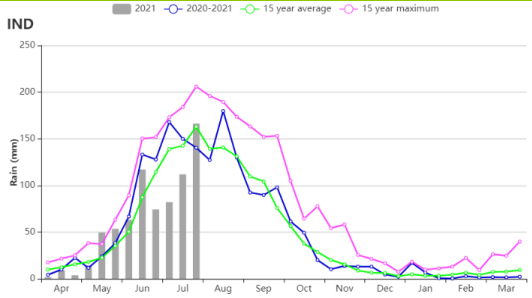
(c) Maximum VCI



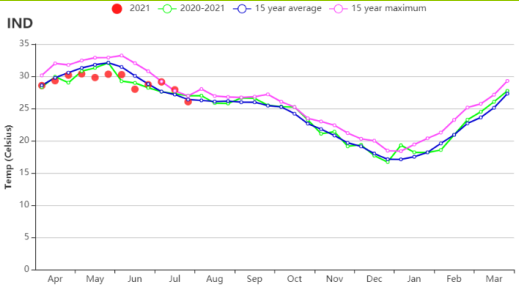
(d) Spatial NDVI patterns compared to 5YA



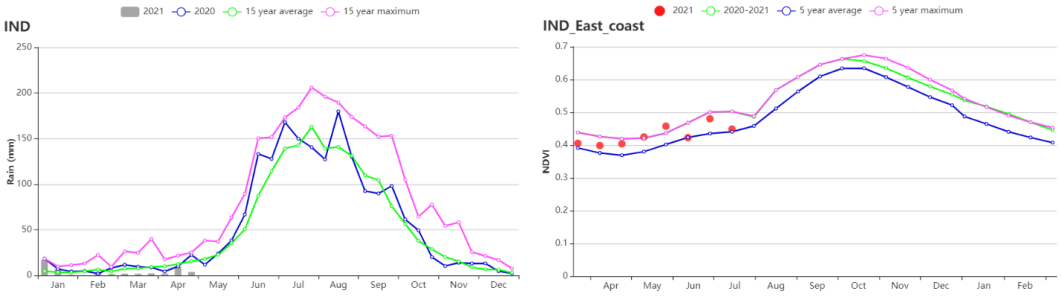
(e) NDVI profiles



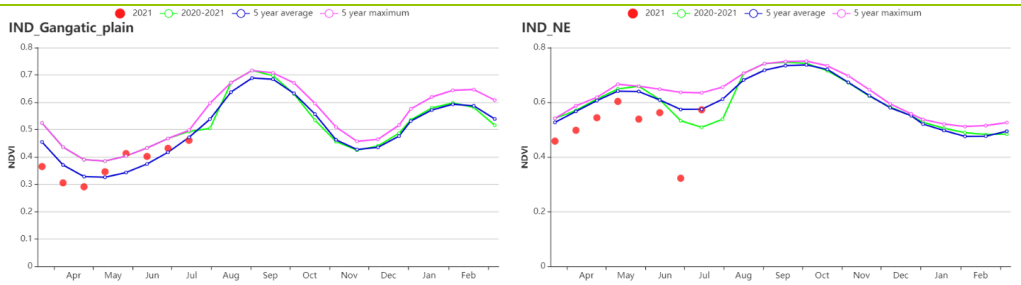
(f) Rainfall profiles



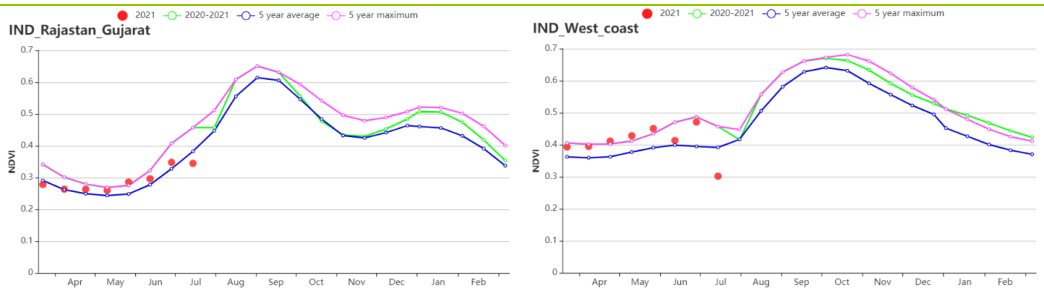
(g) Temperature profiles



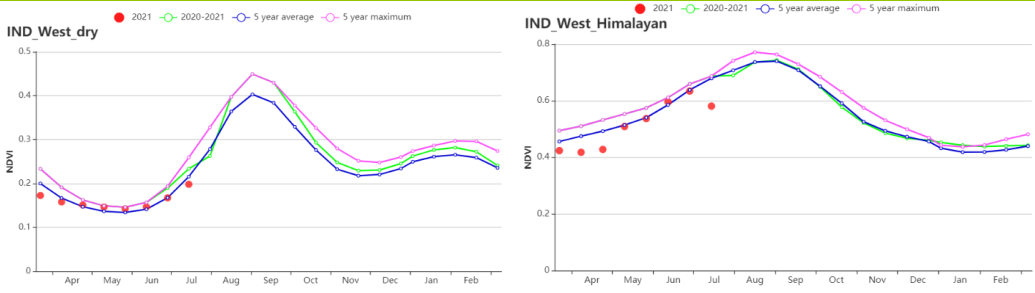
(h) Crop condition development graph based on NDVI (Deccan Plateau (left) and Eastern Coastal Region (right))



(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 (right))



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

Table 3.31 India's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 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 (%)
Deccan Plateau	561	-8	30.3	-0.9	1221	-3	644	3
Eastern coastal region	498	-11	29.4	-0.6	1245	1	727	0
Gangatic plain	615	1	31.1	-0.9	1318	-2	714	-6
Assam and north-eastern regions	1534	-26	25.0	0.6	1172	5	692	1
Agriculture areas in Rajastan and Gujarat	572	11	31.6	-0.4	1280	-6	654	22
Western coastal region	1129	17	26.5	-0.5	1168	-1	704	8
North-western dry region	235	57	33.0	-0.5	1440	-3	737	27
Western Himalayan region	456	-20	19.3	-1.0	1449	0	532	-9

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current
Deccan Plateau	79	15	0.84
Eastern coastal region	81	20	0.97
Gangatic plain	86	4	0.90
Assam and north-eastern regions	96	0	0.91
Agriculture areas in Rajastan and Gujarat	47	-11	0.71
Western coastal region	76	28	1.00
North-western dry region	5	-50	0.43
Western Himalayan region	98	0	0.88

[IRN] Iran

This monitoring period covers the grain filling period and harvest of winter wheat, as well as the planting and early establishment of the rice crop. According to the NDVI based crop condition development graph, the conditions in Iran during this whole monitoring period were below the 5-year average. The cumulative rainfall was 91 mm, which was 1% below average. The average temperature was 22.8°C (1.4°C above average), whereas the photosynthetically active radiation was 1628 MJ/m2 (at average). The potential biomass was 1% lower than the 15-year average. The national maximum vegetation condition index (VCIx) was 0.58, while the cropped arable land fraction (CALF) was 31% lower than the average of the past 5-years.

The NDVI spatial patterns show that from April to July, crop conditions on 8.8% of the cropped areas were above the 5-year average (marked in blue). 29.4% of the cropped areas (marked in dark green) and 21.4% of the cropped areas (marked in red), mainly located in the provinces of West Azaibaijan, East Azarbaijan, Gilan, Mazandaran and Khuzestan, experienced close to average crop conditions almost throughout the monitoring period. The two remaining clustered regions, accounting for 40.4% of the cropped areas, both suffered from significantly below average crop conditions (negative NDVI anomaly more than -0.1) from early to middle June (light green marked regions) and from middle April to middle June (orange marked regions), mainly located in the provinces of Kordestan, Zanjan, Kermanshah, Hamadan, Ilam, lorestan, Golestan, North Khorasan and Razavi Khorasan. The severe lack of rainfall in April caused very unfavorable conditions for rice and wheat, as confirmed by the NDVI profiles. The spatial pattern of maximum Vegetation Condition Index (VCIx) was in accord with the spatial distribution of the NDVI profiles.

The proportion of NDVI anomaly categories, as compared with the 5-year average, shows that in the first and third 16-day phases, almost 10% of the cropped area had slightly below or below average crop conditions. From the 3rd to the 6th 16-day phases, about 20% of the cultivated areas experienced above average crop conditions. The proportion of VHIm categories shows that more than 20% of the cultivated regions suffered from severe droughts from the 6th to the 16th weekly phases. Overall, lack of rainfall caused unfavorable crop conditions for Iran.

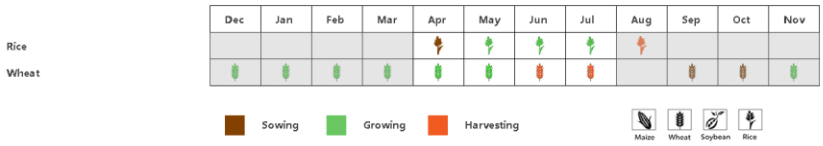
Regional Analysis

Based on farming system, climate, and topographic conditions, Iran can be subdivided into three regions, two of which are the main production areas for crops, namely the **Semi-arid to the subtropical hilly region in the west and the north** and the **Coastal lowland and plain areas of the arid Red Sea**.

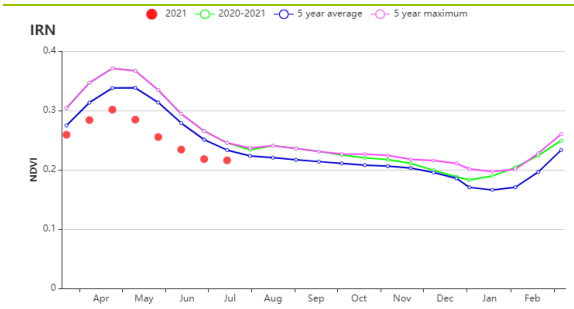
In the **Western and northern semi-arid subtropical hilly areas**, the cumulative precipitation during the monitoring period was 99 mm, 8% below the average, the temperature was 21.0°C (+1.5°C), and photosynthetically active radiation was at average. The potential biomass was 2% lower than the average. Crop conditions were below the 5-year average throughout the monitoring period. The proportion of cultivated land was 25%, which is 31% lower than the 5YA average. The average VCIx for this region was 0.61, indicating unfavorable crop conditions.

In the **Coastal lowland and plain areas of the arid Red Sea**, the temperature was 1.2°C above average, the accumulated precipitation was 36% above average and the photosynthetically active radiation was also slightly above average (+1%). The potential biomass was at the 15-year average. Crop conditions were below to near the 5YA average. During the monitoring period, CALF was 20% below the average of the last 5-years, and the VCIx was 0.51, also indicating poor crop prospects.

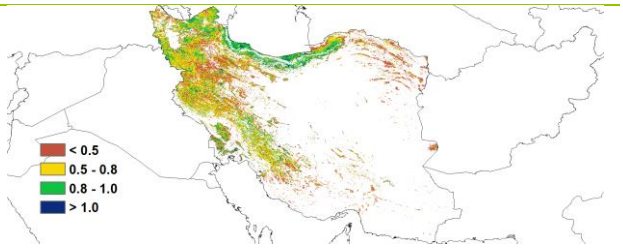
Figure 3.21 Iran's crop condition, April-July 2021



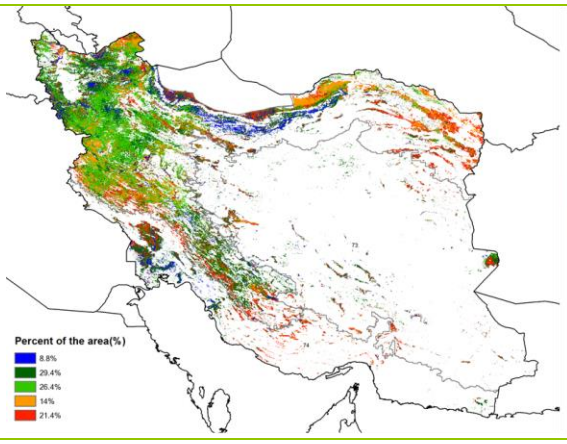
(a). Phenology of major crops



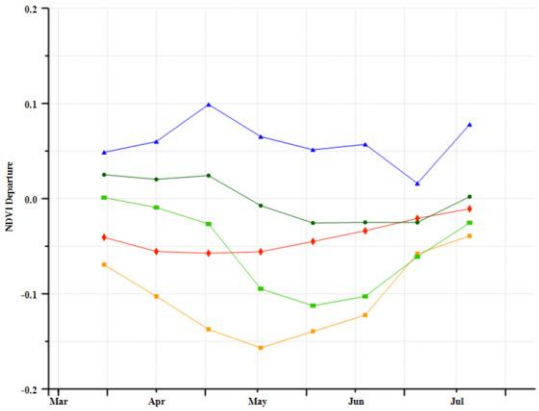
(b) Crop condition development graph based on NDVI



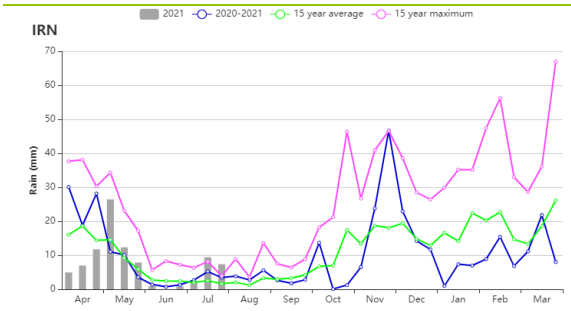
(c) Maximum VCI



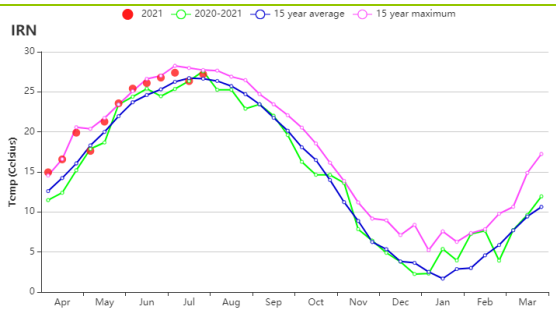
(d) Spatial NDVI patterns compared to 5YA



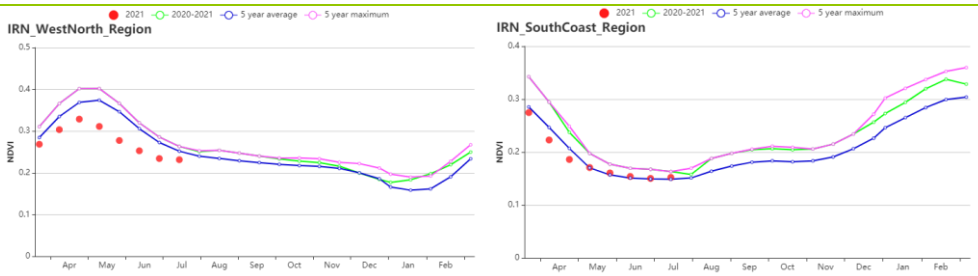
(e) NDVI profiles



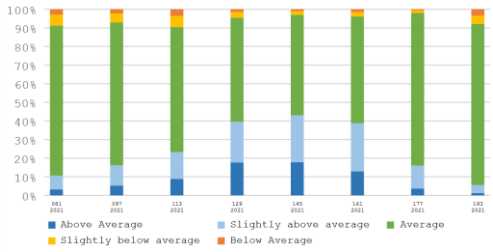
(f) Rainfall time series profile



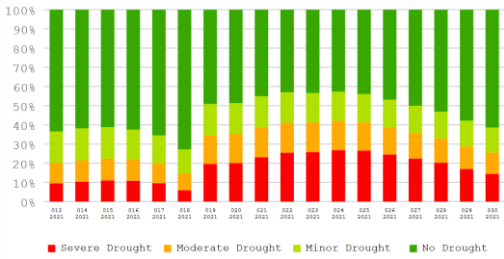
(g) Temperature time series profile



(h) Crop condition development graph based on NDVI (Semi-arid to sub-tropical hills of the west and north region (left) and Coastal lowland and plain areas of the arid Red Sea (right))



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



(j) Proportion of VHIm categories compared with 5YA

Table 3.33 Iran's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April-July 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)	Current (gDM/m^2)	Departure from 15YA (%)
Semi-arid to sub-tropical hills of the west and north	99	-8	21.0	1.5	1617	0	452	-2
Coastal lowland and plain areas of the arid Red Sea	39	36	32.8	1.2	1662	1	327	0

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current
Semi-arid to sub-tropical hills of the west and north	25	-31	0.61
Coastal lowland and plain areas of the arid Red Sea	10	-20	0.51

[ITA] Italy

During this reporting period, winter wheat was harvested in June and July. Summer crops, especially maize, rice, sunflower and soybeans were planted in April and early May. According to the NDVI development graph, crop conditions were below average in all reporting periods.

At the national level, rainfall (-7%), temperature (-0.5 ºC) and solar radiation (RADPAR -2%) were all below the 15YA. Precipitation in April and May was near average, which was favorable for wheat growth. Potential biomass production was 1% above average.

CALF was 99%, and VCIx was 0.88. 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 crop condition development graph indicates that NDVI was below average in this reporting period. In summary, the overall crop conditions during this period were near average.

About 12.5% of the crops, mainly located in the Po Valley and Eastern Italy (Puglia and Emilia-Romagna), showed a positive departure from the 5YA in April and May, but were below average in June and July. 12.4% of arable land experienced below-average crop conditions, scattered in Umbria, Puglia and Sicilia. About 19.4% of arable land (mainly in Piemonte, Lombardia and Veneto) experienced below-average crop conditions between April and early June, above-average conditions in mid-June, and then below-average between late June and July. On about 32.5% of arable land, NDVI was near average in April and early May, and then below average until late July. For the remaining 23.2% of arable land, NDVI hovered above or below average, which was scattered in Toscana, Lazio and Campania.

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.

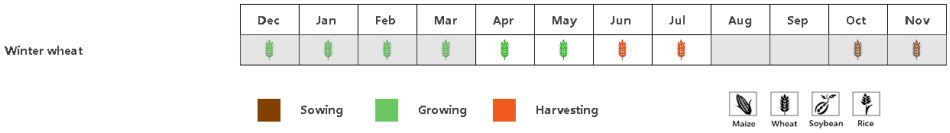
East coast (mainly in Puglia, Marche and Abruzzi) experienced below-average rainfall (RAIN -37%), above-average temperature (TEMP +0.2°C) and slightly above average solar radiation (RADPAR +2%). Although the precipitation was below average, it was sufficient for the growth of winter wheat in April and May. The potential production showed a slightly increase (BIOMSS +2%). VCIx was 0.88. The crop condition development graph indicates that NDVI was close to the average of the past five years from April to mid-May and below the average from late May to July. Close-to-average wheat crop production can be expected.

Crop production in the **Po Valley** (mainly in Piemonte, Lombardia and Veneto) was affected by slightly higher rainfall (RAIN +3%) and below-average temperature (TEMP -1.0°C) and solar radiation (RADPAR -2%). BIOMSS was below the 15YA by 5% and VCIx reached 0.87. The crop condition development graph indicates that the crop condition was near average during the entire reporting period. According to the agro-climatic indicators, a near-average output can be expected.

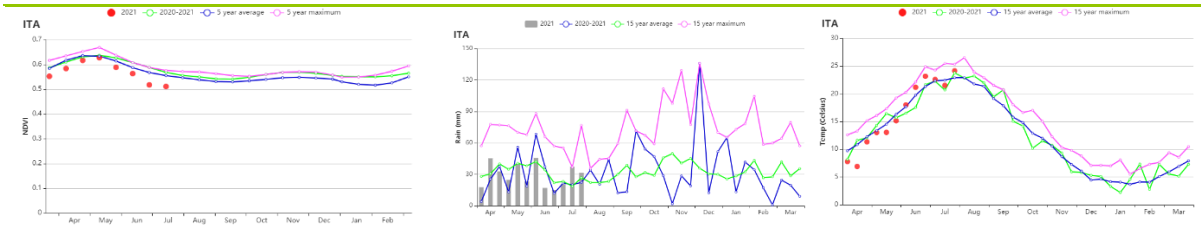
The Islands recorded a below-average precipitation (RAIN -12%) with above-average temperature (TEMP +0.3°C). RADPAR was slightly below average (-2%). BIOMSS increased by 7% compared with the 15YA. VCIx was 0.91. NDVI was close to average throughout the monitoring period. The crop production in this region is expected to be close to average.

In **Western Italy**, RAIN (-20%), RADPAR (-1%) and TEMP (TEMP -0.4°C) were all below average. Although the precipitation was below average, it was sufficient for the growth of winter wheat in April and May, and the biomass production potential increased in this region (BIOMSS +2%). The NDVI was below average from April to early May. It reached average levels from mid-May to mid-June, and was below average from late June to July. VCIx reached 0.87. CropWatch expects an average production.

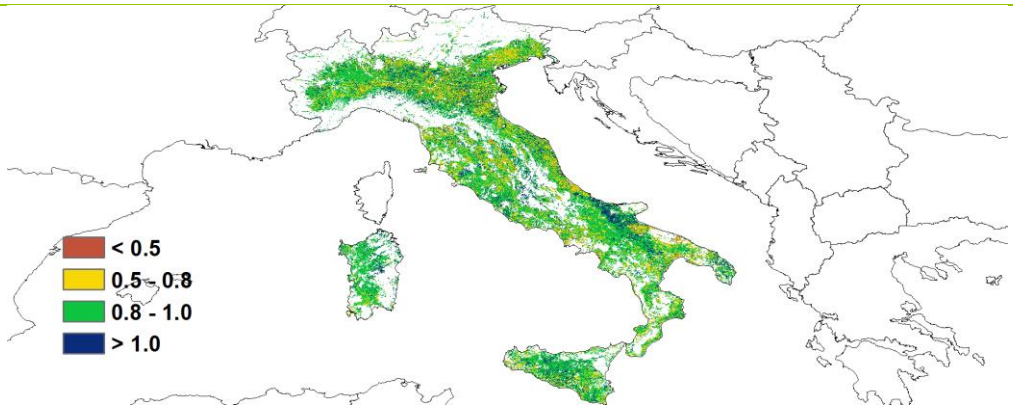
Figure 3.22 Italy's crop condition, April 2021-July 2021



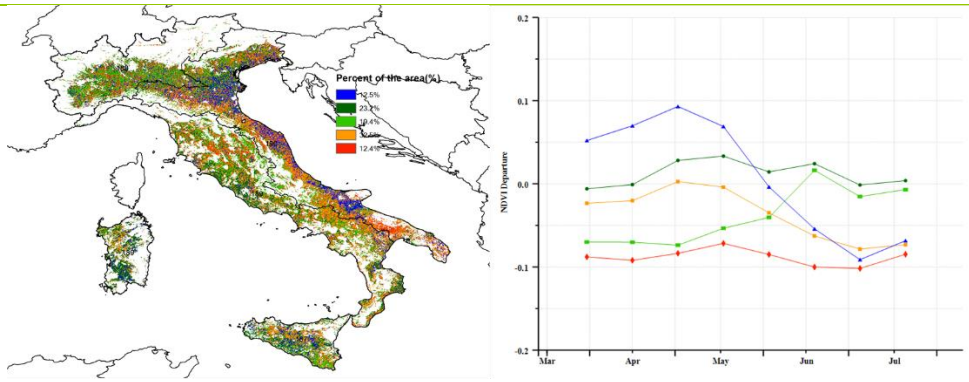
(a). Phenology of major crops



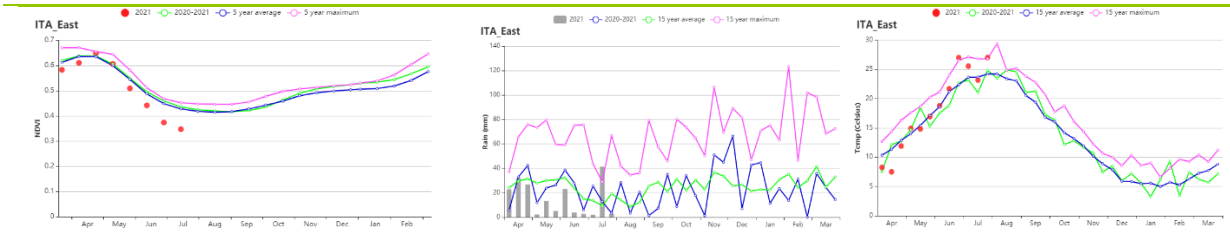
(b) Crop condition development graph based on NDVI, RAIN and TEMP (Italy).



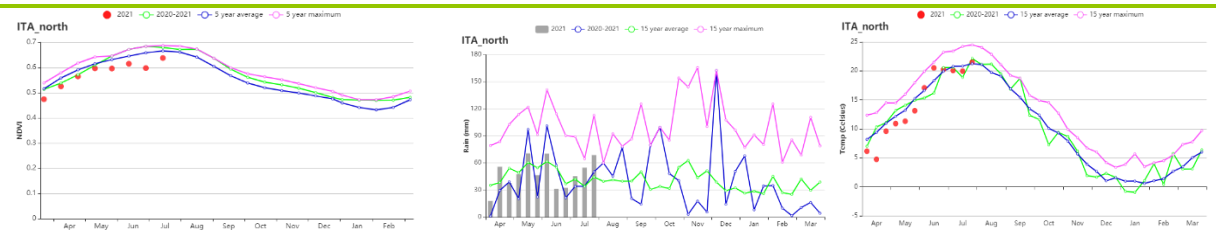
(c) Maximum VCI



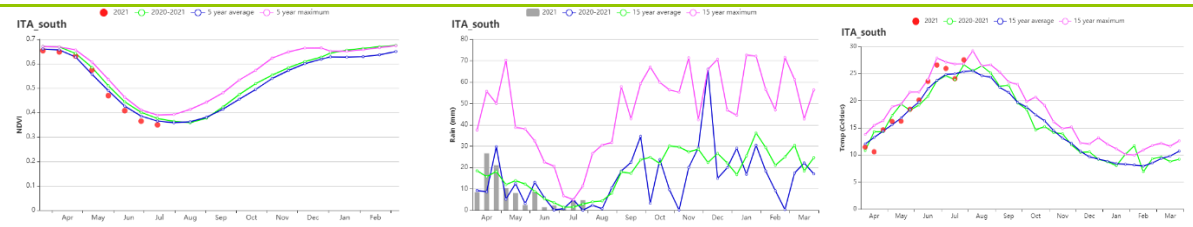
(d)Spatial distribution of NDVI profiles



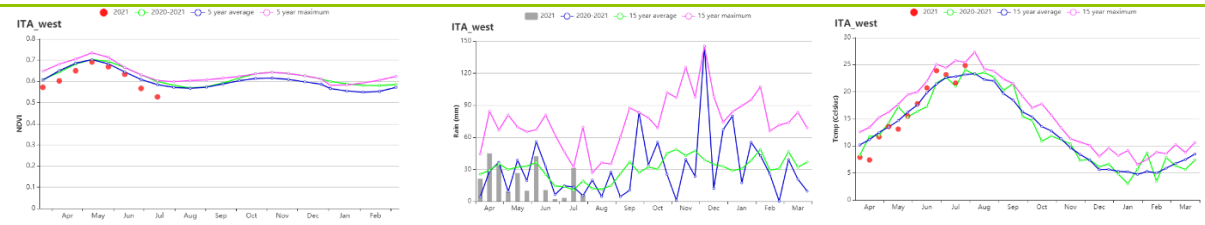
(e) Crop condition development graph based on NDVI, RAIN and TEMP (East Italy).



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



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



(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, April 2021-July 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
East Coast	178	-37	18.1	0.2	1439	1	685	2
Po Valley	579	3	14.6	-1.0	1305	-2	536	-5
Islands	100	-12	19.6	0.3	1508	-2	665	7
Western Italy	241	-20	16.8	-0.4	1410	-1	641	2

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current (%)
East Coast	98	-1	0.88
Po Valley	100	0	0.87
Islands	98	0	0.91
Western Italy	100	0	0.87

[KAZ] Kazakhstan

This report covers the sowing and growing period of spring wheat in Kazakhstan. The crop conditions were generally below average from April to July. Compared to the 15-year average, accumulated rainfall, temperature and radiation were above average (RAIN +23%, TEMP +0.1°C, RADPAR +2%). The dekadal precipitation was above the 15-year maximum in early and mid July. The dekadal temperature reached the 15-year maximum in May and early July. The favorable agro-climatic conditions resulted in an increase in the BIOMSS index by 7%.

However, the national average maximum VCI index was 0.69 and the Cropped Arable Land Fraction (CALF) went down by 13% over the recent five-year average. The spatial VCIx map matched well with the national crop condition development graphs. Due to the impact of continual rainfall deficits from April to June and the high temperature in May, about 84.7% of croplands experienced unfavorable crop conditions from April to July. About 16.3% of croplands, which were distributed in some areas of the Kostanay, Soltustik kazakstan, and Akmola states in central northern region, and some parts of Batysdy kazakstan state in the northwest region, experienced favorable crop conditions in May and June.

Overall, due to the drought during the planting and main growth period of spring wheat, the crop output in this season is estimated to be below average.

Regional analysis

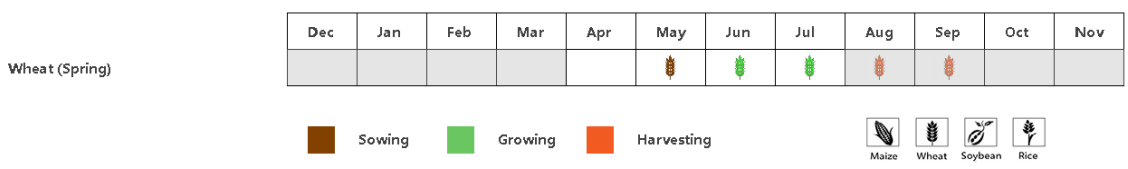
Based on cropping systems, climatic zones and topographic conditions, four sub-national agro-ecological regions can be distinguished for Kazakhstan, among which three are relevant for crop cultivation: The Northern region (112), the Eastern plateau and southeastern region (111) and the South region (110).

The **Northern region** is the main spring wheat production area. Although the accumulated rainfall was above average by 16%, the dekadal rainfalls from April to June were mostly below average. According to NDVI profiles, crop conditions were below average during the monitoring period. The average VCIx for this region was 0.67, and the proportion of cultivated land was 15% lower than the average. The spring wheat production is estimated to be below average.

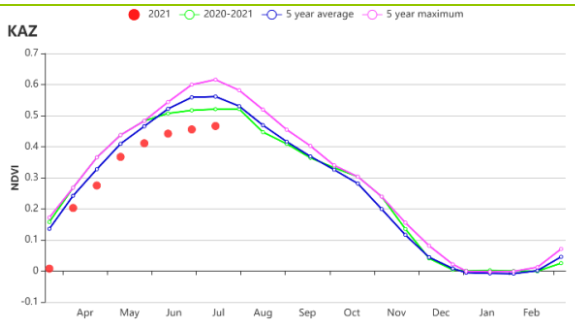
The **Eastern plateau and Southeastern region** had the largest precipitation departure (RAIN +32%) among three regions, while temperature was below average (TEMP -0.6°C). Crop conditions in this region were below average during this reporting period. The average VCIx for this region was 0.83, and CALF was below average by 9%. Outputs for spring wheat are unfavorable.

The **South region** received 100 mm of rainfall, which was lowest among the three regions. Temperature and radiation were above average. The average VCIx for this region was 0.67 and CALF was below average by 14%. The NDVI profiles show poor crop condition from April to July.

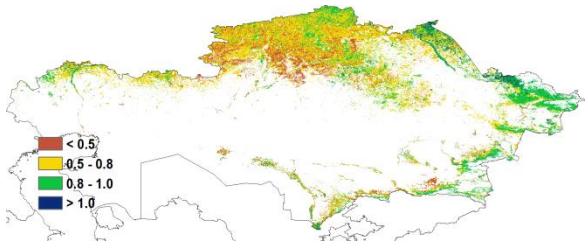
Figure 3.23 Kazakhstan's crop condition, April -July 2021



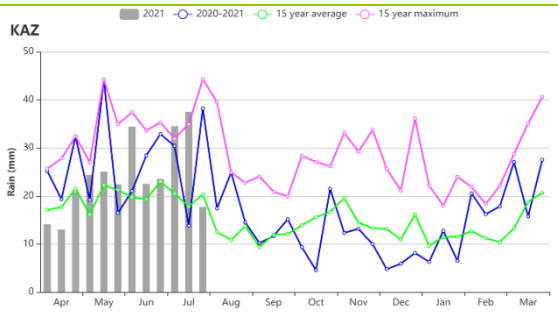
(a). Phenology of major crops



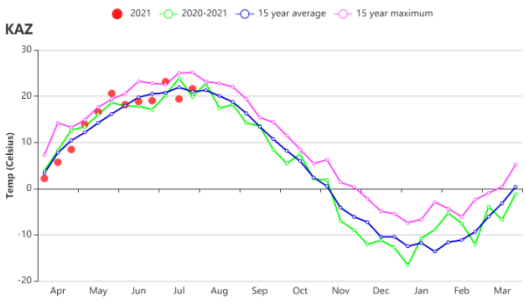
(b) Crop condition development graph based on NDVI



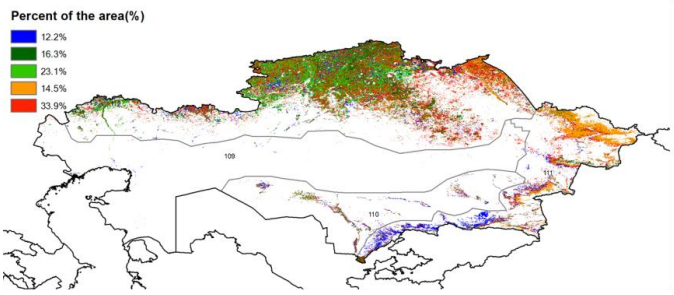
(c) Maximum VCI



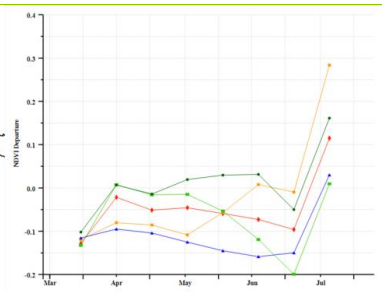
(d) Rainfall Index



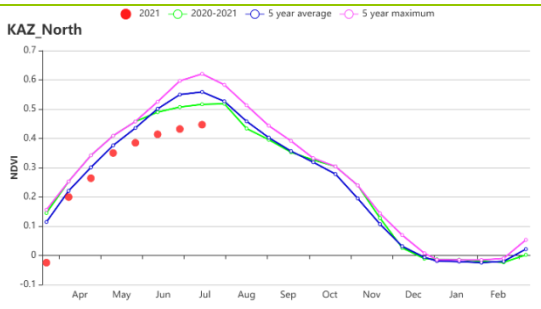
(e) Temperature Index



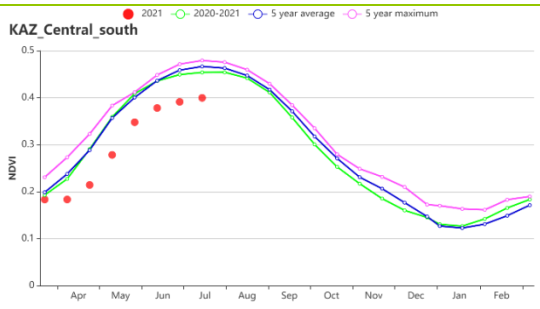
(f) Spatial NDVI patterns compared to 5YA



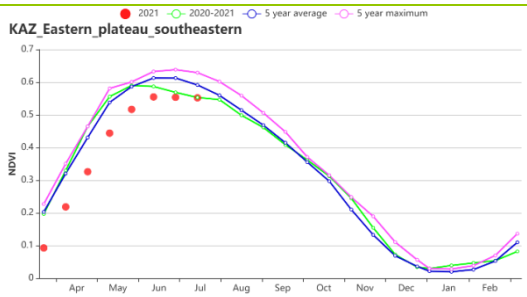
(g) NDVI profiles



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



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



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

Table 3.37 Kazakhstan agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 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 (%)
Northern region	244	16	15.6	0.4	1297	3	595	10
Eastern plateau and southeastern region	431	32	14.4	-0.6	1439	1	562	1
South region	100	6	22.8	0.4	1540	2	730	4

Table 3.38 Kazakhstan, agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 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 has two rainy seasons. The long rainy season lasts from March to May and the short rainy season lasts from October to December. Maize can be grown during the long and short rains, whereas wheat is grown during the long rains only. During the monitoring period from April to July 2021, the short rain maize has been harvested, the sowing of long rain maize has started and wheat sowing starts in May.

At the national scale, precipitation was 546 mm, 12% below average. The weather was slightly cooler (TEMP -0.2°C) and RADPAR was slightly above the 15YA (+3%). The BIOMSS was 1% lower than average. According to the national rainfall profiles, the 10-day accumulations of rainfall presented conditions that were close to the 15YA in April and May but significantly below average in June and July. At the sub-national level, almost all regions received less rainfall and the eastern coastal region had the largest negative departure in rainfall compared with the 15YA (RAIN -26%).

The NDVI development graph at the national level shows lower-than-average NDVI values from April to July. Crop growth condition was significantly below average since June, mainly due to delayed maize planting caused by drought conditions. Significantly lower-than-average precipitation in May and June may have also affected the sowing of wheat in the north. According to the NDVI clusters map and the NDVI departure profiles, western Kenya accounting for 54% of national cropland (areas in red color) had near-average NDVI values, while other areas showed significant deviations in crop growth. This was in agreement with the maximum VCI graph which shows relatively low VCI between 0.5 and 0.8 in the central and southeastern regions. The national average VCI value reached 0.82, and the cropped arable land fraction remains virtually unchanged as compared to the 5YA. In general, crops in Kenya were severely affected by the drought, with the exception of the north-western region.

Regional analysis

The largest negative departure in RAIN was observed in the Eastern coastal region, with average TEMP and 5% above average RADPAR. The shortage of rainfall resulted in a significant drop of NDVI compared with the 5YA throughout the monitoring period. The drought conditions also hampered the sowing of crops as indicated by a 10% drop in CALF compared to the 5YA. The maximum VCI was only 0.68, the lowest among the four AEZs in Kenya. In general, the crop condition was unfavorable in the coastal area with poor perspectives for livestock and crop production.

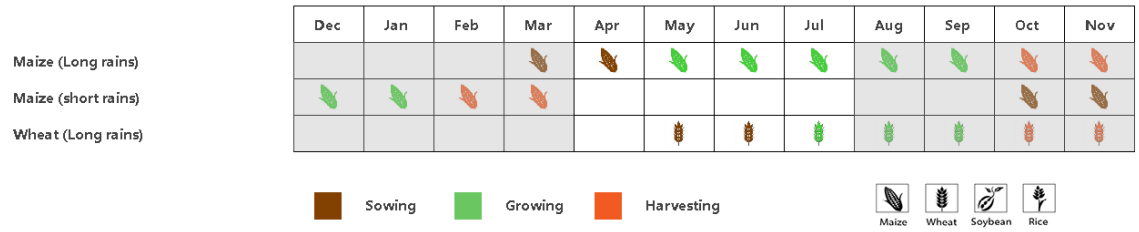
The Highland agriculture zone recorded 582 mm of rain, which was below the 15YA (-11%). In combination with lower temperatures (TEMP -0.2°C) and higher RADPAR (+3%), a lower estimate for biomass resulted (-2%). The NDVI remained below the 5YA from April to July. The maximum VCI value recorded was 0.82. The CALF increased by 2% to 97%. Overall, crop growth has been severely affected by drought conditions in the upland agricultural areas where rainfall was below average.

Agro-climatic indicators in the Northern rangelands region with sparse vegetation were similar to those in the Eastern coastal region. Precipitation was significantly below average at 368 mm, decreasing by 17%. Temperature was close to the 15YA, whereas RADPAR was above average (+1%). BIOMSS was below average (-2%). The below-average trend of its crop condition development graph indicates that the region is affected by drought. The maximum VCI was normal at 0.73. CALF was unchanged.

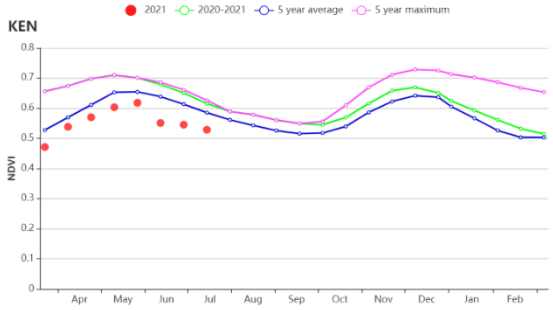
The Southwest region includes the districts Narok, Kajiado, Kisumu, Nakuru, and Embu. The following indicator values were observed: RAIN 851 mm (-16%); TEMP 18.3°C (-0.5°C); RADPAR and BIOMSS both slightly improved. CALF was unchanged and VCIx was 0.90. The crop conditions were normal. NDVI values generally closely followed the five-year average. Despite the large variation in precipitation, its biomass,

CALF and RADPAR all increased and the VCIx value remained at a level of 0.9. This indicates normal crop growth in this region.

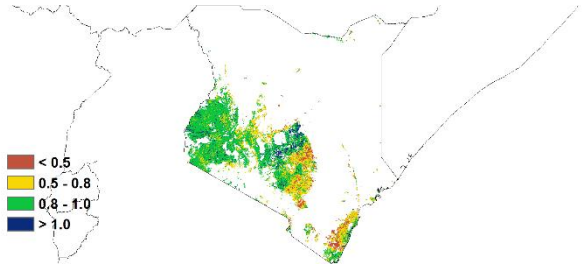
Figure 3.24 Kenya's crop condition, April- July 2021



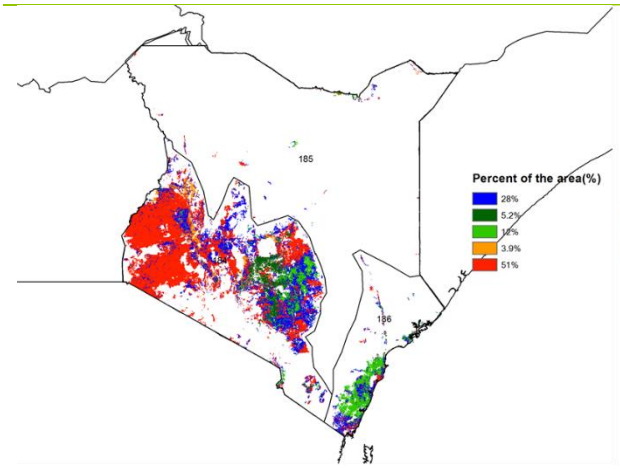
(a) Phenology of major crops



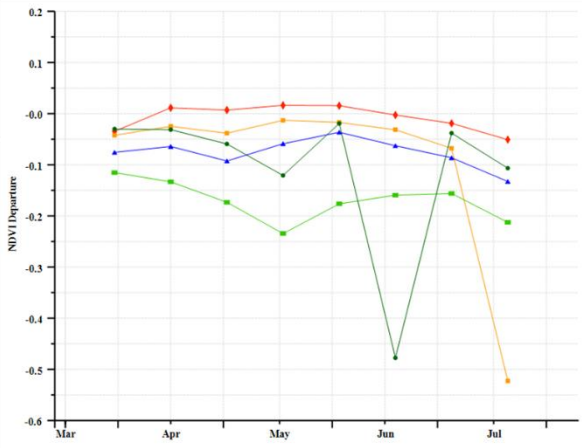
(b) Crop condition development graph based on NDVI



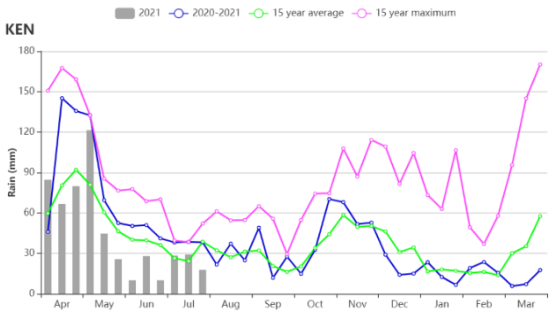
(c) Maximum VCI



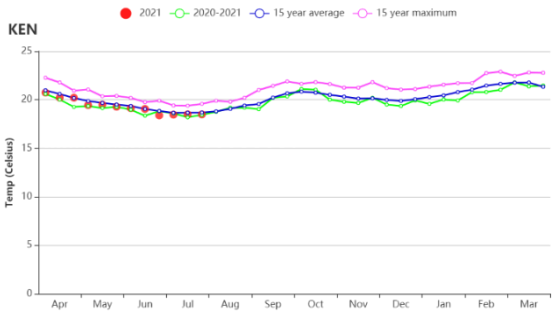
(d) Spatial NDVI patterns compared to 5YA



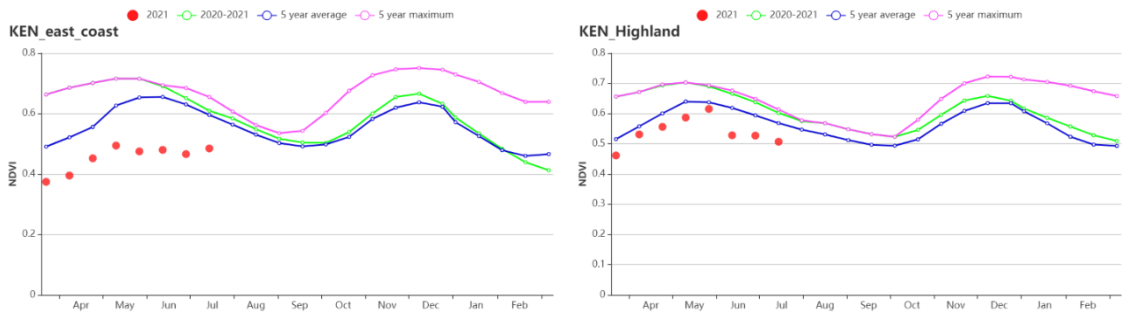
(e) NDVI profiles



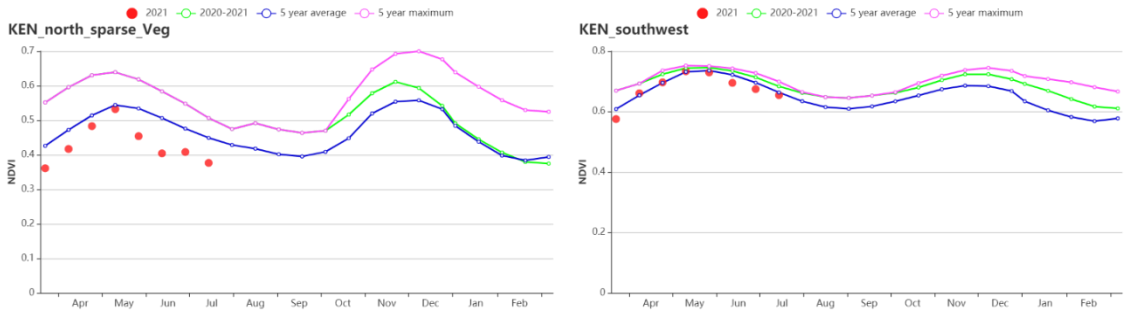
(f) Rainfall profiles



(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, April-July 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m2)	Departure (%)	Current (gDM/m2)	Departure (%)
Coast	243	-26	24.9	0.0	1198	5	765	3
Highland agriculture zone	582	-11	18.0	-0.2	1114	3	507	-2
nothern rangelands	368	-17	22.5	-0.1	1205	1	673	-2
South-west	851	-16	18.3	-0.5	1220	5	587	2

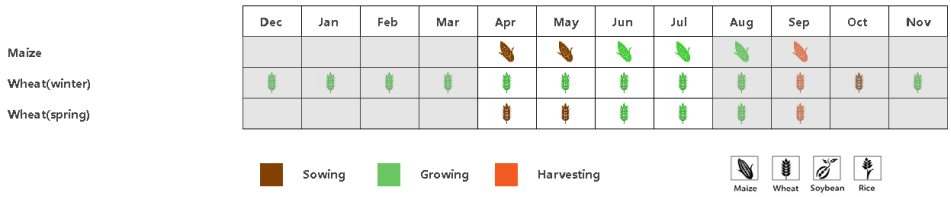
Table 3.40 Kenya's agronomic indicators by sub-national regions, current season's values and departure, April-July 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Coast	88	-10	0.68
Highland agriculture zone	97	2	0.82
nothern rangelands	80	0	0.73
South-west	100	0	0.90

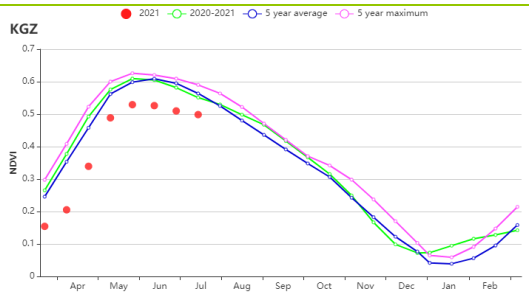
[KGZ] Kyrgyzstan

The reporting period covers the sowing and growing stages of maize, and the growth and harvest of wheat. Among the CropWatch agro-climatic indicators, RAIN (+12%) and RADPAR (+2%) were above average, while TEMP (-0.2°C) was slightly below average. The combination of the factors resulted in an above-average BIOMSS (+2%) compared to the 15YA. As we can see from the time series rainfall profile, the precipitation was above the 15-year average in early May, late May, middle June and early July. From the time series temperature profile, the temperature was lower than the 15YA in April, middle May, middle to late June and middle July. The lower temperature was favorable for pastures, but due to the lack of heat, the glaciers were melting more slowly resulting in a hydrological drought caused by low water levels in the rivers, which influences irrigation. Slightly unfavorable agro-climatic conditions in the early part of the monitoring period affected the growth of wheat and maize to some extent. Therefore, the nationwide crop conditions were below average throughout the whole monitoring period. The spatial NDVI clustering profile shows that all of the cultivated regions suffered from below-average crop conditions from the beginning of the monitoring period to early June. Then, 21.7% of the cropped areas (marked in red) firstly recovered to above-average crop conditions in middle June, mainly located in the southwestern part of Jalal-Abad region and in the northwestern part of Osh region. By the end of the monitoring period, there was only 21.7% of the cropped areas (marked in red) remaining near-average crop conditions. All the other clustered regions had below-average crop conditions throughout the country. The spatial pattern of maximum Vegetation Condition Index (VCIx) was in accord with the spatial distribution of the NDVI profiles. CALF decreased by 3% and the nationwide VCIx average was 0.81. Crop conditions in Kyrgyzstan can be assessed as fair. Close-to-average wheat yields can be expected. Maize harvest will start in September.

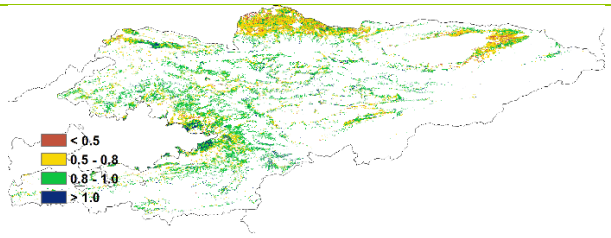
Figure 3.25 Kyrgyzstan's crop condition, April - July 2021



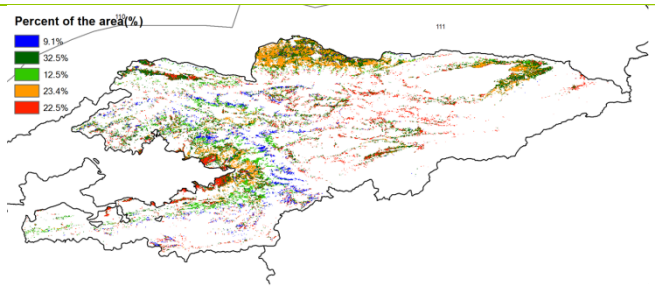
(a). Phenology of major crops



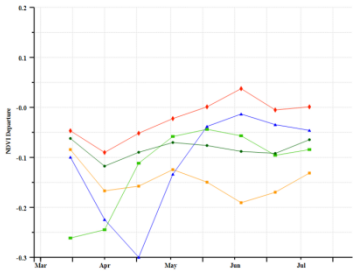
(b) Crop condition development graph based on NDVI



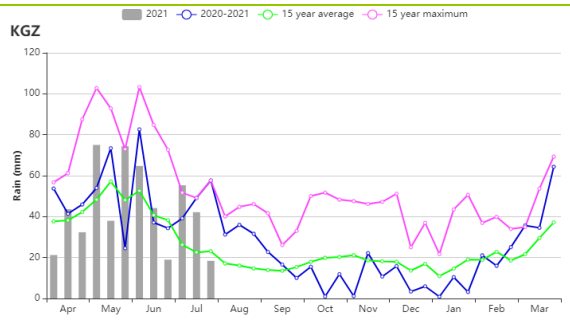
(c) Maximum VCI



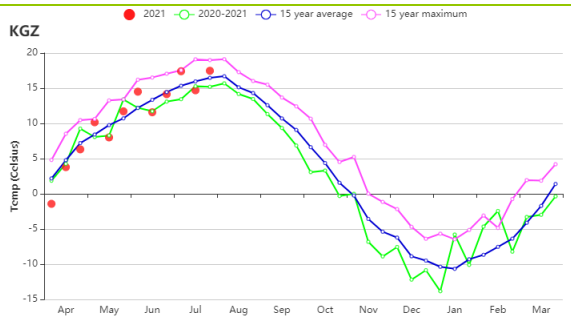
(d) Spatial NDVI patterns compared to 5YA



(e) NDVI profiles



(f) Time series rainfall profile



(g) Time series temperature profile

Table 3.41 Kyrgyzstan agro-climatic indicators, current season's values and departure from 15YA, April - July 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 (%)
Kyrgyzstan	528	12	10.7	-0.2	1508	2	467	2

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current
Kyrgyzstan	94	-3	0.81

[KHM] Cambodia

The wet season in Cambodia usually lasts from May to October, which is the primary production period for the main crops. Within this monitoring period, the harvest of early rice (dry season) and dry season maize was completed in April and the maturation of soybean started in July. Early rice (wet season) and wet season maize started to be planted in May, followed by the floating rice and medium rice.

Cambodia generally experienced normal agro-climatic conditions compared to the past 15 years. As the agro-climate indicators show, the rainfall for the country was slightly higher than average (RAIN, +3%) and the temperature (TEMP) was about average. Moreover, the radiation was above average as well (RADPAR, +5%), which contributed to an above-average predicted biomass (BIOMSS, +6%). Cambodia had experienced several natural disasters during the monitoring period, including strong winds and heavy downpours in early May and heavy rain mixed with strong winds brought by the typhoon Cempaka in late July. The cropped arable land fractionwas slightly higher than average (CALF, +2%), and the maximum VCI value was at 0.88, which indicates the crop conditions were close to average.

According to the NDVI profile for the country, the initial NDVI values were lower than the average of the previous 15 years, which is inferred to be the consequence of the below-average precipitation in March and early April, and then they recovered to the average level in the early May with an increasing rainfall. However, the NDVI values began to decline in early July and remained below the average level, which may have been due to the impact of Cempaka. The spatial patterns of the NDVI profiles show that about 14.3% of crop land (shown by the dark green, mainly located in southwest of the Kampong Cham) had an NDVI that was around 0.1 below average during the whole reporting period. For about 17.7% of crop land (shown by the red color), the NDVI values were higher than average by more than 0.1 in May and June. This indicates that the soybean condition was favorable in Prey Veng.

Regional analysis

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

For the **Tonle Sap Lake area**, compared to the average condition, the rainfall was higher (RAIN, +4%) and the temperature was close to the average (TEMP, +0.1℃). In the meanwhile, the radiation increased above the average level (RADPAR, +4%). The agro-climatic conditions mentioned above were beneficial to the growth of the crops and thus the predicted biomass increased by 5% above the 15YA. According to the NDVI profile, NDVI values were close to the average of the past 5 years before mid-June, when they started to drop slightly below the average.

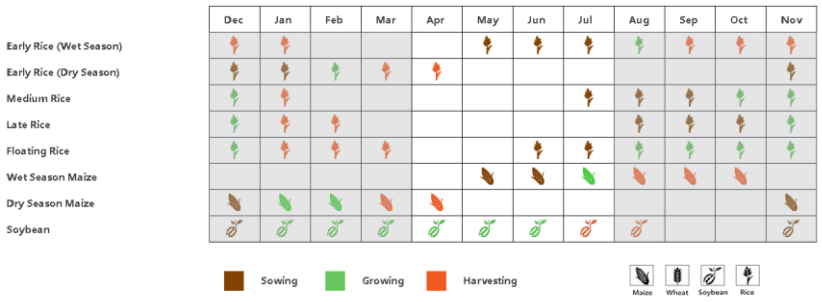
As the main rice growing area of Cambodia, the **Mekong valley between Tonle Sap and Vietnam border** recorded a decreased precipitation (RAIN, -7%), near-average temperature (TEMP) and above-average radiation (RADPAR, +5%). As a result, the predicted biomass was higher than average by 6%. However, as shown by the NDVI profile, the NDVI values were lower than average after the mid-June, which was inferred to be caused by the delay of sowing of early wet-season rice.

The **Northern plain and northeast** experienced a wetter (RAIN, +9%) and slightly cooler (TEMP, -0.1℃) weather compared to the 15YA. The radiation for the region increased (RADPAR, +7%), and the resulted biomass was predicted 8% higher than average (BIOMSS, +8%). The recorded NDVI values for the region was below average for the whole reporting period, especially in mid-May and late July, which is considered as the consequence of the strong winds and heavy downpours in May and the typhoon Cempaka in July.

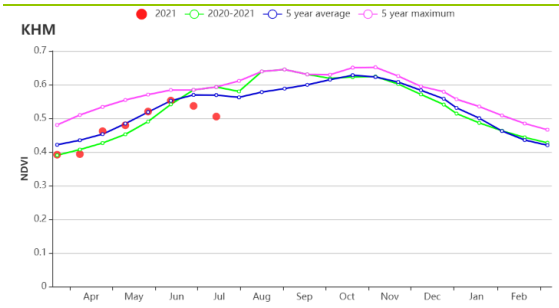
For the **region of Southwest Hilly**, the precipitation was 2% higher than average (RAIN, +2%) , accompanied by near-average temperature (TEMP, +0.2℃) and above-average radiation (RADPAR, +3%), which resulted in an increase for biomass (BIOMSS, +4%). The cropped arable land fraction remained close to the average

(CALF, 99%), and the maximum VCI for the region was at 0.91. However, the NDVI values for the region were slightly lower than average, which means the crop conditions for the region were near average.

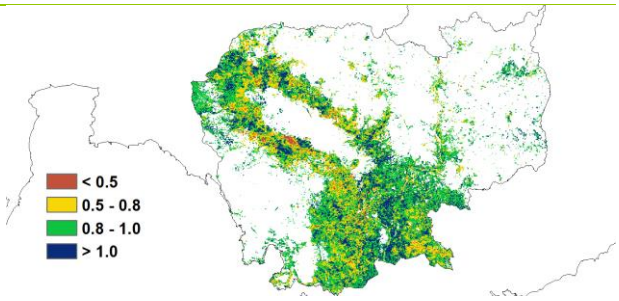
Figure 3.26 Cambodia's crop condition, April - July 2021



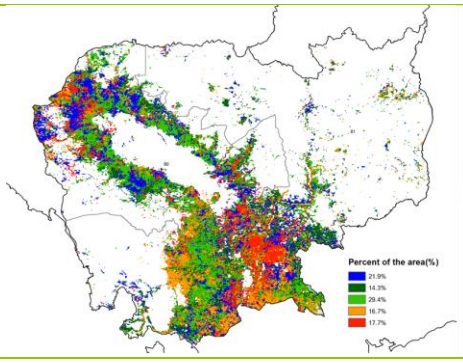
(a) Phenology of major crops



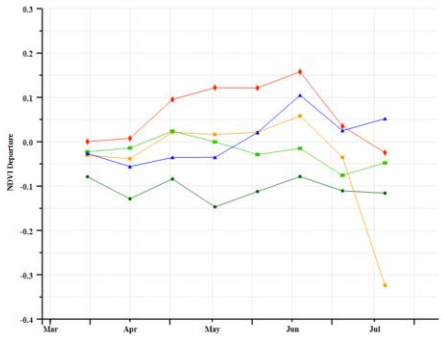
(b) Crop condition development graph based on NDVI



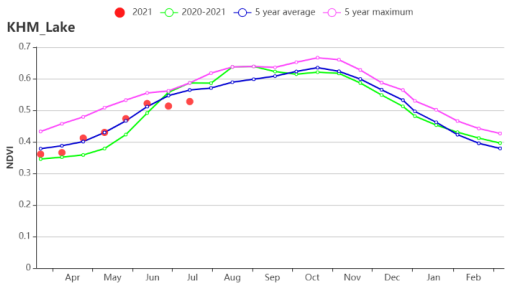
(c) Maximum VCI

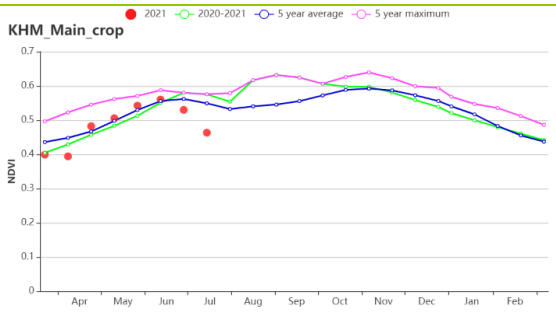


(d) Spatial NDVI patterns compared to 5YA

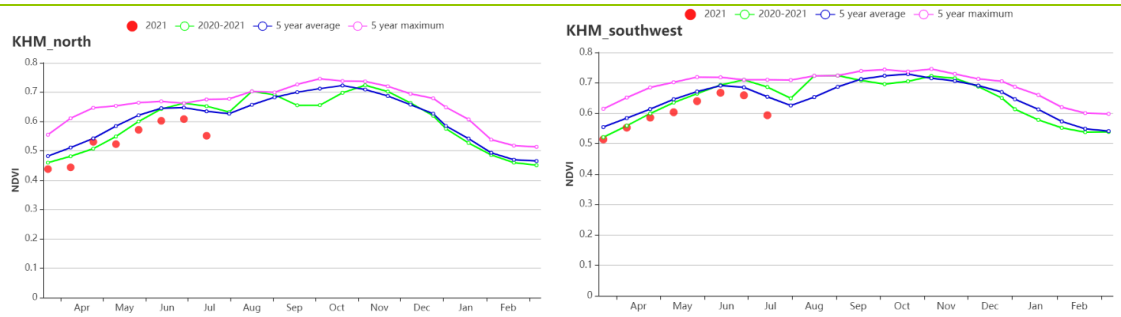


(e) NDVI profiles





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



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

Table 3.43 Cambodia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 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 (%)
Tonle-sap	890	4	27.3	0.1	1221	4	831	5
Mekong valley	906	-7	27.3	0.0	1235	5	844	6
Northern plain and northeast	1320	9	26.7	-0.1	1220	7	826	8
Southwest Hilly region	1047	2	25.7	0.2	1228	3	846	4

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current
Tonle-sap	95	2	0.87
Mekong valley	93	**2**	0.89
Northern plain and northeast	98	0	0.87
Southwest Hilly region	99	0	0.91

[LKA] Sri Lanka

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

This period is dominated by the south-western monsoon, which is active between May and September. At the national level, precipitation significantly increased (RAIN +40%) and radiation also increased (RADPAR +1%), while temperature (TEMP -0.3℃) experienced a slight decrease as compared to the 15-year average (15YA). The increase in rainfall mainly happened in May. As shown on the NDVI development graph, NDVI values were always near average from April to May and slightly above average in early June and below average in July compared to the 5-year average (5YA). The fraction of cropped arable land (CALF) was 1% above the recent five-year average. Potential biomass was 2% above the 15YA. The maximum VCI (VCIx) for the whole country was 0.95.

As shown by the NDVI clusters map at the national level, 40.8% of cropland showed above-average condition from April to July. 7.8% of cropland showed a large decline of NDVI values in late May and early July, as well as 7.2% in late July, which may have been an outlier due to cloud cover. Overall, prospects for crop production are normal.

Regional analysis

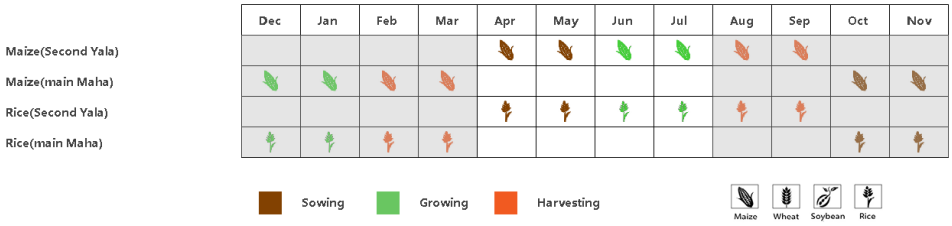
Based on the cropping system, climatic zones and topographic conditions, three sub-national agroecological regions can be distinguished for Sri Lanka. They are the **Dry zone**, the **Intermediate zone**, and the **Wet zone**.

In the **Dry zone**, the recorded rainfall (RAIN 629 mm) was 50% above average, which could meet the water demand of maize growing in this region. The temperature was below average (TEMP -0.4℃) with increased radiation (RADPAR +2%) and above-average potential biomass (BIOMSS +3%) compared with the 15-year average. CALF was 2% up compared to the 5YA level and cropland was near fully utilized. NDVI followed a similar trend as the whole country. The VCIx for the zone was 0.94. Overall, crop conditions were close to the average for this zone.

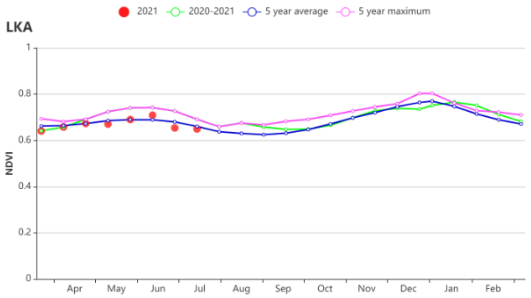
The **Intermediate zone** went through the rainy season during this monitoring period. Rainfall (RAIN 1358 mm) was up by 46% when compared to the 15YA. Temperature, radiation and potential biomass were below average (TEMP -0.4℃, RADPAR -1% and BIOMSS -1%). NDVI followed a similar trend as the whole country. The VCIx value for the zone was 0.96. Overall, crop conditions were average for this zone.

The **Wet zone** also experienced an abundant precipitation (RAIN 2534 mm), 34% above the 15YA. This is more than sufficient for rice and maize. The temperature was down by 0.1°C compared to the 15YA with radiation close to the 15YA. With full use of cropland, potential biomass was close to the average for this zone. NDVI values were below average except for near average in early May and above average in late June. The VCIx value for the zone was 0.96. Crop conditions were assessed as close to the average for this zone.

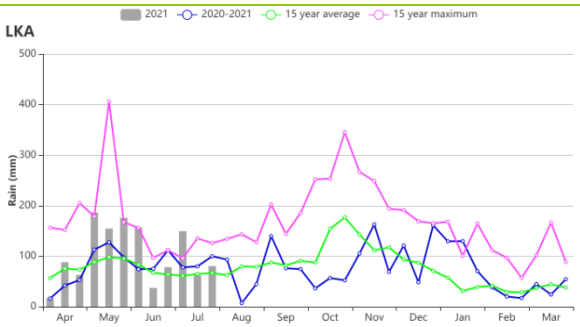
Figure 3.27 Sri Lanka's crop condition, April-July 2021



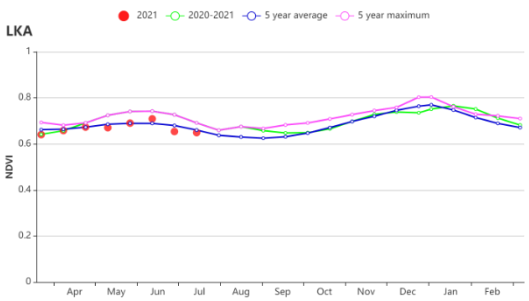
(a) Phenology of major crops



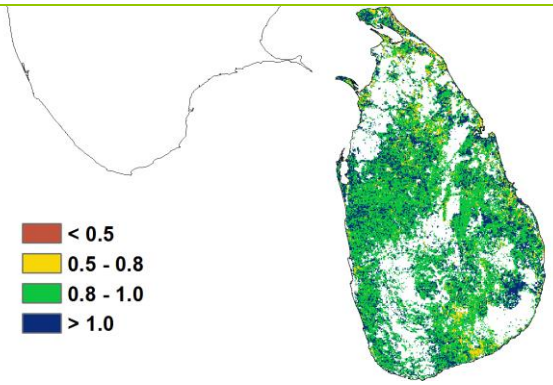
(b) Crop condition development graph based on NDVI



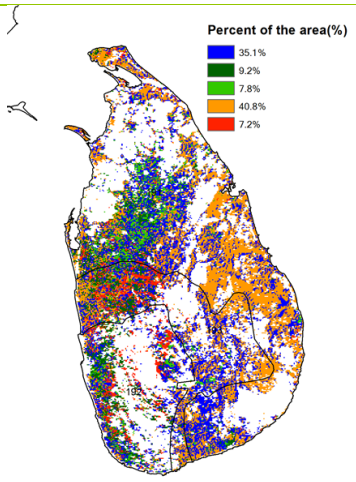
(c) Rainfall profile



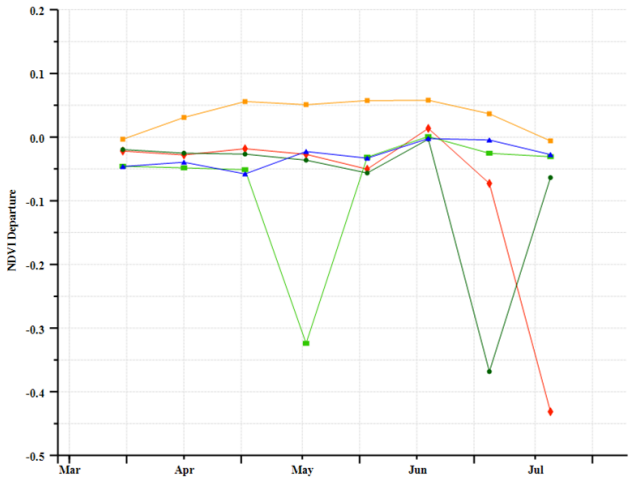
(d) Temperature profile



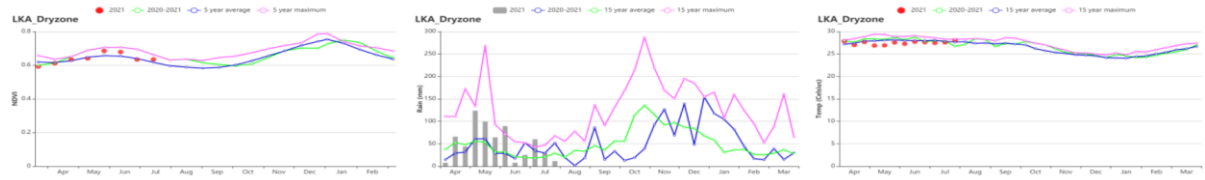
(e) Maximum VCI



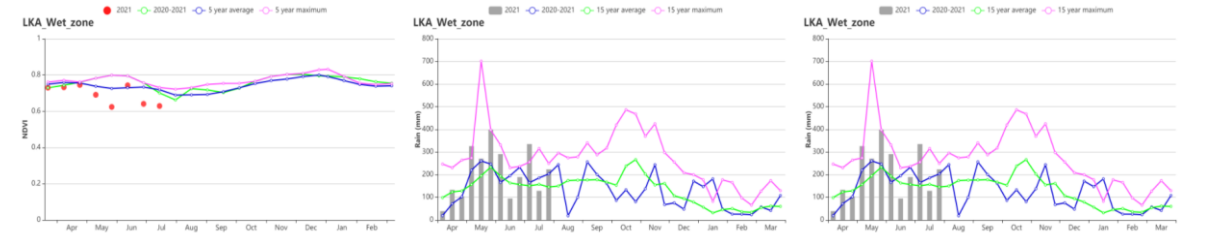
(f) Spatial NDVI patterns compared to 5YA



(g) NDVI profiles



(h) Dry zone crop condition development graph based on NDVI (left), time series rainfall profiles (middle) and temperature (right)



(i) Wet zone crop condition development graph based on NDVI (left), time series rainfall profiles (middle) and temperature (right)

(j) Intermediate zone crop condition development graph based on NDVI (left), time series rainfall profiles (middle) and temperature (right)

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

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Dry zone	629	50	27.4	-0.4	1340	2	872	3
Intermediate zone	1358	46	24.8	-0.4	1186	-1	764	-1
Wet zone	2534	34	24.7	-0.1	1177	0	793	0

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

Region	Cropped arable land fraction		Maximum VCI
	Current	Departure (%)	Current
Dry zone	98	2	0.94
Intermediate zone	100	0	0.96
Wet zone	100	0	0.96

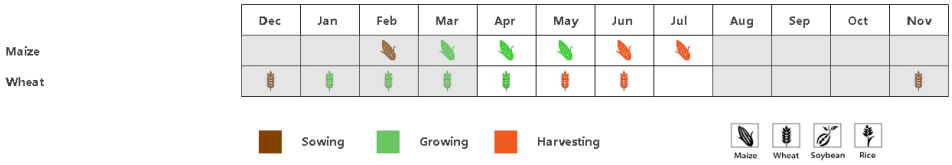
[MAR] Morocco

During this monitoring period (April-July), wheat reached maturity by the end of April. It was harvested in May and June. Maize matured by the end of May and was harvested in June and July. The cumulative rainfall was 36% above the 15-year average (15YA). The average temperature was 20.2℃, close to the 15YA. Both RADPAR and BIOMSS were slightly below the 15YA by 2% and 2%, respectively. The nationwide NDVI development graph indicates that the crop conditions were above the 5-year average (5YA) until the end of April and slightly below the 5YA during the remaining period. The NDVI spatial pattern shows that 19.1% of the cultivated area was above the 5YA crop conditions, 18.8% were below, and 62% fluctuated around the 5YA; the latter was 19% higher than the 5YA to the end of April. CALF was above the 5-year average (5YA) by 23%, with the VCIx value reaching 0.85, confirming favorable crop conditions.

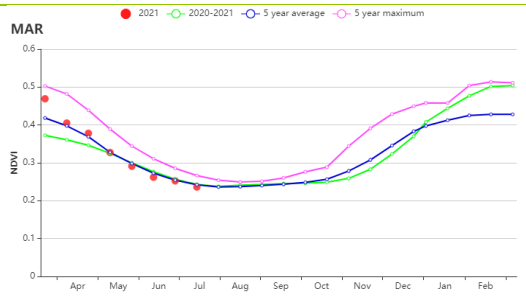
Regional analysis

CropWatch demarcates three agro −ecological zones (AEZs) relevant for crop production in Morocco: **the Sub-humid northern highlands**, **the Warm semiarid zone**, and **the Warm subhumid zone**. In **the Sub-humid northern highlands**, rainfall and temperature were above the 15YA by 66% and 0℃, respectively. Both RADPAR and BIOMSS were below the 15YA by 3% and 1%, respectively. In **the Warm semiarid zone**, rainfall was above the 15YA by 1%. Both RADPAR and BIOMSS were below the 15YA by 2%. In **the Warm sub-humid zone**, rainfall was above the 15YA by 50%. Both RADPAR and BIOMSS were below the 15YA by 3% and 1%, respectively. The NDVI profile confirms generally good crop conditions in the three zones, as it was slightly above the 5YA in April and early May. The CALF was 23%, 28%, and 21% above the 5YA, and the VCIx was 0.89, 0.82, and 0.87, for the three zones, respectively, confirming favorable crop conditions.

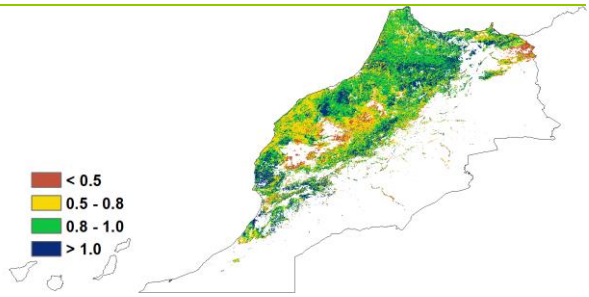
Figure 3.28 Morocco's crop condition, April - July 2021



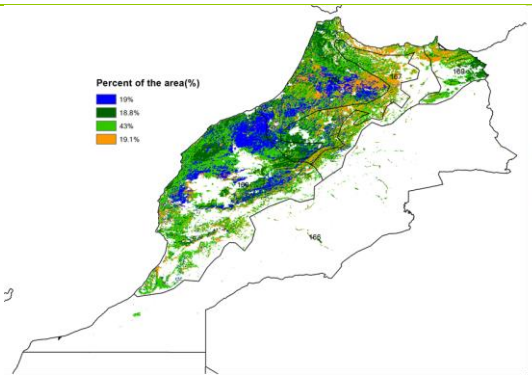
(a). Phenology of major crops



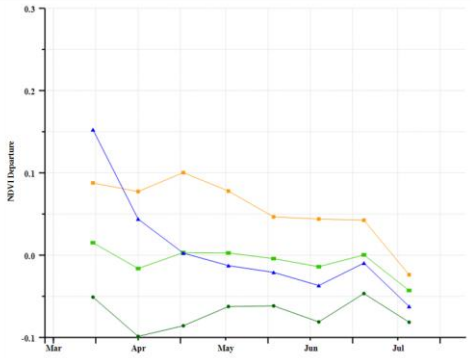
(b) Crop condition development graph based on NDVI



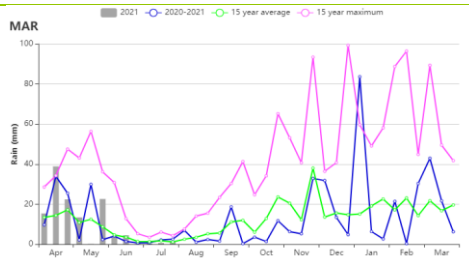
(c) Maximum VCI



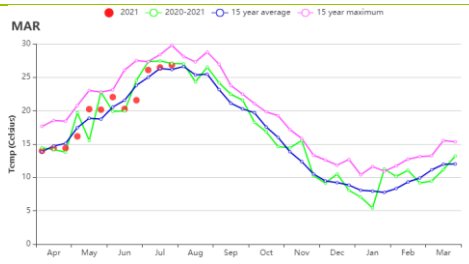
(d) Spatial NDVI patterns compared to 5YA



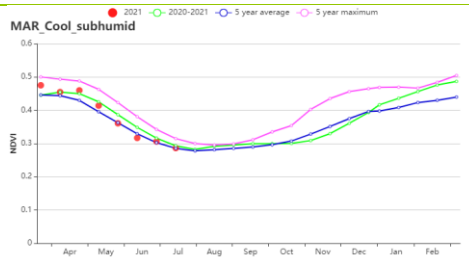
(e) NDVI profiles

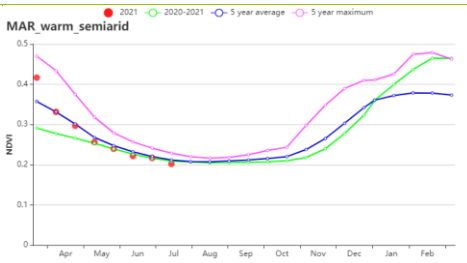


(f) Rainfall profiles

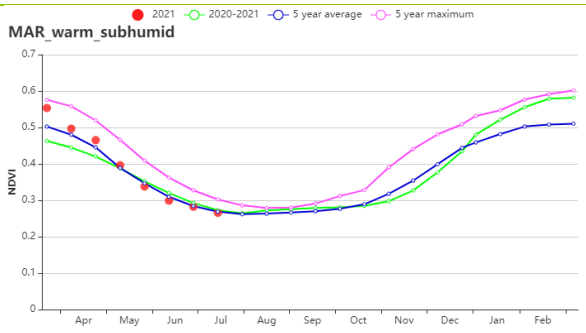


(g) Temperature profiles





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



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

Table 3.47 Morocco's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 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 (%)
Sub-humid northern highlands	211	66	19.7	0.0	1523	-3	624	-1
Warm semiarid zones	63	1	20.6	0.0	1591	-2	616	-2
Warm sub-humid zones	169	50	19.8	0.0	1534	-3	657	-1

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current
Sub-humid northern highlands	68	23	0.89
Warm semiarid zones	26	28	0.82
Warm sub-humid zones	76	21	0.87

[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 above average (+17%). Accordingly, BIOMSS increased by 2% as compared to the 15YA. CALF was close to average and reached 85%. Favorable weather conditions and relatively high CALF made the VCI reach 0.93.

Some parts of Mexico had suffered the worst drought in 30 years during the 2020/21 winter season. Crop growth reported in this monitoring period was initially also affected by the drought. At the national scale, the NDVI graph was not above average until mid-July. 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 east of the Tamaulipas and the northeast of Veracruz province. Other areas with high VCIx were scattered in the eastern coastal areas, whereas extremely low values (less than 0.5) occurred in the west and north of the country.

In April, most parts of central and northern Mexico suffered from drought. The water storage levels of the reservoirs were low and farmers had to limit irrigation. This bulletin believes that this has led to reduced planting and crop growth in northern Mexico. After April, with the gradual recovery from the drought crop growth started to reach average levels. 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, only 21.7% of the total cropped areas were positive during the entire monitoring period, mainly distributed in the south of Veracruz and Tabasco. About 59% of total cropped areas were below average, mainly in the north of Mexico.

Overall, the crop conditions in the north were below average, but reached average or above average levels in the center and south of the country.

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 before mid-July. VCIx was relatively low with a value of 0.89 and CALF increased by 4% compared with the 5YA. RAIN increased by 17% and TEMP and RADPAR were close to average. The Arid and semi-arid region was the most drought affected region and the VCIx was 0.89.

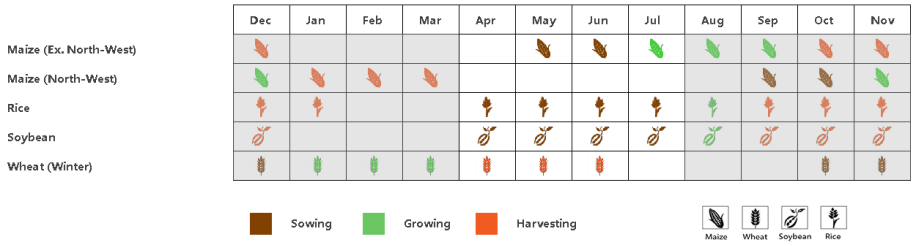
The region of **Humid tropics with summer rainfall** is located in southeastern Mexico. RAIN was significantly above average (+21%), TEMP was 0.1℃ warmer and RADPAR was near the 15YA, which resulted in an increase of BIOMSS (3%). As shown in the NDVI development graph, crop conditions were closed to average from April and July. The VCIx (0.95) 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 at the beginning of this monitoring period, but then recovered to average levels. The agro-climatic condition showed that RAIN increased by

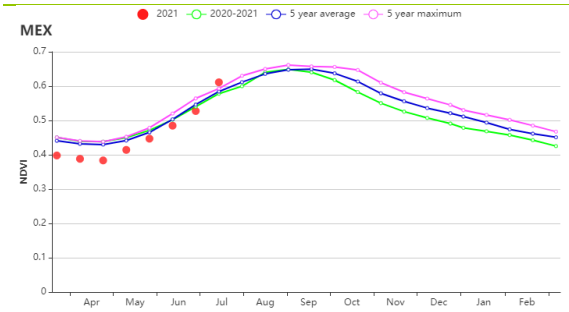
16%, TEMP decreased by 0.3, and RADPAR decreased by 2% compared to the 15YA. BIOMSS also decreased by 1% and CALF was 98%. Favorable meteorological conditions and high CALF made VCIx reach 0.96.

The region called **Sub-humid hot tropics with summer rains** is located in southern Mexico. During the monitoring period, crop conditions were below average between April and June, as shown by the NDVI time profiles. Agro-climatic conditions showed that RAIN was above average (+17%) while TEMP and RADPAR were near average (-0.1°C and -2% respectively). The VCIx for the region was 0.95 and BIOMSS was below average.

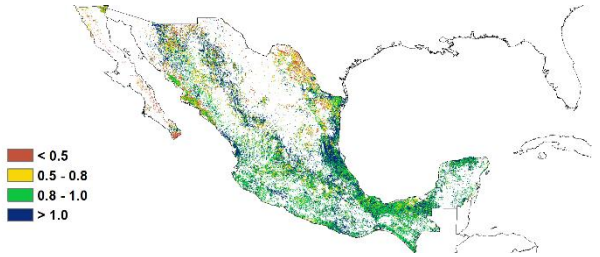
Figure 3.29 Mexico's crop condition, April - July 2021



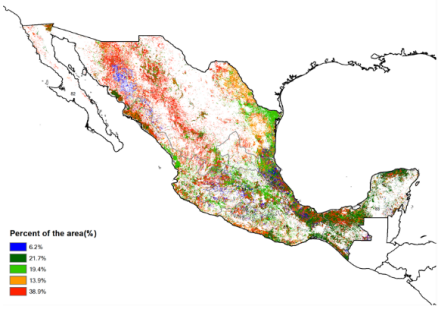
(a) Phenology of major crops



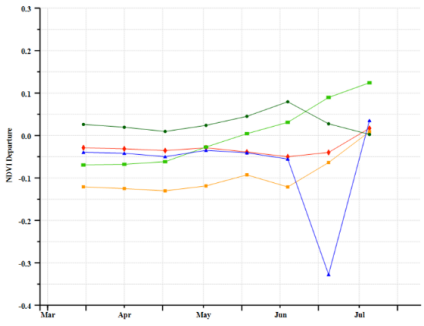
(b) Crop condition development graph based on NDVI



(c) Maximum VCI



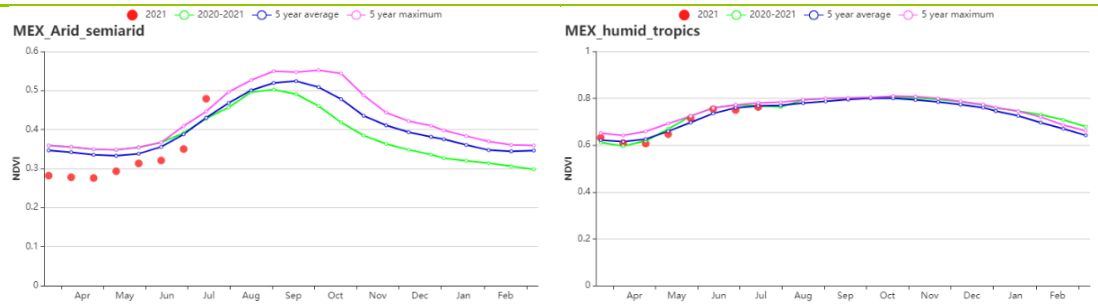
(d) Spatial NDVI patterns compared to 5YA



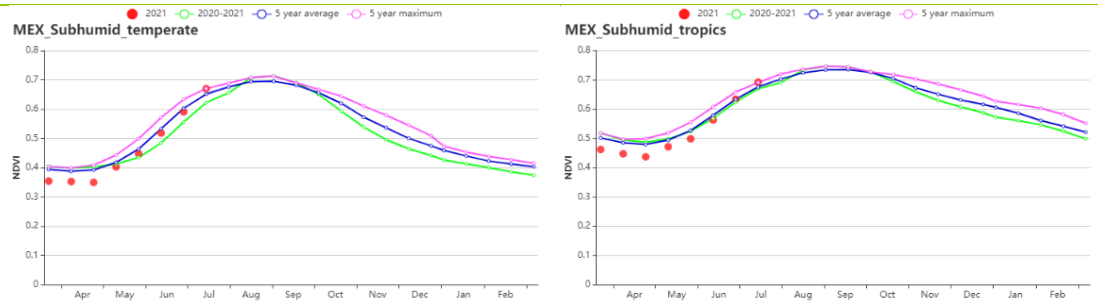
(e) NDVI profiles

(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 tropics with summer rains (right))

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

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Arid and semi-arid regions	435	17	22.9	-0.1	1540	-2	712	4
Humid tropics with summer rainfall	1029	21	26.1	0.1	1386	1	902	3
Sub-humid temperate region with summer rains	839	16	20.4	-0.3	1418	-2	666	-1
Sub-humid hot tropics with summer rains	790	17	23.4	-0.1	1432	-2	714	-2

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Arid and semi-arid regions	67	4	0.89
Humid tropics with summer rainfall	100	0	0.95
Sub-humid temperate region with summer rains	98	3	0.96
Sub-humid hot tropics with summer rains	97	1	0.95

[MMR] Myanmar

Myanmar produces maize, rice (two seasons) and wheat as its main crops. They are predominantly grown across the eastern mountains, central plains and the western coastal areas. The harvesting of maize was completed in April, while the second rice (summer rice) was harvested between April and June. The planting of main rice (monsoon rice) started in May and June. However, the planting period varies according to region and weather conditions. The crop condition development graph based on NDVI shows that the crop conditions during the monitoring period were lower than average in June and July.

Compared with the 15YA, TEMP was slightly higher (+0.5℃), but RAIN showed a large drop (-18%). According to its profile, the precipitation in Myanmar continued to be below average from late April to late June. At the end of the monitoring period, the precipitation had recovered and exceeded the average level. It created favorable conditions for the planting of new crops. RADPAR showed a small change (+2%), while the biomass (+6%) was slightly higher than average and the CALF was 6% below average. During the monitoring period, the maximum VCI value for the whole country was 0.85.

The spatial distribution of crop condition can be divided into two periods according to the NDVI cluster and profile maps: Before mid-May, the crop conditions trended near average. In the second period, the crop situation was more complicated: 34.4% of the cultivated area had good crop conditions, even slightly higher than the average level, mainly distributed in the western part of Mandalay, Shan State, Yangon and Magway. In the southern region of Mandalay and the central region of Magway, 20.5% of the total cultivated area had poor crop conditions in mid-June but recovered to near average by the end of July. 13.7% of the areas, mainly in the north-central Irrawaddy, had bad crop condition in early June and returned to above average by early July. The large negative departures of NDVI were presumably due to cloud cover in the satellite images. The VCIx map shows low values in the central part of the country. Overall crop conditions were below average.

Regional analysis

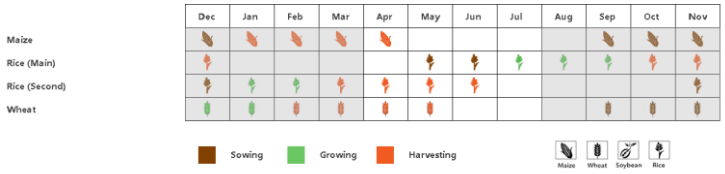
Based on the cropping system, climatic zones and topographic conditions, three sub-national agro-ecological regions (AEZ) can be distinguished for Myanmar. They are the **Coastal region, the Central plain, and the Hills region**.

The cumulative precipitation in the **Central plain** decreased significantly (RAIN -41%), TEMP was higher (+0.9℃) and RADPAR was close to average (+0%). The biomass was 4% higher than the average. The CALF was 77%. It showed that the cultivated land in this area was not fully utilized. It was 6% lower than the 5YA. NDVI was slightly below average during most of the monitoring period, and the maximum VCI value was 0.79 for this region.

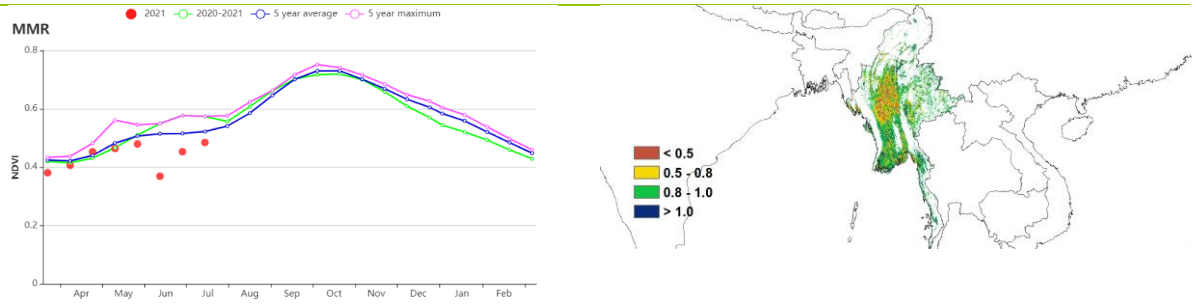
The cumulative precipitation in the **Hills region** decreased by 14% compared with the average level of the past 15 years, and the temperature was 0.4℃ higher. The CALF reached 95%, which is the highest among the agricultural areas in Myanmar. The cultivated land in this region has been fully utilized. This was the only region in which RADPAR was above average (+3%), and the biomass was slightly above average (+5%). The maximum VCI value was 0.91 for this region. The crop condition in this region was slightly below the average level.

In the **Delta and Southern Coastal region**, the cumulative precipitation was below average (-13%), whereas the temperature was only 0.2℃ higher than average, and the RADPAR was close to average (-1%). CALF increased by 11% compared with the 5YA to 87%, as more cultivated land was put into use. NDVI was slightly higher than average, and the maximum VCI value reached 0.90, indicating that the crop growth in this area was relatively normal.

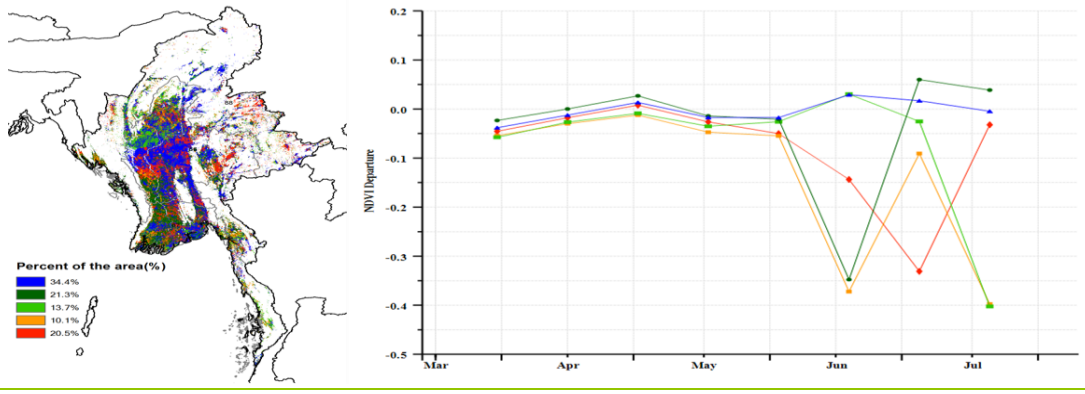
Figure 3.30 Myanmar 's crop condition, April-July 2021



(a). Phenology of major crops

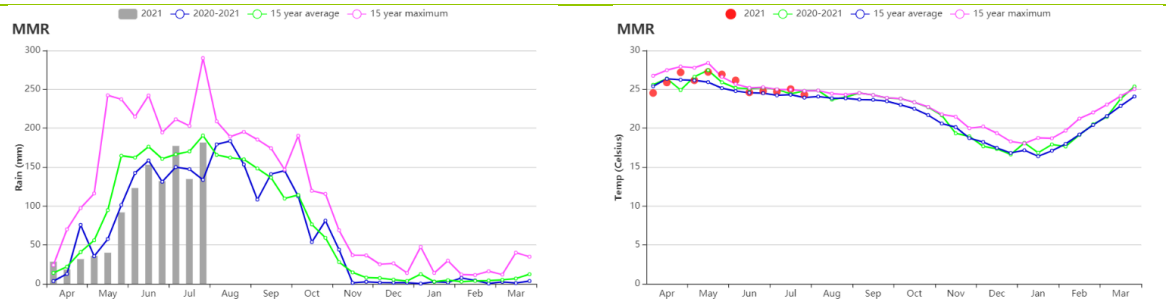


(b) Crop condition development graph based on NDVI



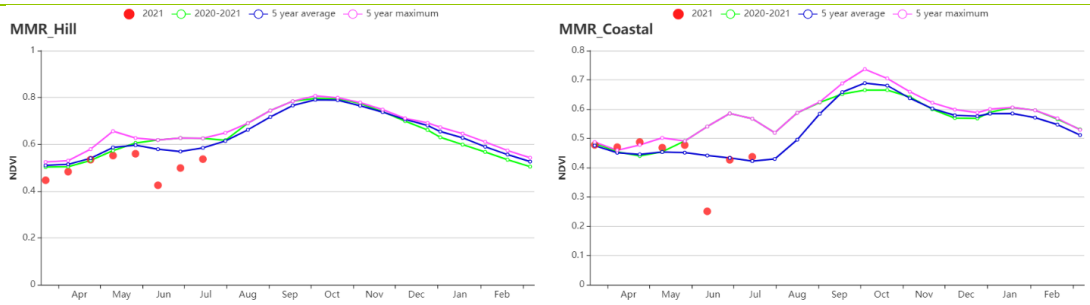
(d) Spatial NDVI patterns compared to 5YA

(e) NDVI profiles

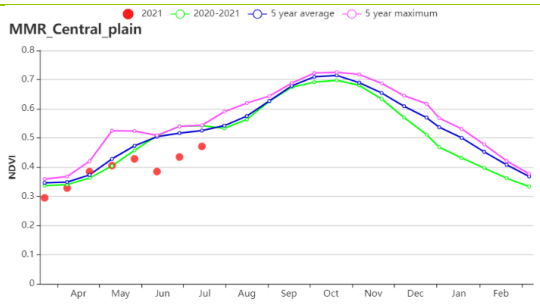


(f) Rainfall time series profile

(g) Temperature time series profile



(h) Crop condition development graph based on NDVI (Hills region (left) and Delta and Southern Coastal region (right))



(i) Crop condition development graph based on NDVI (**Central plain**)

Table 3.51 Myanmar 's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April-July 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 (%)
Delta and southern-coast	1512	-13	27.5	0.2	1214	-1	829	10
Central plain	546	-41	27.1	0.9	1186	0	766	4
Hill region	1334	-14	24.1	0.4	1173	3	713	5

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current
Delta and southern-coast	87	11	0.90
Central plain	77	-6	0.79
Hill region	95	0	0.91

[MNG] Mongolia

During the monitoring period, the temperature has been higher than 0℃ since April and reached the highest in July, which corresponds to the sowing and growing stage of wheat. Among the CropWatch agroclimatic indicators, RAIN was above the fifteen-year average (+45%), while TEMP and RADPAR were below average (-1.2℃ and -5%). The combination of these factors resulted in a decreased BIOMSS (-10%) compared to the fifteen-year average. The national VCIx was 1.05, and the cropped arable land fraction increased by 3%. Overall, since the rainfall is abundant, the conditions for crop production are expected to be favorable.

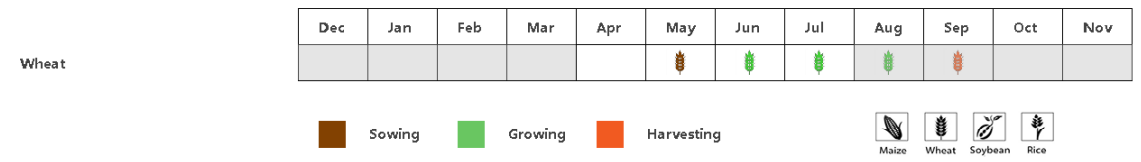
Regional analysis

Hangai Khuvsgul Region: NDVI was above the five-year average from late June to July, RAIN was above average (+43%), while TEMP and RADPAR were below average (-1.0℃ and -4%). The BIOMSS index decreased by 8% compared to the fifteen-year average, the maximum VCI index was 0.96. Overall crop prospects are normal.

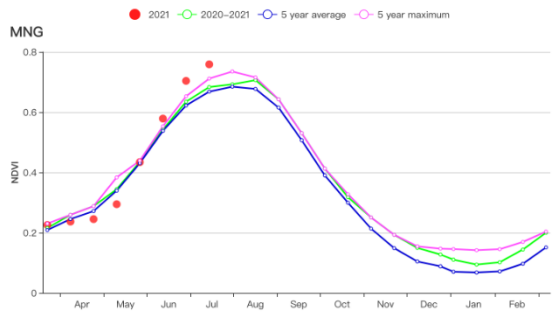
Selenge-Onon Region: Crop conditions were above the five-year average from late June to July, RAIN was above average (+51%), while TEMP and RADPAR were below average (-1.5℃ and -6%). The BIOMSS index decreased by 14% compared to the fifteen-year average. The maximum VCI index was 1.08, and the cropped arable land fraction increased by 4%. Overall, crop conditions are expected to be normal.

Central and Eastern Steppe Region: According to the NDVI development graph, crop condition in this region was below the five-year average in April, May, and late June, and above the five-year average in July. RAIN was above average (+41%), while TEMP, RADPAR, and BIOMSS were below average (-0.6℃, -4% and -5% respectively). The maximum VCI index was 1.1, and the cropped arable land fraction increased by 5%. Overall crop prospects are favorable.

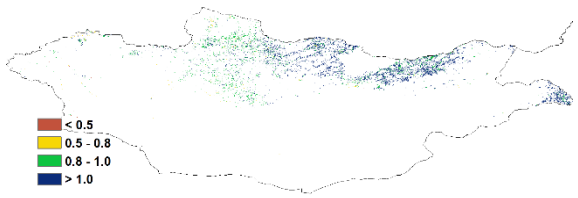
Figure 3.31 Mongolia's crop condition, April - July 2021



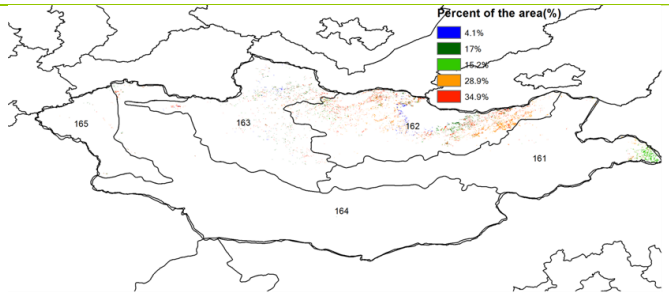
(a) Phenology of major crops

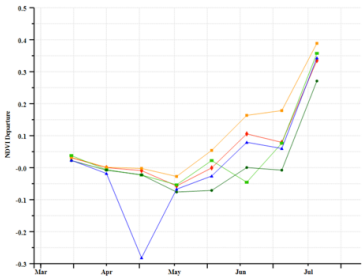


(b) Crop condition development graph based on NDVI

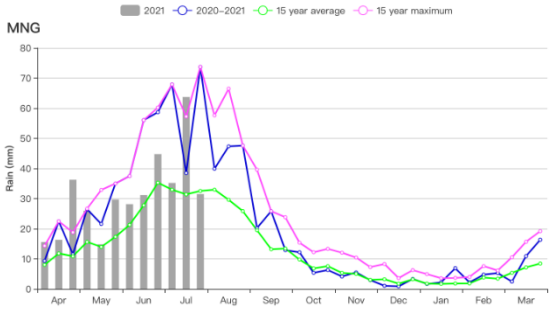


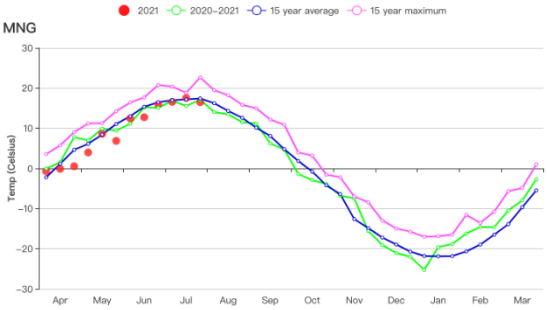
(c) Maximum VCI



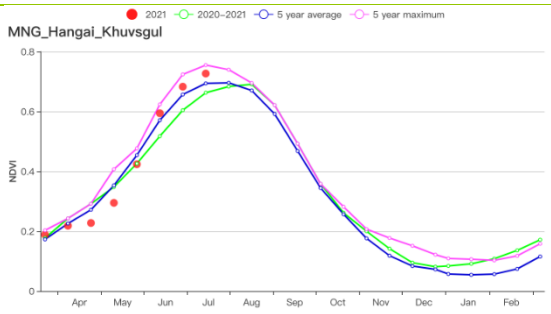


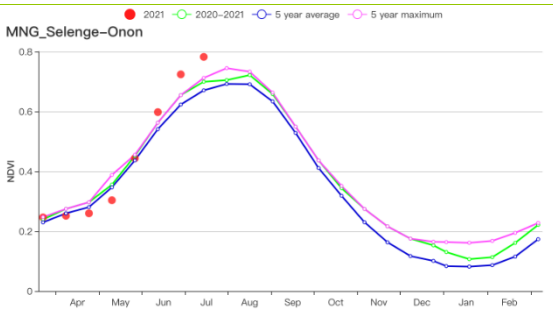
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



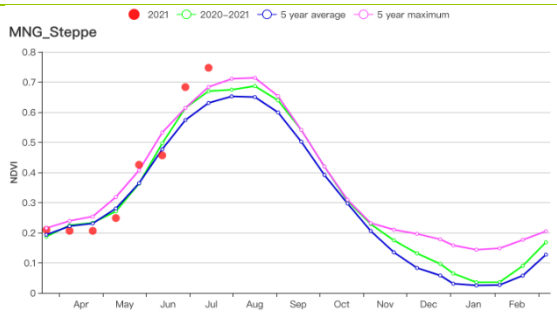


(f) Rainfall profiles (g) Temperature profiles

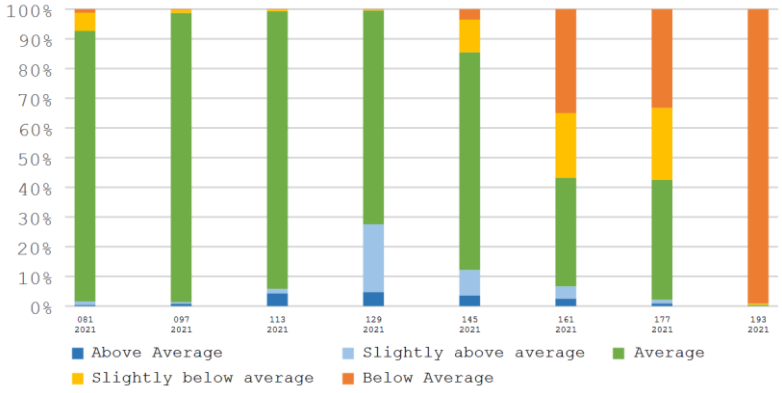




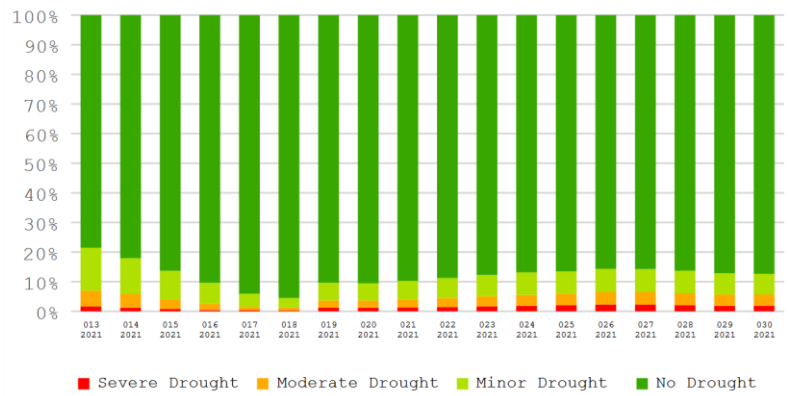
(h) Crop condition development graph based on NDVI (Hangai Khuvsgul Region (left) and Selenge-Onon Region (right))



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



(j) Proportion of NDVI anomaly categories compared with 5YA in Mongolia



(k) Proportion of VHIm categories compared with 5YA in Mongolia

Table 3.53 Mongolia's agroclimatic indicators by sub-national regions, current season's values, and departure from 15YA, April- July 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 Region	409	43	7.0	-1.0	1335	-4	345	-8
Selenge-Onon Region	387	51	9.6	-1.5	1282	-6	393	-14
Central and Eastern Steppe Region	296	41	13.0	-0.6	1296	-4	499	-5
Altai Region	420	-1	7.3	-0.6	1355	1	383	-2
Gobi Desert Region	185	-5	10.9	-0.5	1431	-1	493	2

Table 3.54 Mongolia's agronomic indicators by sub-national regions, current season's values, and departure from 5YA, April- July 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Hangai Khuvsgul Region	100	1	0.96
Selenge-Onon Region	100	4	1.08
Central and Eastern Steppe Region	100	5	1.10
Altai Region	83	8	0.88
Gobi Desert Region	76	8	0.90

[MOZ] Mozambique

During the April-July 2021 reporting period, the summer crops including maize, rice and wheat were completely harvested in Mozambique. The agroclimatic indicators show that rainfall was 15% below the average of the past fifteen years, the temperature decreased by about 0.5℃ and radiation increased by 1%. The potential biomass decreased by 2%. The country's seasonal rainfall profile indicates overall above-average rainfall in late April and May.

The crop conditions development graph based on NDVI indicates that NDVI fluctuated near the average of the past five years throughout the entire reporting period. In general, the maximum VCIx across the country (0.89) was favourable. High values of the VCIx were recorded in the northern Tete, Zambezia and Nampula provinces. However, low values of VCIx were observed in the coastal regions of Maputo, Gaza and Inhambane, influenced mostly by the tropical storms in late March. The spatial distribution of NDVI profiles indicates that on nearly 17.6% of the cropland, crop conditions were above and 54.9% were near average. Despite the climate adversity recorded in late March, the country recorded favourable crop conditions.

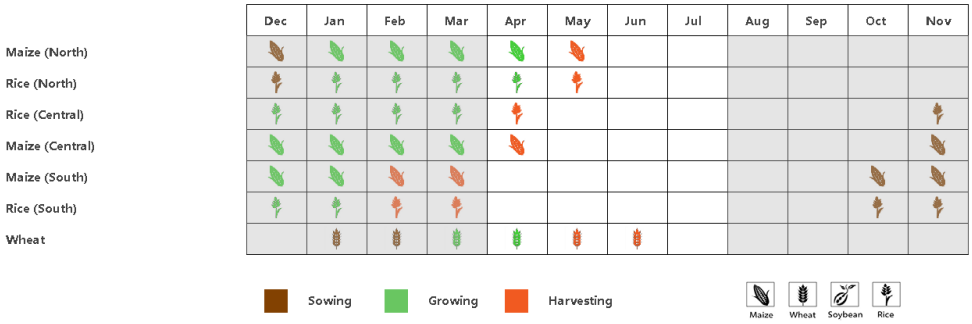
Regional analysis

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.

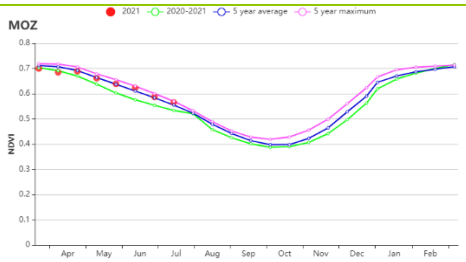
During the reporting period, four zones received below-average rainfall, including Buzi basin (-51%), Northern high-altitude areas (-18%), Low Zambezia River basin (-26%) and Southern region (-38%). Above-average rainfall was only observed on the Northern coast (+4%). In all regions, the temperature was below average varying from -0.3℃ to -0.7℃, with the largest decreases recorded in the Buzi basin (-0.7℃), Northern high-altitude areas (-0.6℃) and the Low Zambezia River basin (-0.6℃). Except for the Northeast cost (radiation about the average), the remaining regions recorded an increase in radiation with the highest increase verified in the Buzi Basin (RADPAR +4%). The potential biomass in the Buzi basin was near average while in the Southern region it increased by 1%. In the remaining zones, including the Northern high-altitude areas, Low Zambezia River basin, and the Northern coast, the potential biomass production decreased by about 3%, 3% and 1%, respectively.

With the exception of the Southern region (CALF +1%), CALF in the remaining regions was near the average of the past five years. With the maximum VCIx values varying from 0.84 to 0.93, the crop conditions based on the NDVI graph reveal favourable crop conditions through the entire monitoring period, with the exception of the Buzi basin. in this region, the crop conditions were below the average for the past 5 years and the same monitoring period in 2020.

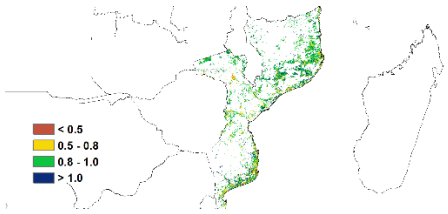
Figure 3.32 Mozambique's crop condition, April–July 2021



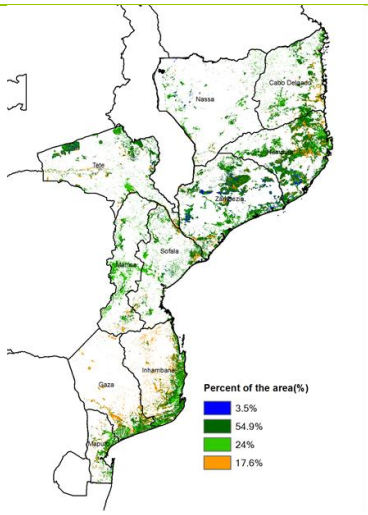
(a). Phenology of major crops



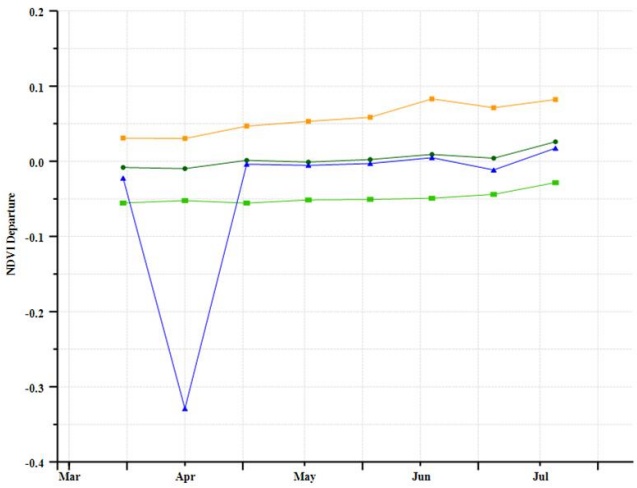
(b) Crop condition development graph based on NDVI



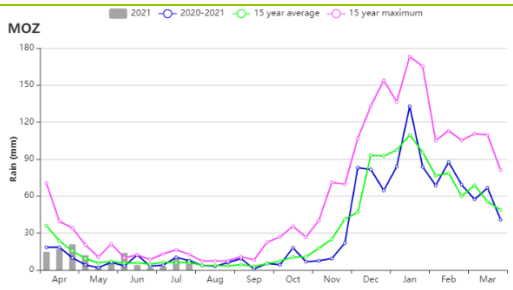
(c) Maximum VCI



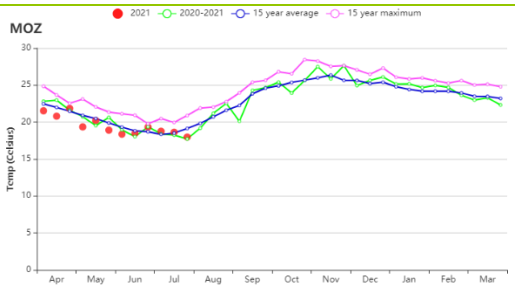
(d) Spatial NDVI patterns compared to 5YA



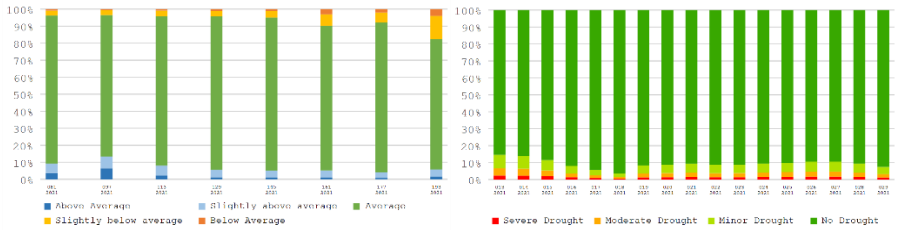
(e) NDVI profiles



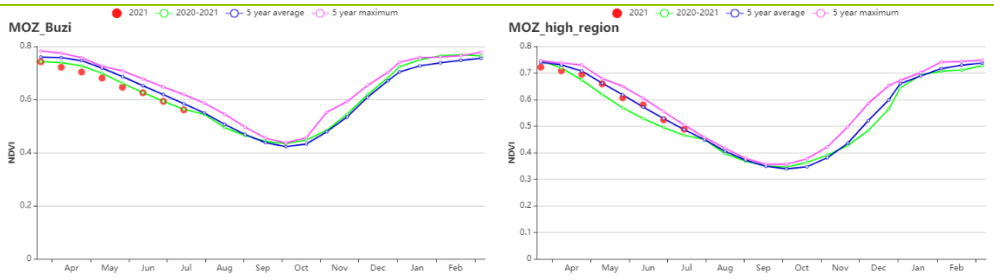
(f) National time-series rainfall profiles



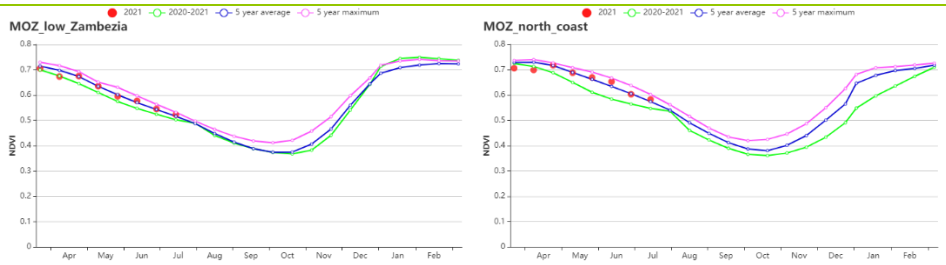
(g) National time-series temperature profiles



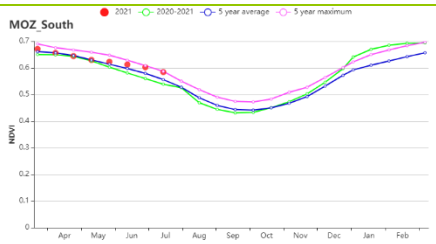
(h) Proportion of NDVI anomaly categories compared with 5YA (i) Proportion of VHIm categories compared with 5YA



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



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



(l) 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, April – July 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Buzi basin	52	-51	16.7	-0.7	1039	4	427	0
Northern high-altitude areas	94	-18	18.6	-0.6	1000	1	485	-3
Low Zambezia River basin	92	-26	19.0	-0.6	968	1	457	-3
Northern coast	175	4	20.6	-0.3	985	0	551	-1
Southern region	64	-38	20.1	-0.4	920	3	465	1

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current
Buzi basin	100	0	0.84
Northern high-altitude areas	100	0	0.93
Low Zambezia River basin	98	0	0.88
Northern coast	100	0	0.91
Southern region	99	1	0.87

[NGA] Nigeria

This report covers crop conditions for maize and rice in Nigeria during the reporting period. In the northern region, maize sowing started in May, while in the south, it had begun in March and the crop was reaching maturity in July. The planting of rainfed rice started in April, followed by that of irrigated rice one month later.

The CropWatch agroclimatic indicators show that the rainfall was below the 15YA (-42%) and the average temperature was above the 15YA (+0.5°C). Rainfall had stayed below the 15YA during the entire monitoring period. The recorded radiation increased by 4%. Due to the decline of rainfall, the BIOMSS was below the 15YA (-5%). The observed maximum vegetation condition index (VCIx) was 0.71 and the CALF was lower than the 5YA (- 6%).

According to the crop condition development graph based on NDVI, the NDVI of the country was below the 15YA from April to July. The maximum VCI graph showed values that were lower in the north and higher in the south. As shown in the spatial NDVI profiles and distribution map, 45.7% of the total cropped areas were near the 15YA from April to the middle of May and below average from June to July in the north of the country. About 19.7% of the total cropped areas were near the 15YA from April to mid-May and above average in June and July. Overall, the crop conditions in most of the cropped areas were below average due to lack of rainfall.

Regional analysis

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

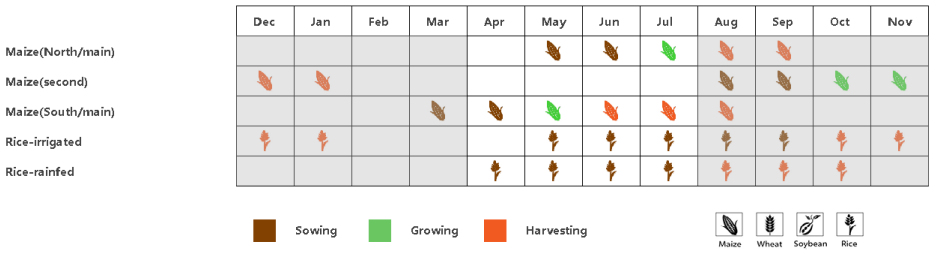
The **Sudan-Sahel savanna** zone is located in northern Nigeria. The agro-climatic condition showed that rainfall decreased by 43% and the overall temperature was near the 15YA. The radiation increased by 2%. The BIOMSS decreased by 13% compared to the 15YA because of the decline of RAIN and associated cloud cover. The CALF was 47% and the maximum VCI was 0.51. According to the NDVI development graph, crop conditions in the zone were near average from April to May and below average from May to July.

The **Guinea savanna** region is predominantly located in the central region of the country. Compared to the 15YA, TEMP increased by 0.5°C, RAIN decreased by 40%, RADPAR was 2% lower, and BIOMSS was down by 10% because of the decline of rainfall. The CALF was 87% and the maximum VCI was 0.74. According to the NDVI development graph, crop conditions in the region were below average throughout the monitoring period.

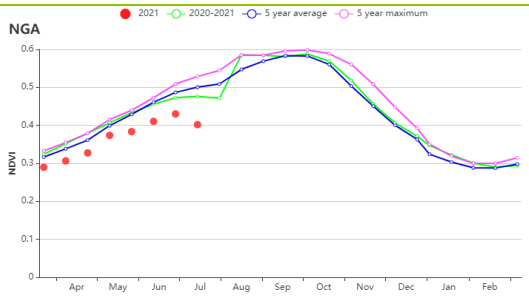
The **Derived savanna** region is a transition zone between the Guinea savanna and Humid Forest zones. The rainfall decreased by 45% and the temperature increased 0.9°C. The radiation increased by 4% compared to the 15YA and the BIOMSS was near the 15YA (+1%). The CALF was 98% and the maximum VCI was 0.88. According to the NDVI development graph, crop conditions in the region were below average throughout the monitoring period.

In the **Humid Forest** zone, the precipitation is quite high as compared to other regions. However, it decreased by 41% whereas the average temperature increased about 0.5°C. The radiation increased by 9% and the BIOMSS increased by 10%. The CALF was near the 5YA at 99% and the maximum VCI was 0.94. According to the NDVI development graph, crop conditions in the zone were below average throughout the monitoring period.

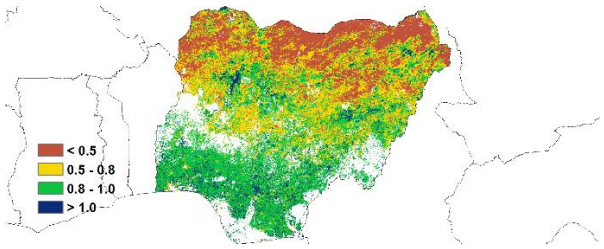
Figure 3.33 Nigeria 's crop condition, April-July 2021



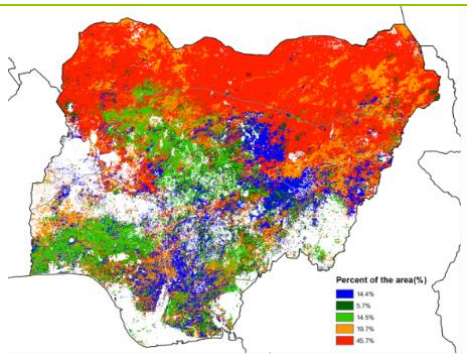
(a). Phenology of major crops



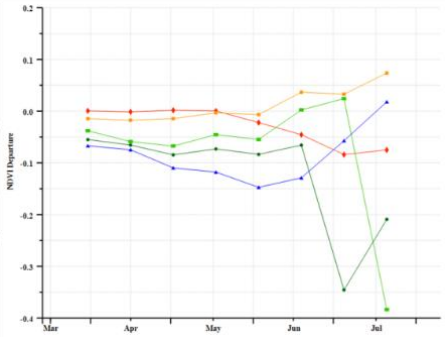
(b) Crop condition development graph based on NDVI



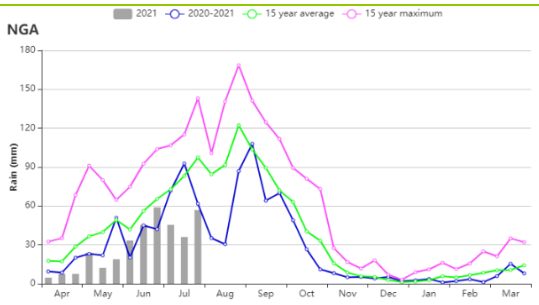
(c) Maximum VCI



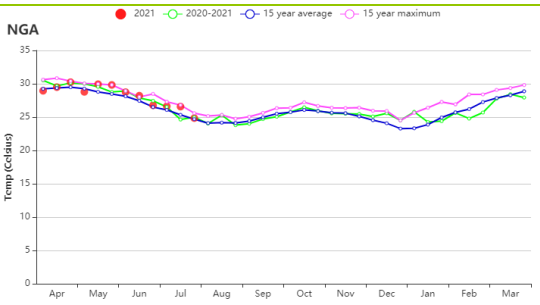
(d) Spatial NDVI patterns compared to 5YA



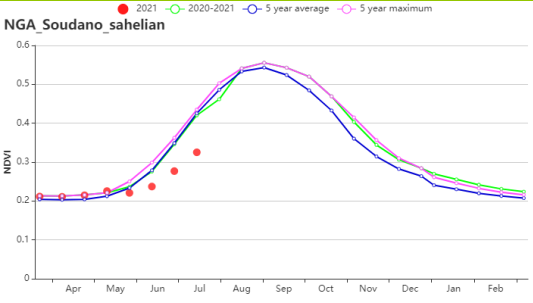
(e) NDVI profiles

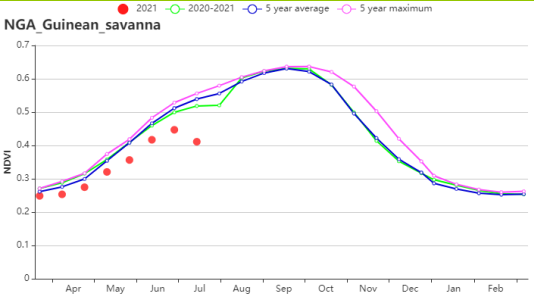


(f) Time series rainfall profile

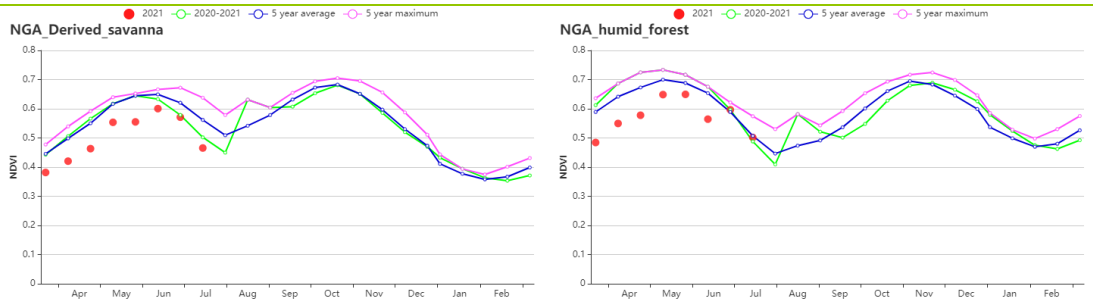


(g) Time series temperature profile





(h) Crop condition development graph based on NDVI for Sudan-Sahel savanna (left) and Guinean savanna (right)



(i) Crop condition development graph based on NDVI for Derived savanna (left) and Humid forest (right)

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

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Sudan-Sahel savanna	103	-43	31.1	-0.0	1361	2	567	-13
Guinea savanna	255	-40	28.5	0.5	1280	2	683	-10
Derived savanna	386	-45	27.4	0.9	1215	4	778	1
Humid forest	694	-41	26.1	0.5	1172	9	795	10

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

Region	Cropped arable land fraction		Maximum VCI
	Current	Departure (%)	Current
Sudan-Sahel savanna	47	-18	0.51
Guinea savanna	87	-4	0.74
Derived savanna	98	-1	0.88
Humid forest	99	0	0.94

[PAK] Pakistan

During this reporting period, winter wheat harvest was completed in June. The planting of maize and rice, together with cotton the main summer crops, started in May. Crop conditions were below average in April, but by July, they had reached average levels. The only exception was the northern highlands, where the conditions remained below average throughout this monitoring period.

RAIN was 4% below average at the country level. TEMP and RADPAR were also below the 15YA (-0.7℃ and -1% respectively). The combination of all the agro-climatic indicators resulted in BIOMSS exceeding the 15YA by 6%. Precipitation varied greatly in time and space. The dekad rainfall was continuously below average for most dekads, except for one dekad in July, when it reached maximum levels. The drier than usual conditions in May and June caused unfavorable conditions for the planting of summer crops, although most of them are irrigated. About 40% of the crop areas experienced drought in April, as shown in the VHIn graph. After early July, summer maize and rice had benefited from the generally favorable weather conditions, but the fraction of cropped arable land (CALF) decreased by 9% compared with 5YA, which may have a negative effect on the summer crop production.

At the national level, the NDVI development graph indicated below-average conditions for most of this monitoring period. The spatial NDVI patterns and profiles show that 80% of the cropped areas were below average in April, while 39% were above average in July. About 46% of the cropped area was continuously below average, mainly located in the north highland and Punjab and some regions along the Indus river basin. The sowing of maize was hampered by unfavorable conditions in Punjab, which resulted in a lower CALF. It was also below the average of the last 5 years in the other regions. The Indus river basin, the main rice producing area, had reached average NDVI after transplanting in June. Though below-average crop conditions were observed in the three main agricultural areas in June, above-average rainfall in the Northern Highland (+37%) and the Lower Indus river basin in south Punjab and Sind (+47%) regions, together with irrigation in the lower Indus river basin, might help sustain favorable crop conditions for the remainder of the growing season. The below-average CALF will reduce crop production, but high yield levels of the summer crops might still be achievable, as NDVI had improved to average levels in all 3 major production regions.

Regional analysis

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

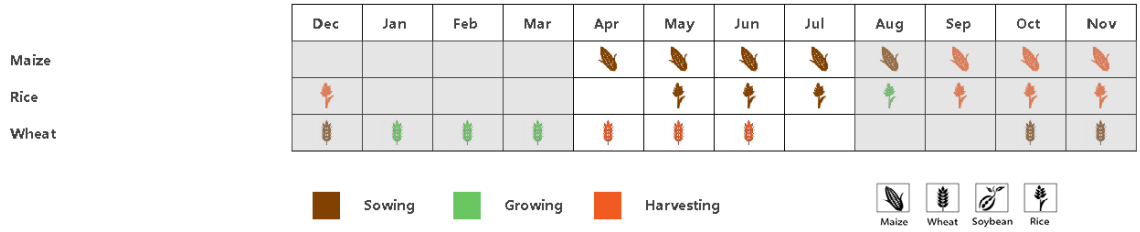
The NDVI development graph of **Northern highlands** shows below-average crop conditions from April to early July. It was caused by drier-than-usual conditions (RAIN -12%). RADPAR was near average (+1%) and temperatures sightly cooler (-0.8℃). The resulting BIOMSS fell short of the fifteen-year average by 5%. Wheat conditions were unsatisfactory due to drought; weather was generally favorable for the establishment of maize. The region achieved a rather low CALF of 50%, which is a decrease by 10% over the 5YA and VCIx is 0.68. Production is expected to be below average.

The **Northern Punjab**, the main agricultural region in Pakistan recorded abundant RAIN (37% above average). The TEMP was below average by 0.7℃, and the RADPAR departure was -3%. The estimated BIOMSS departure by +5%, as compared to the fifteen-year average, is probably not relevant, since this period covers the harvest of wheat and the establishment of maize and rice crops. Wheat had below-average NDVI values during the entire growth period, which resulted in below-average yields. Together with the relatively small VCIx (0.68) and low CALF (61% with a decrease by 14%), crop productions of summer crops are forecasted to be below average.

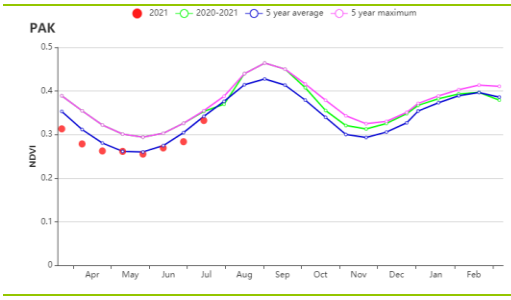
In the **Lower Indus river basin** in south Punjab and Sind, RAIN was above average by 47%, while RADPAR and TEMP were below average by 2% and 0.5℃ respectively. Estimated BIOMSS was 15% higher than the

last fifteen-year average. The VCIx was at 0.69, which is normal for this period between the harvest of wheat and the establishment of the summer crops. Considering that the vast majority of land in this region is irrigated, prospects for the newly established crops are promising. But CALF was rather low (38%), 7% lower than the five-year average. Thanks to favorable weather, slightly below-average summer crop production can be expected despite a smaller planted area.

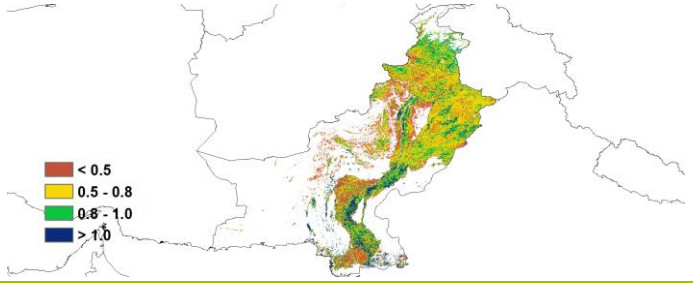
Figure 3.34 Pakistan crop condition, April-July 2021



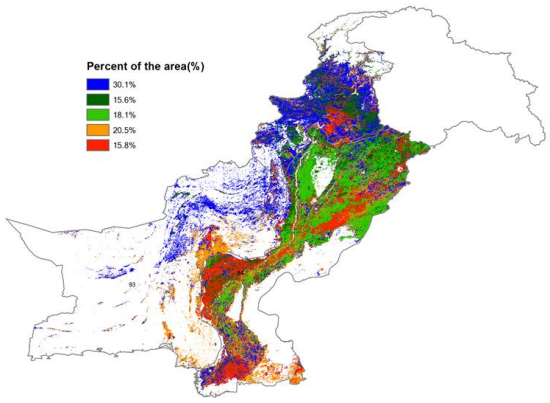
(a). Phenology of major crops



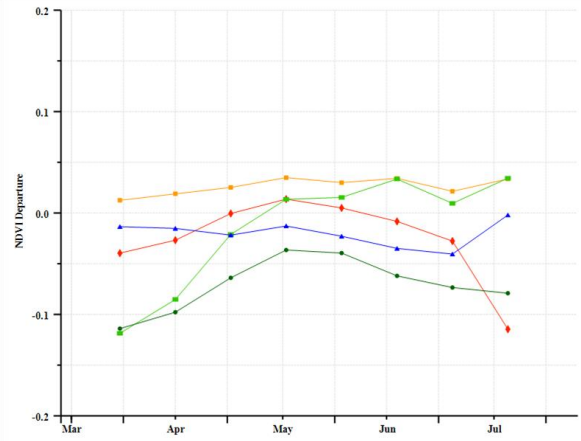
(b) Crop condition development graph based on NDVI



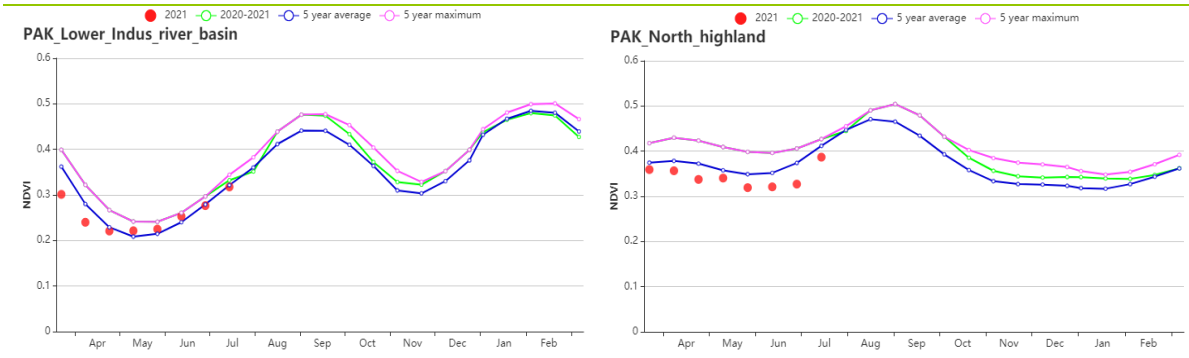
(c) Maximum VCI



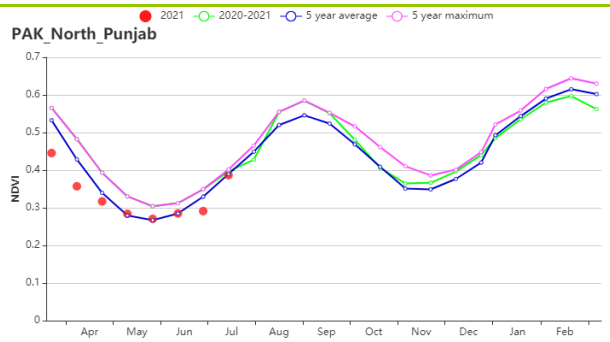
(d) Spatial NDVI patterns compared to 5YA



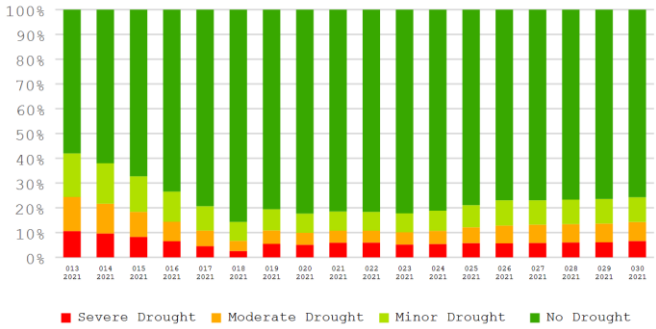
(e) NDVI profiles



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



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



(h) Proporation of VHIn categories compared with 5YA

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

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Lower Indus river basin in south Punjab and Sind	105	47	34.4	-0.5	1526	-2	741	15
Northern highland	317	-12	20.5	-0.8	1568	1	651	-5
Northern Punjab	276	37	32.2	-0.7	1470	-3	947	5

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Lower Indus river basin in south Punjab and Sind	38	-7	0.69
Northern highland	50	-10	0.68
Northern Punjab	61	-14	0.68

[PHL] Philippines

The rainy season in the Philippines lasts from May to early October. The harvest of the second rice crop was completed in April, followed by the second maize crop one month later.

The country experienced a drier (RAIN -7%) and slightly warmer (TEMP +0.2℃) period. Compared to the average of the past 15 years, the radiation (RADPAR) for the country increased by 4% and the resulting biomass (BIOMSS) increased by 3%. The country experienced several natural disasters, including the strong typhoon Surigae in mid-April and the tropical storm Dante in late May. The cropped arable land fraction was near average and reached 100%, and the maximum VCI for the country was at 0.95.

According to the NDVI profile of the country, the NDVI values kept trending slightly below average starting in late April. In particular, the values in mid-July were significantly below average, which might have been due to cloud cover in parts of the satellite images. Considering the spatial pattern of the NDVI profiles, the NDVI values for most of the crop land were stable fluctuating around the average level during the whole reporting period. About 9.1% of the crop land (mainly in the northern part of Mindanao) experienced a significant drop in NDVI in mid-April, which seems to have been caused by Typhoon Surigae or cloud cover in the satellite images. The storm Dante caused negative NDVI departures for the east of Luzon that was visible until mid-July. Approximately 9.2% of the crop land, mainly in central Misamis, had a decrease in NDVI of about 0.5 in mid-July, presumably due to cloud cover. In general, the crop conditions were normal for those regions that were not affected by Dante.

Regional analysis

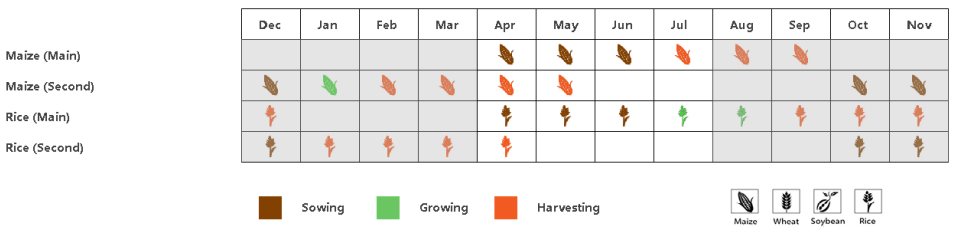
Based on the cropping systems, climatic zones and topographic conditions, three main agro-ecological regions can be distinguished for the Philippines. They are **the Lowlands region** (northern islands), **the Hilly region** (Island of Bohol, Sebu and Negros), and **the Forest region** (mostly southern and western islands). All the regions are characterised by a stable cropped arable land fraction (CALF almost 100%) and a high maximum VCI value (VCIx ⩾0.93).

The Lowland region experienced a decrease in precipitation (RAIN -17%) and a slight rise in temperature (TEMP +0.2℃). The radiation (RADPAR) for the region increased by 5% compared to the 15YA, which resulted in a 3% increase in estimated biomass (BIOMSS).

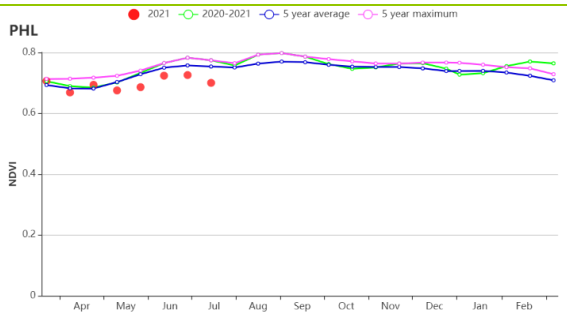
Compared to previous 15 years, **the Hilly region** underwent a drier (RAIN, -6%) and slightly warmer (TEMP +0.1℃) period, accompanied by above-average radiation (RADPAR +4%). As a result, the estimated biomass (BIOMSS) increased by 4%. The NDVI for the region was close to average during most of the time except in late May and late June.

For the **Forest region**, the rainfall (RAIN) increased by 4% and the temperature was close to average (TEMP +0.1℃). The radiation (RADPAR) rose by 3% and the resulted biomass (BIOMSS) increased by 3% compared to the average level. As the NDVI profile shows, the regional NDVI remained close to average during the whole reporting period, which indicates the crop conditions for the region were normal.

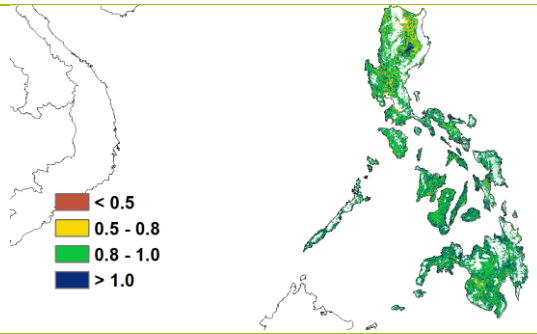
Figure 3.35 Philippines' crop condition, April - July 2021



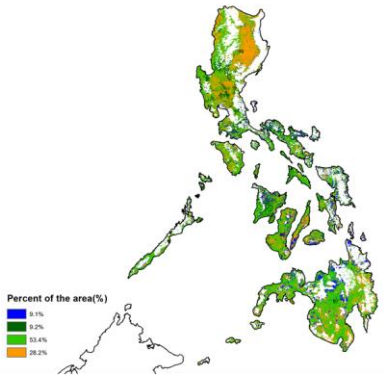
(a). Phenology of major crops



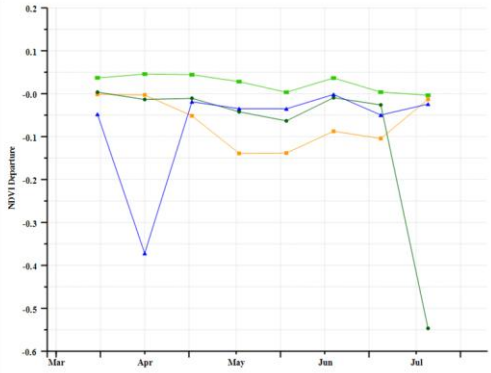
(b) Crop condition development graph based on NDVI



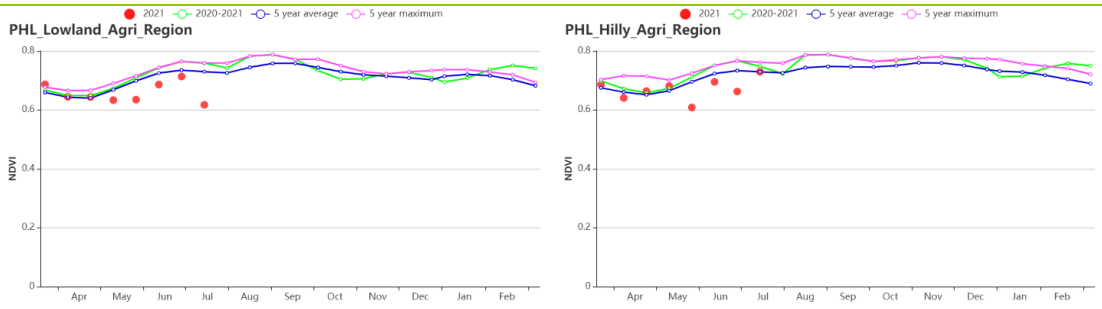
(c) Maximum VCI



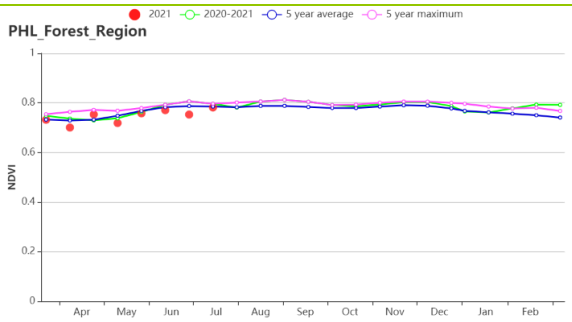
(d) Spatial NDVI patterns compared to 5YA



(e) NDVI profiles



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



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

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

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)	Current (gDM/m^2)	Departure from 15YA (%)
Forest region	1350	4	25.5	0.1	1303	3	873	3
Hilly region	1208	-6	27.4	0.1	1385	4	941	4
Lowlands region	**1154**	-17	26.4	0.2	1374	5	911	5

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current
Forest region	100	0	0.97
Hilly region	100	0	0.97
Lowlands region	100	0	0.93

[POL] Poland

During this monitoring period, the sowing of maize and spring wheat started in late April. However, the continuously cool and wet weather in the spring caused some delays in the sowing. Winter wheat harvest started in late July.

Compared to the average of the last 15 years, rainfall and RADPAR were both 1% higher and temperature was 0.4°C lower, which led to a 6% higher BIOMSS. Below-average temperatures in April and May were accompanied by above-average rainfall. Temperatures increased to above-average levels in June. As shown by the development graph of NDVI, the conditions in the spring were not conducive to planting and early crop development. NDVI was lower than the average of the last 5 years until early June. Subsequently, the conditions became more favorable, especially during the grain filling period of winter wheat, which started in mid-June. NDVI approached the average of the last 5 years in June and July.

NDVI on about 24.1% of the country's arable land area, was continuously below average during the entire period scattered over the cultivated area. For another 14.7% of the crops, located mainly in the north and west region, NDVI was above average until the end of July. In addition, NDVI on 28.1% of the crops mainly in the eastern region was below average from late April to May and above average from June to July. For the rest 33.2% crops, located mainly in the southeast region, NDVI was significant below average from April to May, recover after June until near average.

CALF reached 100% and VCIx was 0.93. VCIx was above 0.8 in almost the entire country.

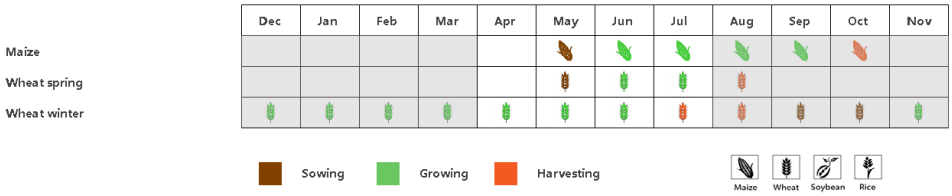
Overall, it appears that winter wheat yield can be expected to be near average. Conditions for spring wheat were less favorable. Maize seems to have benefitted from the warm and humid conditions that started in mid-June.

Regional analysis

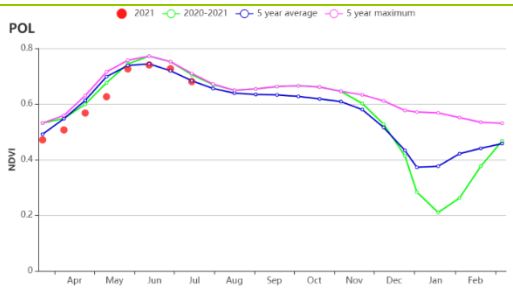
The country is divided into four zones according to agro-ecological characteristics, including: (a) the **Northern oats and potatoes areas** covering the northern half of West Pomerania, eastern Pomerania and Warmia-Masuria, (b) the **Northern-central wheat and sugar-beet area** (Kuyavia-Pomerania to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

Although the TEMP, RAIN, RADPAR and BIOMSS differed in their departures from the average level among the four subregions (TEMP: +0.1°C, -0.2°C, -0.4°C, -0.7°C; RAIN: 0, +1%, 0, +1%; RADPAR: +2%, +1%, +1%, +2%; BIOMSS: +10%, +7%, +6%, +4%), the temporal distribution of temperature and rainfall in all four regional zones was consistent with the national characteristics, with wet and cold weather from April to May, dry and hot in June, and wet and hot in July. As shown by the crop development graphs, NDVI in the Northern oats and potatoes areas and the Northern-central wheat and sugar-beet area was below average only in May, and close to average in the other three months. In the Central rye and potatoes area and Southern wheat and sugar-beet area, NDVI was below average from April to May, and close to or even slightly above average from June to July.

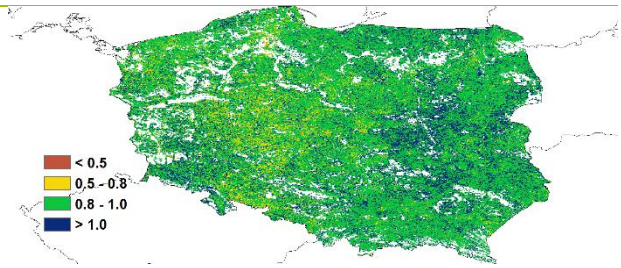
Figure 3.36 Poland's crop condition, April-July 2021



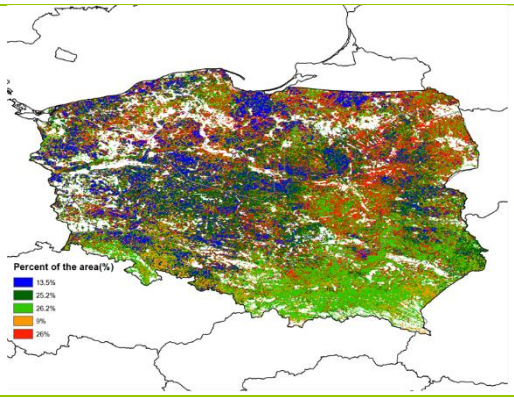
(a). Phenology of major crops



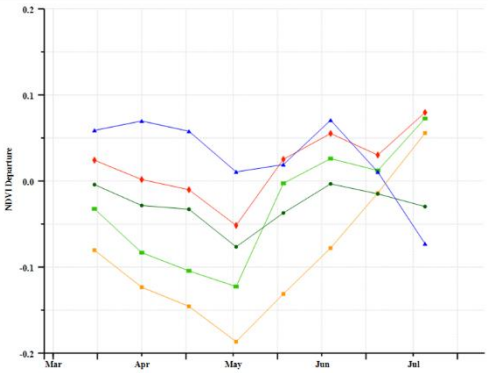
(b) Crop condition development graph based on NDVI



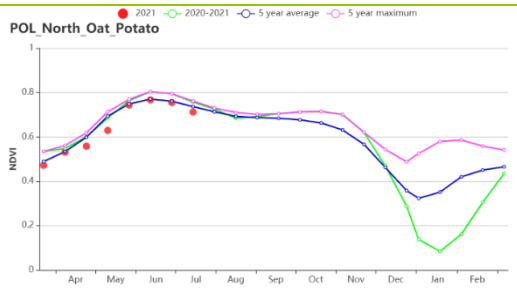
(c) Maximum VCI

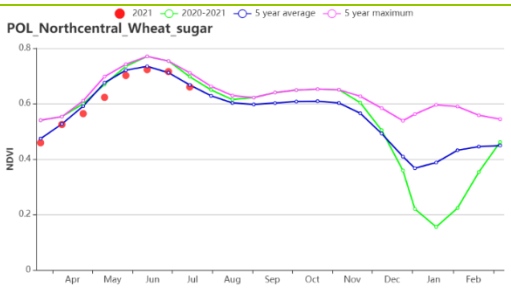


(d) Spatial NDVI patterns compared to 5YA

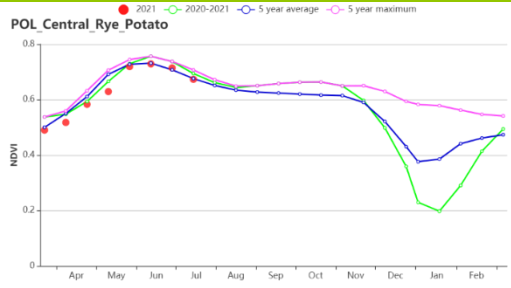


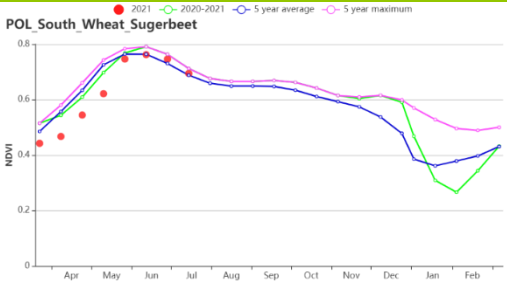
(e) NDVI profiles



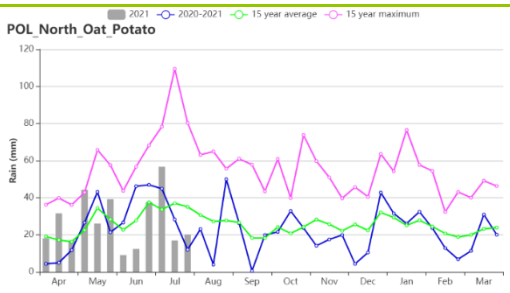


(f) Crop condition development graph based on NDVI, Northern oats and potatoes area (left) and Northern-central wheat and sugar beet area (right).

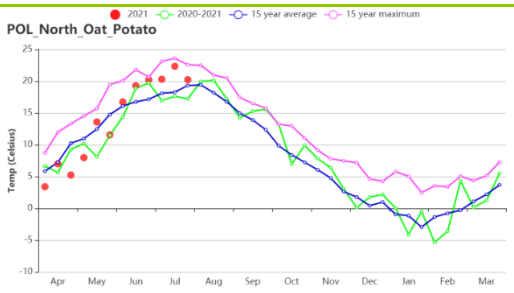




(g) Crop condition development graph based on NDVI, Central rye and potatoes area (left) and Southern wheat and sugar beet area (right)



(h) Rainfall index



(i) Temperature Index

Table 3.63 Poland's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April-July 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	329	0	14.0	0.1	1163	2	485	10
Northern-central wheat and sugarbeet area	302	1	14.1	-0.2	1164	1	489	7
Central rye and potatoes area	310	0	14.6	-0.4	1171	1	505	6
Southern wheat and sugarbeet area	360	1	13.7	-0.7	1203	2	494	4

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

Region	Cropped arable land fraction		Maximum VCI
	Current	Departure (%)	Current
Northern oats and potatoes areas	100	0	0.94
Northern-central wheat and sugarbeet area	100	0	0.91
Central rye and potatoes area	100	0	0.94
Southern wheat and sugarbeet area	100	0	0.95

[ROU] Romania

During this reporting period, maize and spring wheat were sown, while winter wheat was harvested in July. At the national level, rainfall was 16% below average, average temperature was 0.8°C lower and radiation was slightly above average (+1%). Higher radiation compensated for the negative impact of lower temperature and rainfall, resulting in an average biomass production. The CALF of Romania remained unchanged (100%) and the maximum VCI was at 0.94, which was fair for production. The rainfall time series shows that it was around average in April, far below average in May, early June and July, impacting the growth of maize and wheat. The temperature was below average in April and above average in July. The VHI map shows that drought conditions were not serious during the reporting period. According to the NDVI development curve, crop conditions were below average from April to June and reached close-to-average levels in July. Crop conditions are assessed as generally favorable.

Regional analysis

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

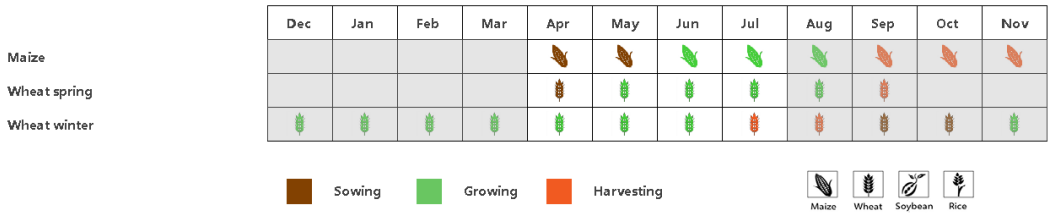
For **the Central mixed farming and pasture Carpathian hills**, compared to the 15YA, rainfall decreased by 20%, temperature was down by 0.7°C, radiation was above average (RADPAR +1%) and BIOMSS increased by 2%. According to the NDVI development, crop conditions were below average during the reporting period. The regional average VCI maximum was 0.92. This region occupies only a small part of cropland in Romania, thus the below-average vegetation conditions have little impact on Romania's crop production.

For **the Eastern and Southern maize, wheat and sugar beet plains**, rainfall decreased by 12%, temperature was 0.9 °C lower than average and radiation remained average. This resulted in a reduced estimate of biomass (-2%). The NDVI development graph shows that crop conditions dropped to below average in April and then improved. The VCI max value of this region was 0.95. According to the distribution map, the blue NDVI profile line region in the southeast (counties of Tulcea and Constanta) dropped largely in June and July, meanwhile the VCI maximum values in this area were between 0.8 and 1.0. All indicators show that the crop condition in this region was fair.

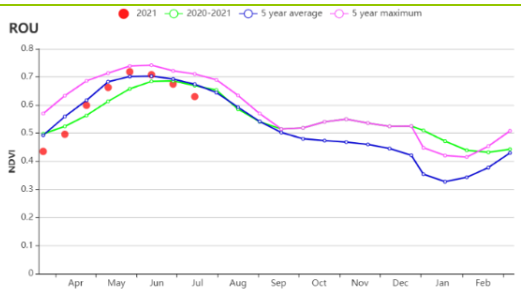
For **the Western and central maize, wheat and sugar beet plateau**, rainfall was lower than average by 19%. Temperature was also lower than average by 0.6°C, radiation was a bit higher (RADPAR +3%) and biomass increased by 4%. Maximum VCI of this region was 0.89 and the spatial distribution was between 0.5 and 1.0. Spatial NDVI pattern shows that NDVI increased in the central region from May to July (red line) and NDVI of the western region was constant (green line), which indicates that crop conditions were fair for this region.

Overall, crop conditions were fair and close to average in Romania during this reporting period. Currently, the outlook is favorable for wheat and maize.

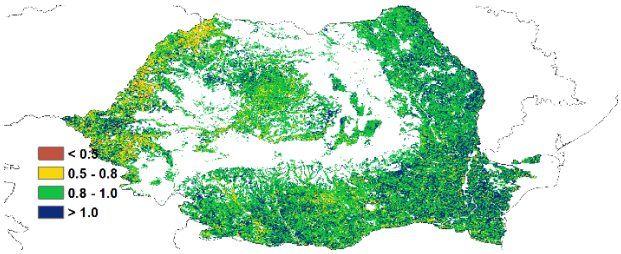
Figure 3.37 Romania's crop condition, April - July 2021



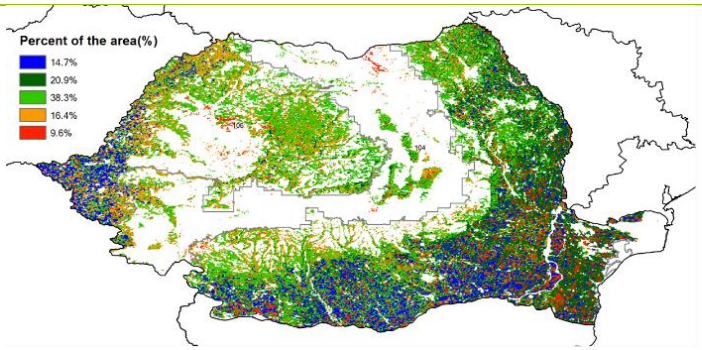
(a). Phenology of major crops



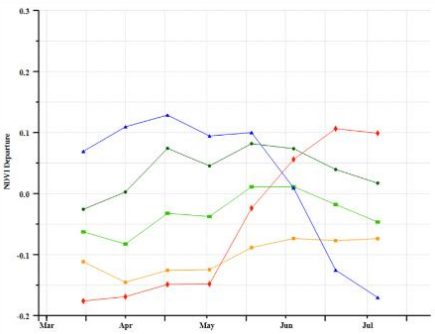
(b) Crop condition development graph based on NDVI



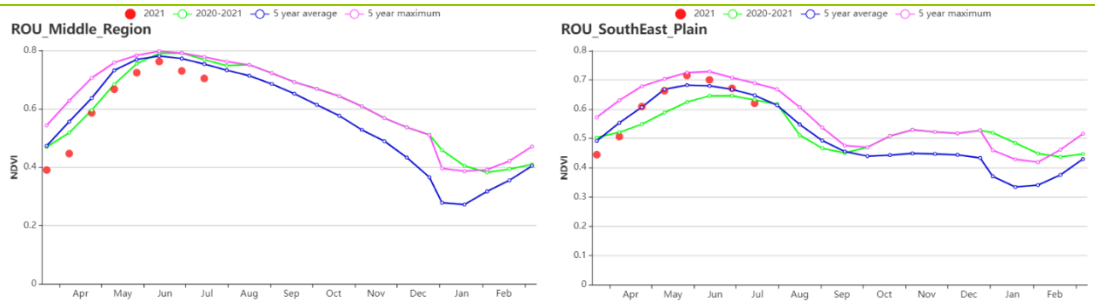
(c) Maximum VCI



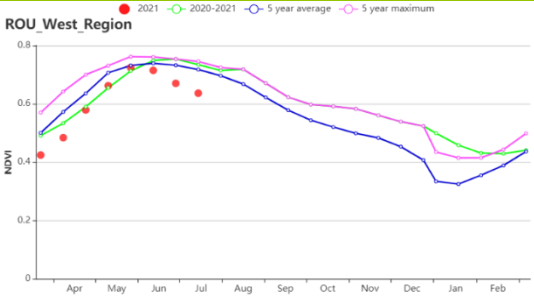
(d) Spatial NDVI patterns compared to 5YA



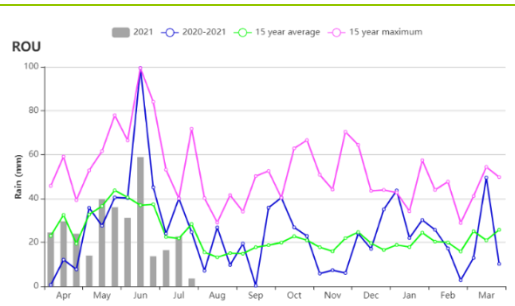
(e) NDVI profiles



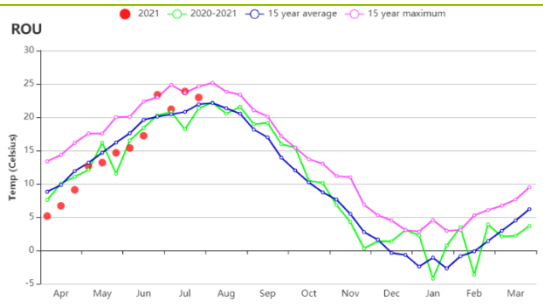
(f) Crop condition development graph based on NDVI (Central mixed farming and pasture Carpathian hills (left) and Eastern and southern maize, wheat and sugar beet plains (right))



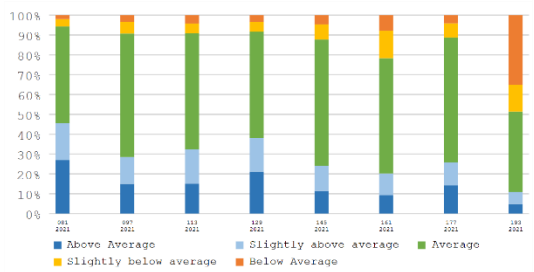
(g) Crop condition development graph based on NDVI (Western and central maize, wheat and sugar beet plateau)

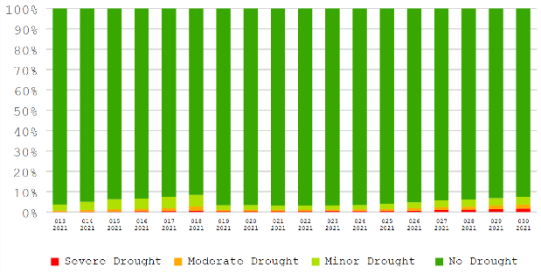


(h) Time series rainfall profile



(i) Time series temperature profile





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

Table 3.65 Romania's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 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	355	-20	13.4	-0.7	1305	1	512	2
Eastern and southern maize wheat and sugar beet plains	299	-12	16.3	-0.9	1319	0	606	-2
Western and central maize wheat and sugar beet plateau	305	-19	15.2	-0.6	1352	3	592	4

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current
Central mixed farming and pasture Carpathian hills	100	0	0.92
Eastern and southern maize wheat and sugar beet plains	100	0	0.95
Western and central maize wheat and sugar beet plateau	100	0	0.89

[RUS] Russia

In Russia, the period from April to July is a time of active crop growth. At the end of July, winter crop harvest started in many regions, and the grainfilling period of spring crops started.

According to the national data, during the analyzed period, the NDVI stayed mainly below the 5-year average, although in June, its peak values reached the 5YA in most regions. Atmospheric precipitation from April to June was above the 15-year average and in early May it reached the 15-year maximum. Starting in late June, rainfall was below last year's level and the 15-year average. The temperature was mainly close to the 15-year average and the level of the previous year, except mid-May and the period from mid-June to mid-July when it reached the 15-year maximum. In general, the NDVI Index in Russia is lower than last year and lower than the long-term average. Most regions showed negative NDVI departure during the report period except for June. Only South Caucasus and North Caucasus regions showed positive NDVI departure from late April to June. In almost all regions, the index was below the average during the growth and maturation of winter crops.

In the main regions of winter crop production, such as Central Russia, Central black soils region, North and South Caucasus, the Middle Volga, VCI values ranged from 0.8 to 1 and higher. VCI in the Urals and western Volga regions varied mainly from 0.5 up to 1. The situation was worse for the crops in Western Siberia and in the Volga region. It was better in Central Siberia. In the rest of the territory, it was close to normal. Thus, we can expect a lower-than-normal harvest of spring wheat in Western Siberia and in the Volga region. The situation is better in Central Siberia, but that region's crop production is not large.

The winter crop production is forecasted to be slightly below the long-term average. Summer crop conditions were generally close to, but below average.

Regional analysis

South Caucasus

Rainfall was 7% below the 15-year average. Temperature and RADPAR were above the 15-year average by 0.9°C and 4% correspondingly. CALF was 1% lower than the 5-year average. The VCI was 0.86. NDVI from late April to early June was close to the 5-year average. Even though the situation was worse at the beginning of the growing season, according to the NDVI profile, the winter wheat harvest is expected to be higher than last year and close to the average. The maize harvest is expected to be at the level of last year or slightly higher.

North Caucasus

Rainfall exceeded the 15-year average by 27% and temperature was higher by 0.2°C. RADPAR was down by 3% compared to the 15-year average. CALF was 1% higher than the 5-year average. The VCI was 0.90. NDVI stayed below the 5-year average and the level of the previous year until May, when it started to increase and reached the 5-year maximum in late June and then dropped back to the level of the previous year in July. Despite the fact that the situation was unfavorable at the beginning of the growing season, it improved starting in May. In accordance with the NDVI index, the winter wheat harvest is expected to be higher than last year and above average. The maize harvest is expected to be at the level of the last year or slightly higher.

Central Russia

Rainfall was 5% below average. The air temperature was 0.9°C above the average. BIOMSS was above average by 14%. The CALF was equal to the 5-year average. The VCI was 0.97. The NDVI was mostly below the 5-year average, but it reached the average level in late May and early June. The yield of winter wheat is likely to be at the level of last year, and spring wheat is slightly lower than last year and the average. As to maize, the result will depend on the weather conditions in August.

Central black soil area

Rainfall was 28% higher than the 15-year average, which is the maximum deviation from the 15-year average in Russia. The air temperature was 0.4°C above the 15-year average. RADPAR was 3% below the 15-year average. BIOMSS was by 5% above average. The CALF was equal to the 5-year average. The VCI was 0.96. The NDVI was mostly below the 5-year average reaching the level of the previous year only in June. The yield of winter and spring wheat is expected to be below the level of last year and close to the long-term average. The maize yield will be below the level of last year and slightly below the average level.

Middle Volga

The atmospheric precipitation, temperature and RADPAR were higher than the 15-year average by 14%, 1.6°C and 2% respectively. BIOMSS was 17% above average. CALF was 2% below the 5-year average. The VCI was 0.85. The NDVI was mostly below the 5-year average and the level of the previous year. According to the NDVI profile, the yield of winter, spring wheat and maize is likely to be lower than last year and the 5-year average.

Ural and western Volga

Rainfall was 29% below the 15-year average. The air temperature and RADPAR were above the 15-year average by 1.6°C and 10% correspondingly. BIOMSS was by 23% higher than the average, which is the maximum excess in Russia. CALF was 1% below the 5-year average. The VCI was 0.79. The NDVI was equal to the 5-year average until early May, when it dropped below the average level. The yield of winter and spring wheat, as well as maize is likely to be lower than last year and below average. If the conditions in August are favorable, the maize yield may reach the level of last year.

Western Siberia

Rainfall increased by 18%, while the temperature decreased by 0.3°C compared to the 15-year average. CALF was equal to the 5-year average. VCI was 0.92. NDVI in the period from April to early June was less than the 5-year average, but from early June to late July it was equal to the 5-year average. The yield of spring wheat is expected to be close to the average and similar to last year.

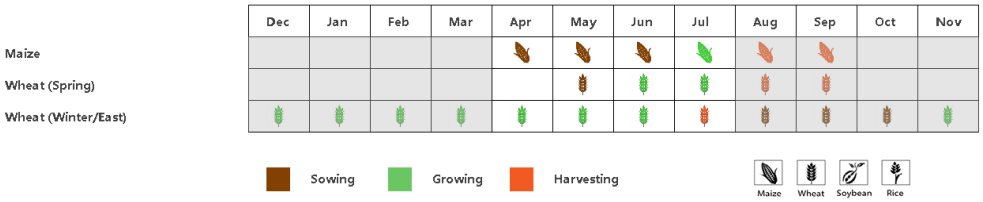
Middle Siberia

Rainfall increased by 18% compared to the 15-year average. Lower temperature and less sunshine resulted in a decrease of BIOMSS by 8%. CALF was 4% higher. VCI was 1.02. The NDVI in the period from April to late May was less than the 5-year average, but from early June to July it exceeded the 5-year maximum. According to the NDVI graph, the yield of spring wheat is expected to be higher than the average, above last year and close to the maximum.

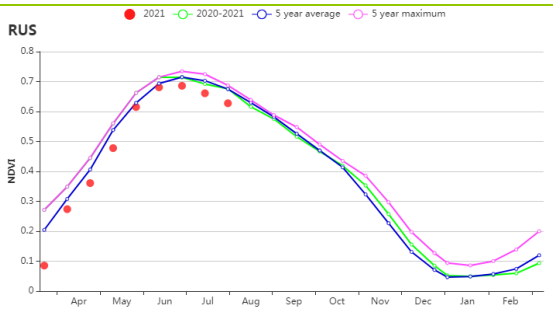
Eastern Siberia

Favorable agroclimatic conditions (TEMP +1.0°C, RADPAR +4%) brought an increase of BIOMSS by 14%. CALF was equal to the 5-year average. VCI was 0.96. The NDVI in the period from April to early June in the region was less than the 5-year average, but from early June to late July it was equal to the 5-year average. According to the graphs, the yield of spring wheat is expected to be slightly lower than the average and last year.

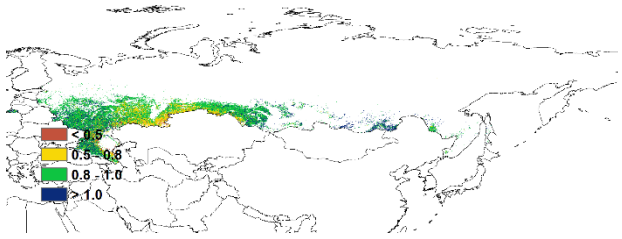
Figure 3.38 Russia's crop condition, April - July 2021



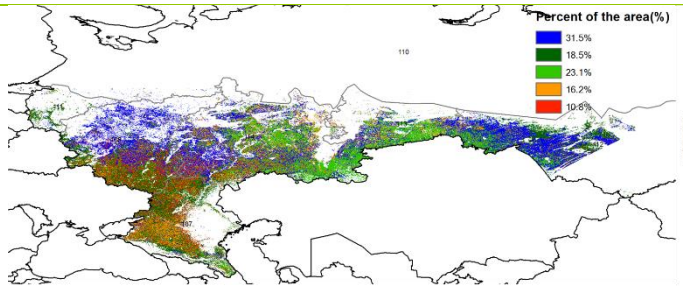
(a) Phenology of major crops



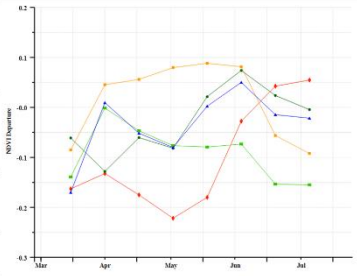
(b) Crop condition development graph based on NDVI



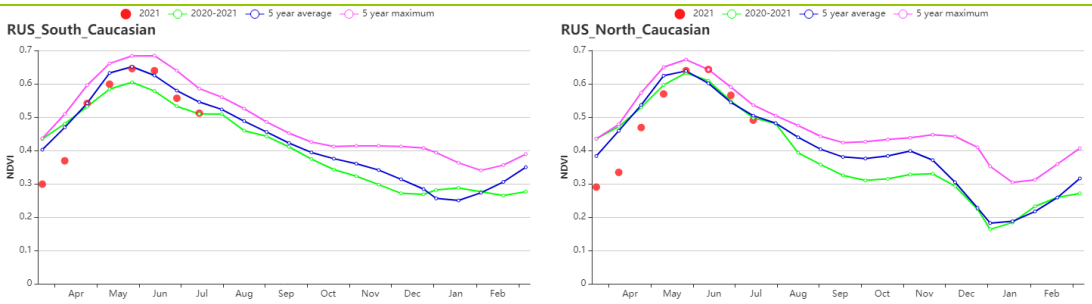
(c) Maximum VCI



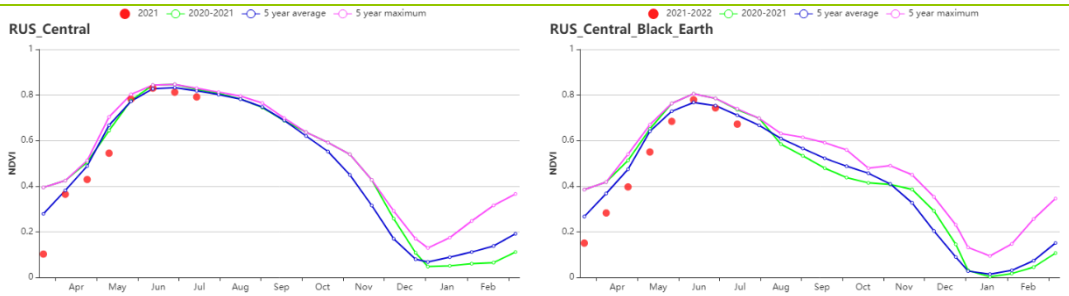
(d) Spatial NDVI patterns compared to 5YA



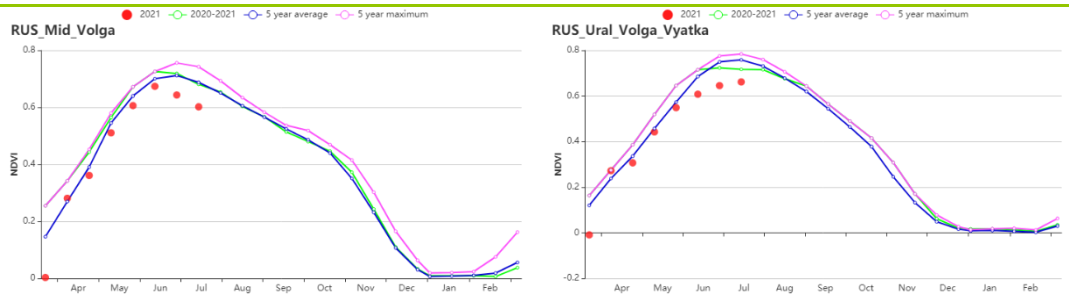
(e) NDVI profiles



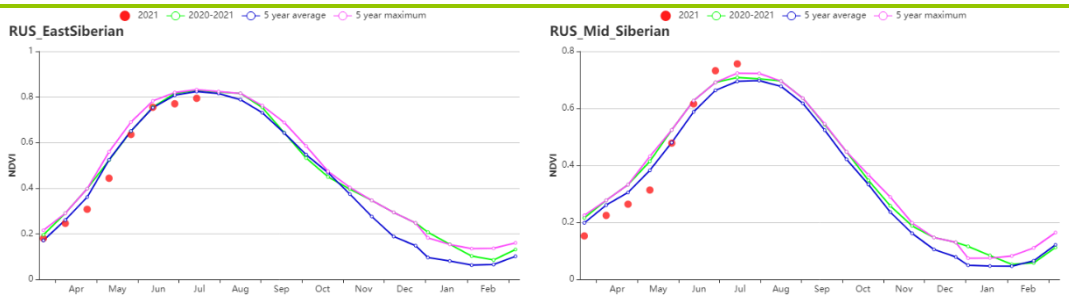
(f) Crop condition development graph based on NDVI, Southern Caucasus (left) and Northen Caucasus (right).



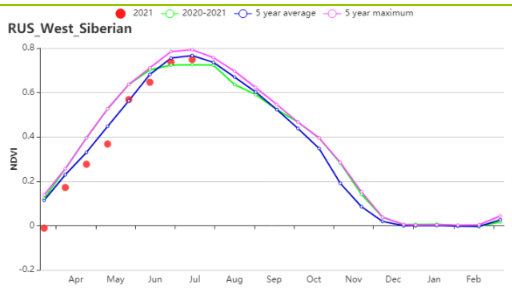
(g) Crop condition development graph based on NDVI, Central Russia (left) and Central black soils area (right).



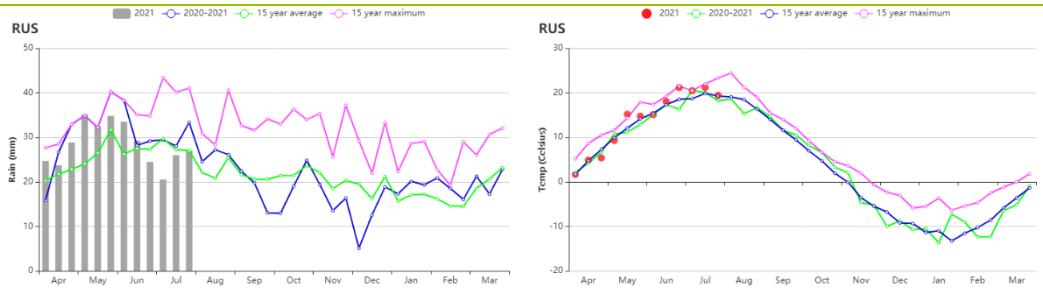
(h) Crop condition development graph based on NDVI, Middle Volga (left) and Ural and western Volga region (right).



(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, April - July 2021

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Central Russia	315	-5	13.7	0.9	1085	0	470	14
Central black soils area	380	28	15.1	0.4	1146	-3	522	5
Eastern Siberia	414	-6	12.5	1.0	1182	4	459	14
Middle Siberia	332	18	9.4	-1.1	1210	-4	378	-8
Middle Volga	341	14	15.0	1.6	1174	2	544	17
Northern Caucasus	369	27	17.9	0.2	1279	-3	639	1
Southern Caucasus	477	-7	16.0	0.9	1346	4	551	0
Ural and western Volga region	205	-29	14.1	1.6	1203	10	512	23
Western Siberia	341	18	12.3	-0.3	1153	1	441	2

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Central Russia	100	0	0.97
Central black soils area	100	0	0.96
Eastern Siberia	100	0	0.96
Middle Siberia	99	4	1.02
Middle Volga	96	-2	0.85
Northern Caucasus	96	1	0.90
Southern Caucasus	95	-1	0.86
Ural and western Volga region	98	-1	0.79
Western Siberia	100	0	0.92

[THA] Thailand

From April to July, the main rice and maize crops were sown, and the harvest of the second rice was completed in June. According to the agroclimatic indicators, Thailand suffered rainy and cooler than usual weather in this monitoring period with above-average rainfall (RAIN, +36%) and sunshine (RADPAR, +5%), as well as decreased temperature (TEMP, -0.4°C). Sufficient rainfall mitigates water stress for crops, while enough sunshine ensures photosynthesis and benefits the accumulation of biomass. All of these indicators led to a favorable potential biomass (BIOMSS, +6%). As shown by its profile, rainfall was above average during the whole monitoring period.

The NDVI development graph shows that crop conditions were above average in April and May. According to the NDVI departure clustering map, 29.9% of cropland was always slightly above average from April to July, mostly located in central and eastern areas. Crop conditions for 28.2% of the cropped area were slightly below average, except for the end of April, when they were slightly above average. Those areas were located in patches around most of Thailand, but predominantly in the south, including Surat Thani, Nakhon Si Thammarat, Krabi, Trang and northern areas including Chiang Rai, Phayao, Chiang Mai and Lampang. 30.4% of the cropped area, mostly located in central and eastern regions, fluctuated near the average level at beginning of the monitoring period and significantly improved to be above average after May. For the remaining 11.5% of the cropped area conditions were above average until June. The sharp negative departure at the end of this monitoring period was mostly likely due to cloud cover in the satellite image.

At the national level, all arable land was cropped during the season (CALF +1%) and had favorable VCIx values of around 0.94. CropWatch estimates that the crop condition was favorable and above average.

Regional analysis

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

The situation in the **Central double and triple-cropped rice lowlands** followed the same pattern as for the whole country: accumulated rainfall and radiation were above average (RAIN +91%, RADPAR +4%), and temperature was below average (TEMP -1.0°C), which resulted in above-average biomass production potential (BIOMSS +6%). According to the NDVI development graph, crop conditions were slightly above the 5-year average. At the end of April, the crop conditions even reached the 5-year maximum level. Considering the favorable VCIx value of 0.91, the situation is assessed as slightly above average.

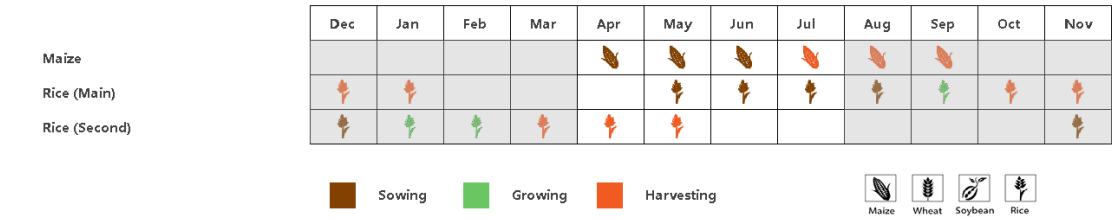
According to agro-climatic indicators for the **South-eastern horticulture area**, temperature was below average (TEMP -0.1°C), while accumulated rainfall and solar radiation were above average (RAIN +24%, RADPAR +4%), resulting in a slightly above-average biomass production potential (BIOMSS +5%). Crop conditions were slightly above average for most of the monitoring period, except for late June and July. Considering the favorable VCIx value of 0.96, the crop conditions in this area were slightly above average.

Agro-climatic indicators show that the conditions in the **Western and southern hills** were slightly above average: accumulated rainfall and radiation were above average (RAIN +22%, RADPAR +3%), and temperature was below average (TEMP -0.3°C), resulting in a biomass production potential increase (BIOMSS +5%). As shown in NDVI development graph, the crop conditions were slightly above average

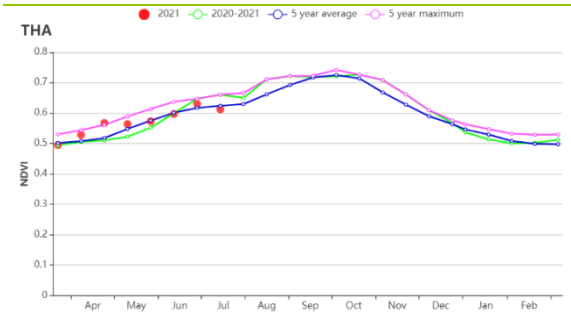
before May but dropped to below-average levels in June and July. According to the favorable VCIx value of 0.94, crop conditions are assessed as fair.

Indicators in the **Single-cropped rice north-eastern region** follow the same patterns as those for the country as a whole: accumulated rainfall and radiation were above average (RAIN +41%, RADPAR +7%), and temperature was below average (TEMP -0.3°C), resulting in an increased biomass production potential (BIOMSS +8%). The crop condition was slightly above average as depicted in the NDVI development graph. According to the satisfactory VCIx value of 0.96, the crop conditions were above average.

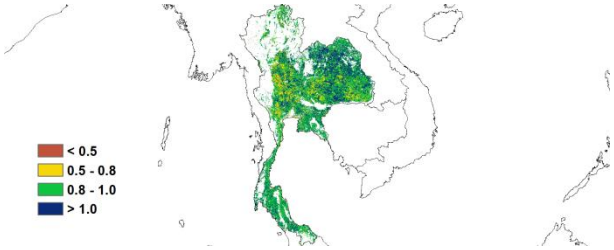
Figure 3.39 Thailand's crop condition, April - July 2021



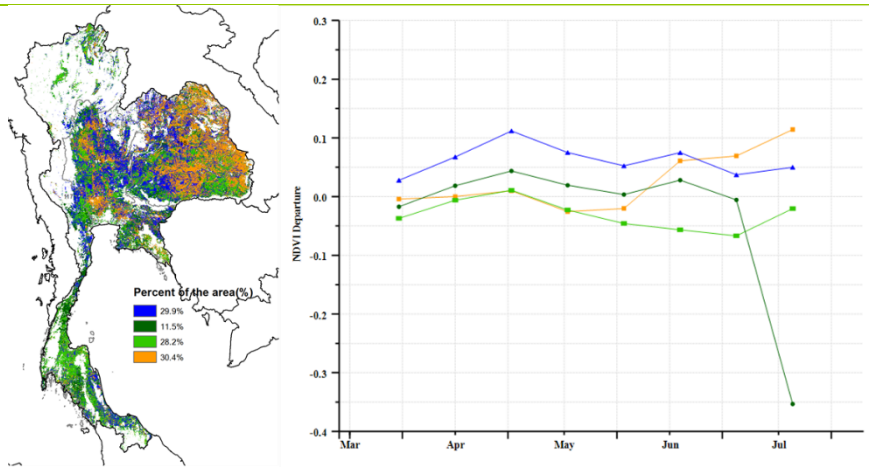
(a). Phenology of major crops



(b) Crop condition development graph based on NDVI

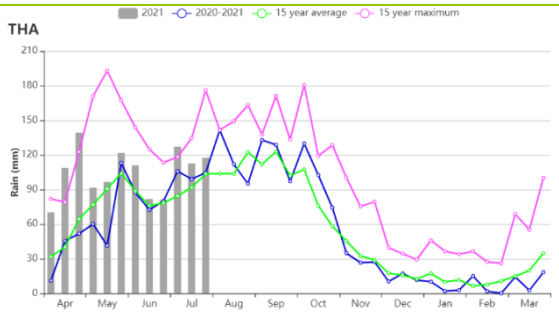


(c) Maximum VCI

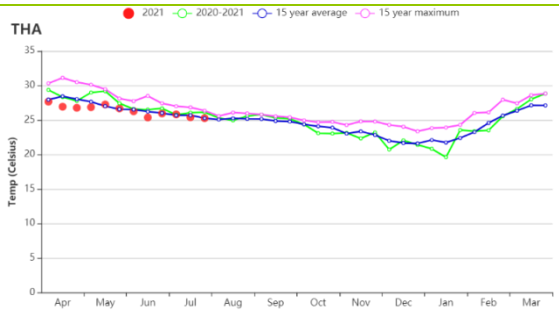


(d) Spatial NDVI patterns compared to 5YA

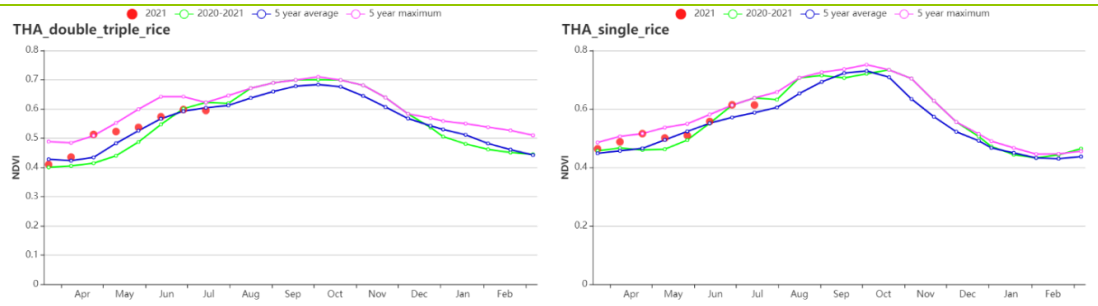
(e) NDVI profiles



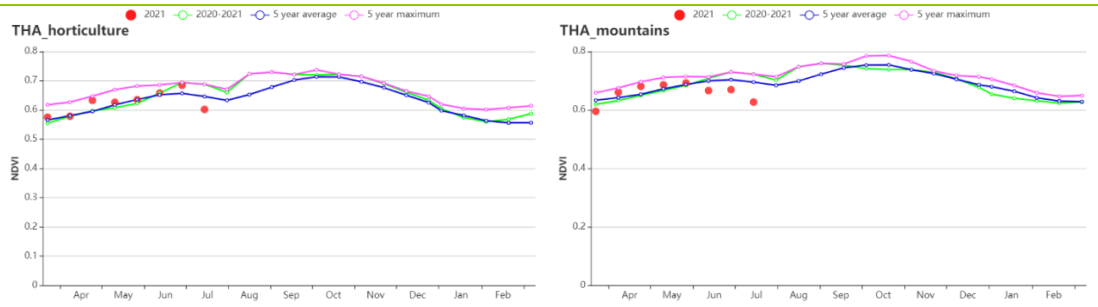
f) Rainfall profile



g) Temperature profile



(h) Crop condition development graph based on NDVI in the double and triple-cropped rice lowlands (left) and single-cropped rice North-eastern region (right)



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

Table 3.69 Thailand's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 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	1389	91	26.8	-1.0	1215	4	823	6
South-eastern horticulture area	1314	24	27.0	-0.1	1290	4	884	5
Western and southern hill areas	1111	22	25.4	-0.3	1239	3	828	5
Single-cropped rice north-eastern region	1402	41	27.3	-0.3	1229	7	835	8

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current
Central double and triple-cropped rice lowlands	99	1	0.91
South-eastern horticulture area	99	1	0.96
Western and southern hill areas	100	0	0.94
Single-cropped rice north-eastern region	100	1	0.96

[TUR] Turkey

This monitoring period covers the sowing and main growing period of maize and rice, while the harvest of wheat was almost concluded by the end of July. Nationwide, RAIN was far below average (-35%), and both TEMP (+0.4°C) and RADPAR (+2%) were slightly above the 15YA. BIOMSS was 7% below average. During the last reporting period, rainfall was 7% less than average and the impact of rainfall deficiency was not yet obvious from crop condition and indicators. However, in this monitoring period, especially in April and mid-May, lack of rainfall has caused negative impact on the growth of winter crops and severe drought was observed for around 10% of the country.

The NDVI-based crop condition development graph indicates below-average crop conditions during the whole monitoring period. The national average VCIx was 0.76. The southeastern, southern, and western provinces, such as Sanliurfa, Mardin, and Adana, experienced low VCIx values ranging from 0.5 to 0.8, indicating that crops in those regions were not satisfactory. Low VCIx (< 0.5), which indicates below-average crop conditions, was mainly observed for the central provinces such as Ankara, Yozgat and Kayseri.

In terms of the NDVI spatial departure clustering map, the results confirmed the spatial pattern described above. Due to the impact of low rainfall in April and May, strong negative departures of NDVI were observed. As shown by the VHIn graph, some areas went through dry conditions in the reporting period starting in April. Due to the severe drought, crop conditions were below average for Turkey.

Regional analysis

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

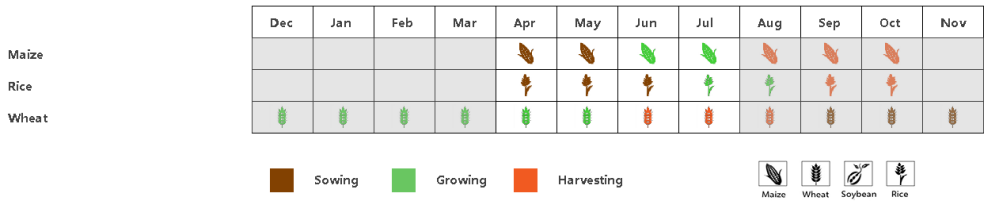
In **the Black Sea zone**, crop conditions were close to average. The rainfall was slightly below average (RAIN -6%), while the temperature (TEMP) increased by 0.1°C and radiation remained average. The cropped arable land fraction was 92%, 6% below average. The average value of VCIx was high at 0.88, the highest among all four AEZs of Turkey. The crop conditions are assessed to be close to normal.

In **the Central Anatolian plateau**, rainfall was far below average (RAIN -40%) during this monitoring period. TEMP (+0.4°C) and RADPAR (+2%) were both above the 15YA, resulting in a decrease of the BIOMSS index (-5%). The average VCIx for this region was 0.73. The cropped land area was only 55%, a decrease by 14%. Crop conditions are assessed as below average.

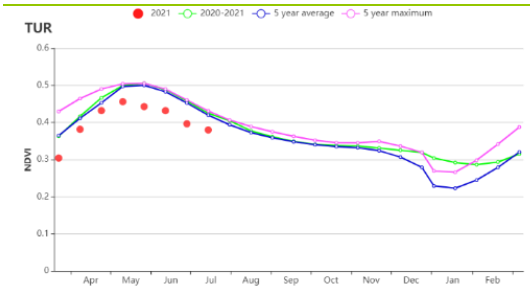
In **Eastern Anatolia**, rainfall was 48% below average, which is the largest decrease among the four AEZs. TEMP and RADPAR were 1.1°C and 5% above average, respectively. The lack of rainfall led to a decrease of biomass by 2%. The CALF decreased 16% compared to the average. With VCIx at 0.72, crop output is assessed to be below average.

As indicated by the NDVI profile, in **the Marmara Aegean Mediterranean lowland zone**, the crop conditions were below average during the reporting period. RAIN was 38% below average. The temperature was slightly above average (TEMP +0.1°C). VCIx was 0.79, and CALF was down 3% and biomass decreased 10%. Production in this region is expected to be below average.

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

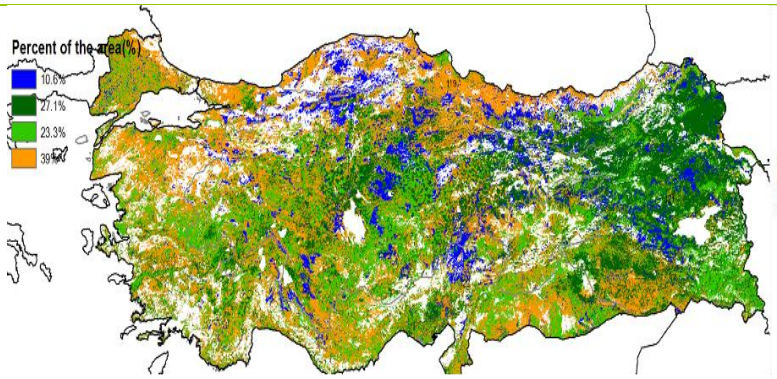


(a). Phenology of major crops

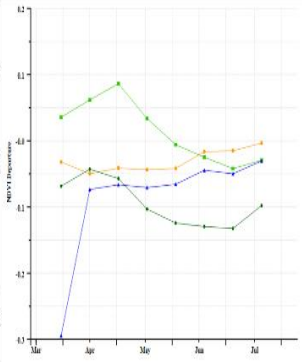


(b) Crop condition development graph based on NDVI

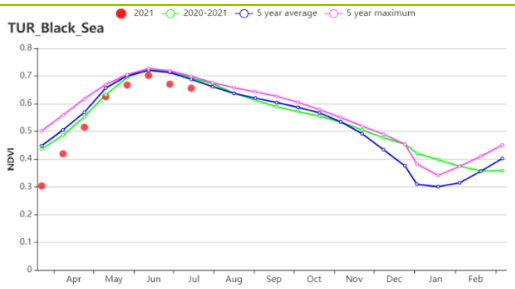
(c) Maximum VCI

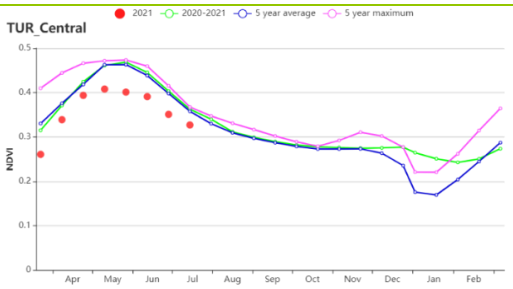


(d) Spatial NDVI patterns compared to 5YA

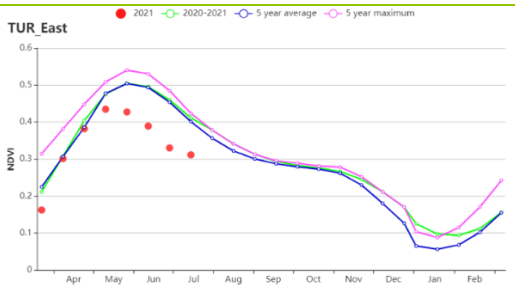


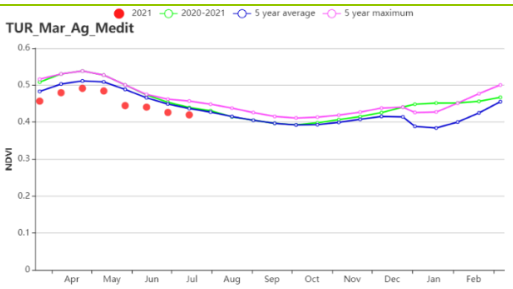
(e) NDVI profiles



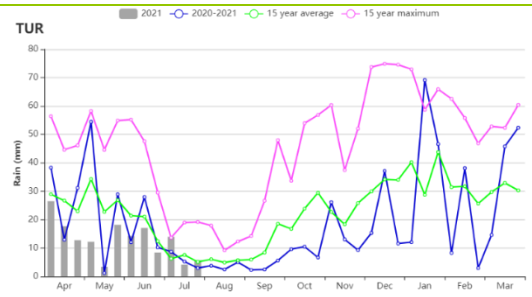


(f) Crop condition development graph based on NDVI (Black Sea region) (g) Crop condition development graph based on NDVI (Central Anatolia region)

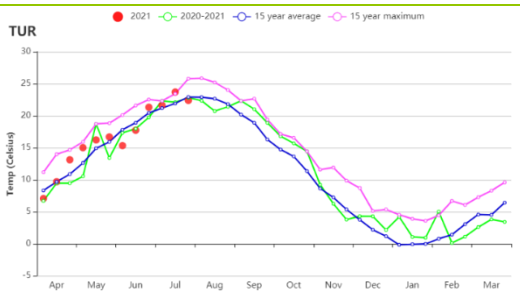




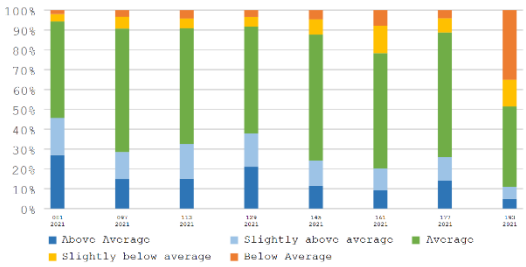
(h) Crop condition development graph based on NDVI (Eastern Anatolia region) (i) Crop condition development graph based on NDVI (Marmara_Agean_Mediterranean lowland region)



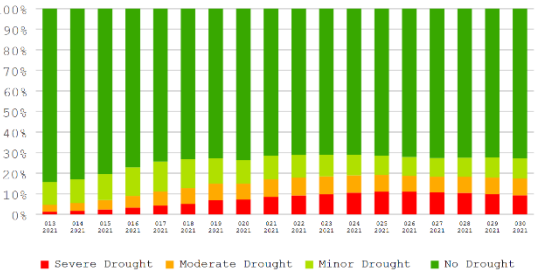
(h) Time series rainfall profi



(i) Time series temperature profile



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



(k) Proportion of VHIn categories compared with 5YA

Table 3.71 Turkey's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, April - July 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 (%)
Black Sea region	353	-6	13	0.1	1325	0	478	-3
Central Anatolia region	129	-40	15.8	0.4	1503	2	535	-5
Eastern Anatolia region	162	-48	15.4	1.1	1598	5	462	-2
Marmara Agean Mediterranean lowland region	110	-38	19	0.1	1567	2	523	-10

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current
Black Sea region	92	-6	0.88
Central Anatolia region	55	-14	0.73
Eastern Anatolia region	69	-16	0.72
Marmara Agean Mediterranean lowland region	77	-3	0.79

[UKR] Ukraine

In the Ukraine, maize, winter wheat and canola were the major crops in the field between April and July. Maize was planted in May and winter wheat was harvested in July.

At the national level, rainfall was abundant (RAIN 374 mm, +24%) during this monitoring period, while temperatures were cooler (TEMP 15.4°C, -0.7°C) with close-to-average RADPAR (-2%). Agroclimatic conditions results in close to average potential biomass is normal (-1%) as compared to the 15YA. Almost all cropland was cultivated (CALF 100%) and the maximum vegetation condition index (VCIx) reached 0.97. NDVI at the national level recovered from below-average levels in April to normal levels in late May and subsequently exceeded the 5YA maximum in July. NDVI on 84.6% of the cropland was at or higher than the 5YA at the end of July, which indicated most of the crops were in good conditions. However, the remaining 15.4% of cropland, mainly concentrated in southern areas, especially in Odessa and Crimea experienced a depression in July. According to its spatial pattern, the VCIx of most cropland in this period was between 0.8 and 1, confirming the favorable crop conditions.

In summary, weather conditions were positive for crop growth, resulting in favorable conditions for winter wheat and maize.

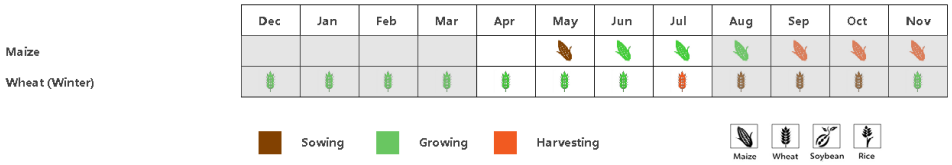
Regional analysis

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

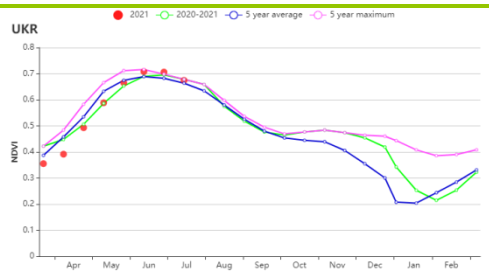
The **Central wheat area** and **Southern wheat and maize area** experienced similar conditions in this period. They recorded abundant rainfall (384 mm, +34% and 381 mm, +55%, respectively). Both had cooler temperature (-0.8°C) and less sunshine (-4%) as compared to the 15YA. Potential biomass for both regions was estimated 4% lower than the 15YA average. CALF reached 100% for both areas with a favorable VCIx (0.96 and 0.99 respectively). Crop development based on NDVI also showed near or above average levels starting in June. Based on the above information, above average production of wheat and maize in these two zones can be expected.

The other two AEZs, **Eastern Carpathian hills** and **Northern wheat area**, generally showed normal conditions during this season, near average rainfall (-7 and+8%, respectively) and normal sunshine (0 and +1%, respectively) with cooler temperatures (-0.7 and -0.4°C). The BIOMSS indicator reached 493 and 531 gDM/m2 respectively, which were very close to the 15YA average (+1% and +4%) as compared to the 15YA. The agronomic indicators show a very good CALF (100%) and VCIx (0.94 and 0.95). The NDVI development profile also confirmed favorable conditions starting in mid-June, when they started to surpass the 5YA. Conditions for the crops were favorable.

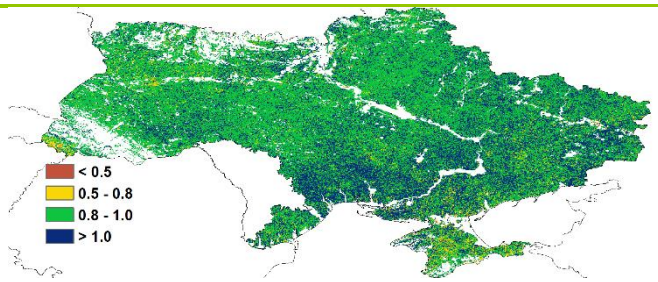
Figure 3.41 Ukraine's crop condition, April - July 2021



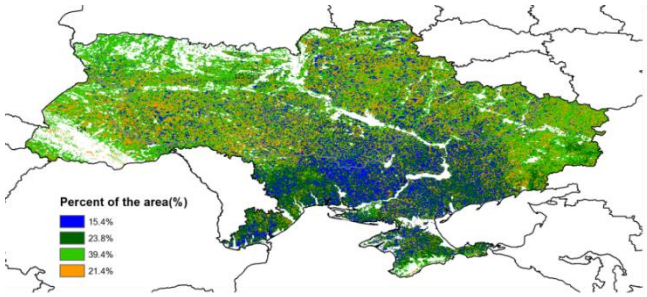
(a). Phenology of major crops



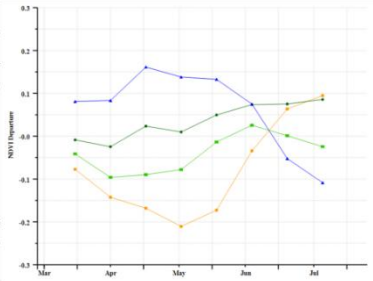
(b) Crop condition development graph based on NDVI



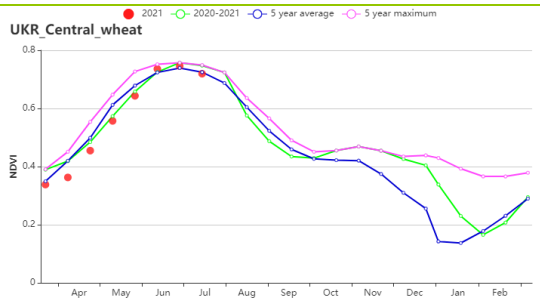
(c) Maximum VCI

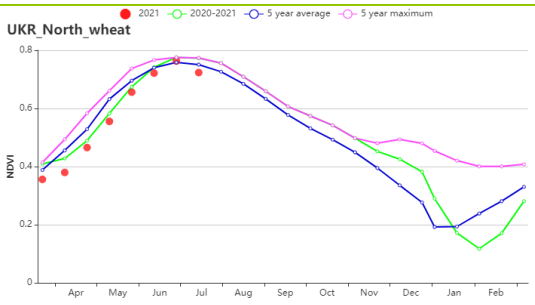


(d) Spatial NDVI patterns compared to 5YA

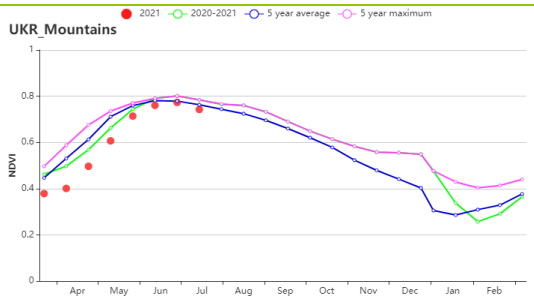


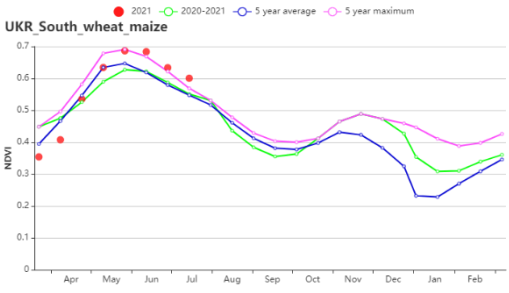
(e) NDVI profiles



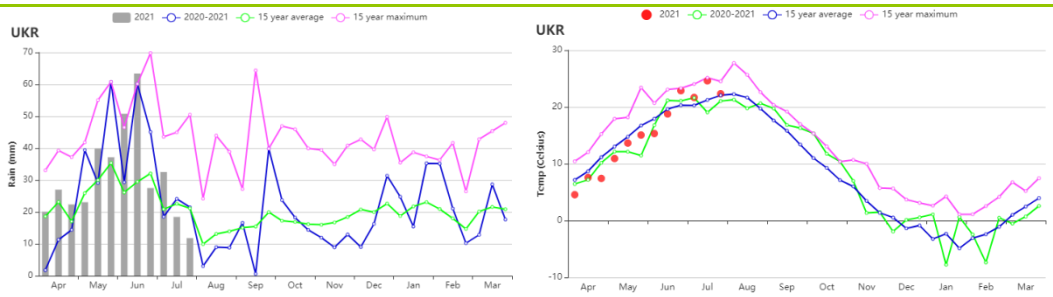


(e) Crop condition development graph based on NDVI (Central wheat area(left) Northern wheat area(right))

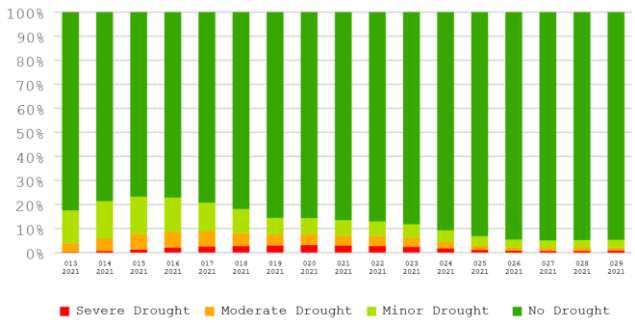




(f) Crop condition development graph based on NDVI (Eastern Carpathian hills(left) Southern wheat and maize area(right))



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



(h) Proportion of drought categories from January-July 2021

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

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Central wheat area	386	34	15.3	-0.8	1195	-4	543	-4
Eastern Carpathian hills	401	-7	13.7	-0.7	1222	0	493	1
Northern wheat area	349	8	14.8	-0.4	1202	1	531	4
Southern wheat and maize area	381	55	16.6	-0.8	1241	-4	595	-4

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Central wheat area	100	0	0.96
Eastern Carpathian hills	100	0	0.94
Northern wheat area	100	0	0.95
Southern wheat and maize area	100	1	0.99

[USA] United States

This report covers the period from April to July 2021. Winter wheat had reached maturity in June and July. Maize and soybean planting started in April and finished in May. Corn reached the silking stage in late July and soybeans the flowering and podding stage. Spring wheat sowing was completed in May and it will reach harvest stage in August. Overall, NDVI showed below-average crop conditions until July and near-average conditions in July.

For the country as a whole, rainfall was 20% higher and temperatures 0.4°C lower than the 15 years' average. Time-series rainfall profile indicated above-average rainfall in all time windows except mid-June. Hot weather was observed in early to mid-June 2021, with temperatures reaching the maxima of the last 15 years. Rainfall in California (-70%), Oregon (-50%), Washington (-50%), Idaho (-47%), Nebraska (-21%), Montana (-13%), North Dakota (-13%) and Minnesota (-11%) was below the 15YA, and temperatures in these states were 0.8°C to 1.7°C warmer than the 15YA. Other states, particularly those along the Mississippi River, received abundant rainfall during the reporting period.

Poor crop condition due to water and temperature stress is confirmed by the VCIx in the Northern Plains and Northwest, which is important spring wheat and maize production area where poor unfavorable weather conditions had a negative impact on crop production. NDVI departure clustering also identified the poor crop condition in the Northern Plains. Elsewhere, VCIx reflected good or excellent crop conditions, particularly in major parts of the Corn Belt and the lower Mississippi River area. The latter is an important maize, soybean and rice producing area and good crop conditions indicate that above-average crop production can be expected. At the country level, CALF was 3% below average due to drought conditions that reduced crop emergence.

In short, favorable crop conditions were assessed by CropWatch with the exception of the Northern Plains, northwest area and western regions.

Regional analysis

Southern Plains

The Corn Belt, as indicated by its name, is the most important maize and soybean producing zone. Normal agro-climatic conditions were observed during period with slightly above average precipitation, and average temperature and RADPAR. On average, the crop conditions were close to the 15-year peak at the end of July. Rainfall was 28% in Illinois above average, effectively replenishing the soil moisture needed for crop growth. Although the rainfall in Iowa was above 15YA (+7%), the northern half of Iowa was affected by severe and extreme drought. The cropped arable land fraction reached 100%, and the maximum vegetation index reached to 0.95, identifying favorable crop growing conditions. Soybeans and maize harvest will start in September and above-average crop production could be expected if the good agro-climatic conditions continue.

Northern Plains

The Northern Plains is the largest spring wheat producing region and an important corn producing region in the United States. During the reporting period, the region experienced severe water shortages, and the weather was dominated by hot and dry conditions with rainfall 5% below average and temperatures 0.9°C above average. During the early and middle stages of crop growth, this region suffered from severe drought, which had a significant negative impact on crop emergence. Some crops were almost destroyed by drought. CALF was only 73% which was 17% below the average. As a result of the drought, the crop

conditions in the Northern Plains, as indicated by the NDVI development profile, were significantly below the average. The maximum vegetation index dropped to 0.69, also indicating the poor crop conditions. In short, CropWatch assessed that below average crop production can be expected for this the region.

Lower Mississippi

The Lower Mississippi region is the most important rice producing region and an important producer of soybean and maize. During the reporting period, abundant rainfall occurred, with rainfall 53% above average. Rice has a high water demand and the significantly above-average rainfall facilitated the recharge of soil moisture in favor of rice growth. The NDVI development profile indicated good crop conditions by the end of July. Compared to the last 5 years, cropped arable land fraction reached 100%, and the maximum vegetation index reached to 0.93, indicating good growth conditions. In short, CropWatch assessed that above-average crop production can be expected in the region given that rice is about to reach harvest stage soon.

Southern Plains

The Southern Plains is the most important area for winter wheat, sorghum and cotton production. During this period, winter wheat harvest was completed. Sorghum and cotton finished sowing and entered their peak growth periods. The Southern Plains received abundant rainfall, 58% above average. The NDVI development profile indicates the good crop condition after June. CALF reached 90%, which is 4% higher than the average, and the maximum vegetation index reached 0.93, indicating favorable growing conditions for the crop. In short, CropWatch assessed that above average production can be expected for the crops growing in the region.

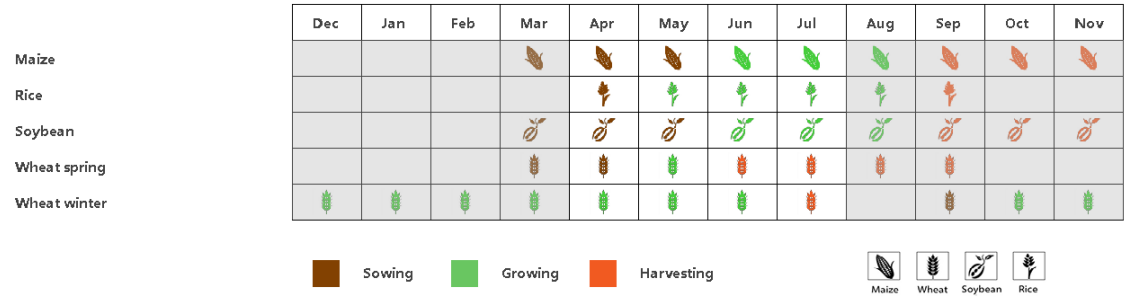
Southeast region

Southeast region is an important cotton and maize producing area. This region received abundant rainfall, 33% above average. The NDVI development profile indicated that the good crop conditions were observed after June. CALF reached 100%, and the maximum vegetation index reached 0.95, indicating good growing conditions. In short, CropWatch assessed that average production can be expected for the crops growing in the region.

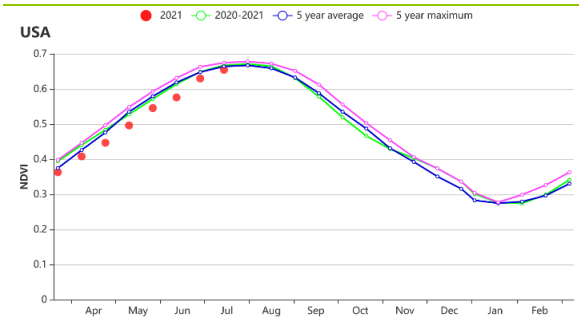
Northwest

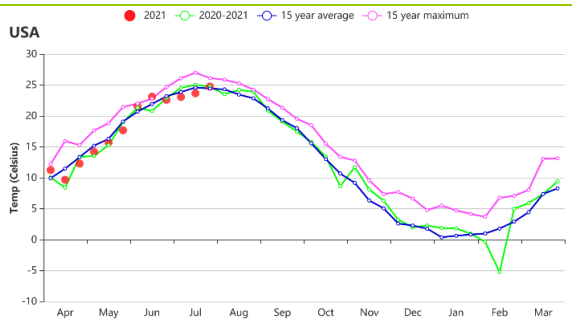
The Northwest is the second most important winter wheat producing areas, and an important spring wheat producing area. During the monitoring period, this region experienced hot and dry weather conditions with rainfall 45% below average and temperatures 1.5°C above average. The continued hot and dry weather accelerated soil moisture loss and greatly limited crop growth. The NDVI development profile indicated very poor crop conditions during this reporting period. CALF was only 71%, which was 16% below the average. The maximum vegetation index was 0.70. This also indicated the unfavorable crop conditions. In short, CropWatch assessed below average crop production can be expected in the region.

Figure 3.42 United States crop condition, April to July 2021

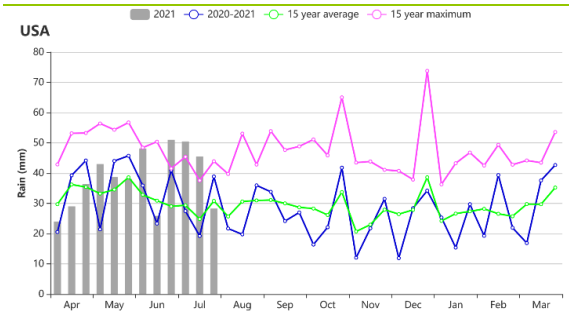


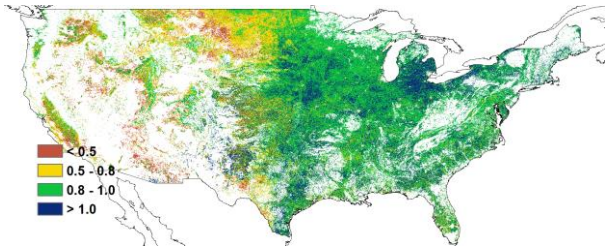
(a). Phenology of United States from April to July 2021



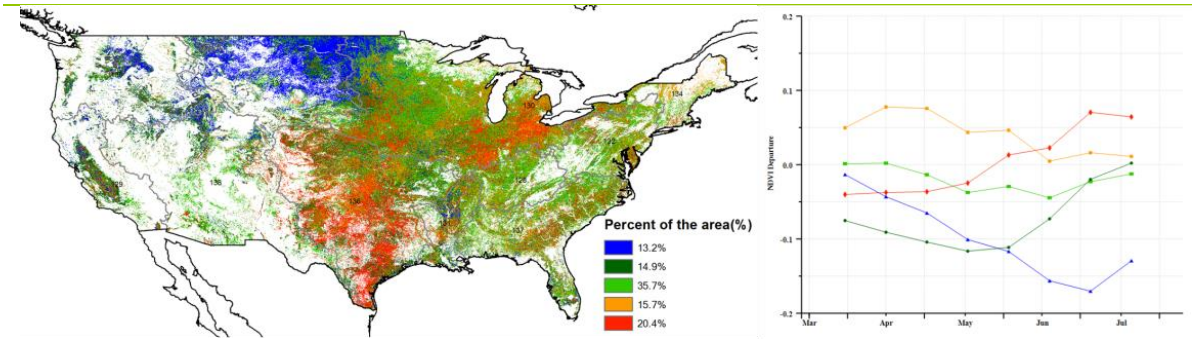


(b). Crop condition development graph based on NDVI (c) Time series temperature profile

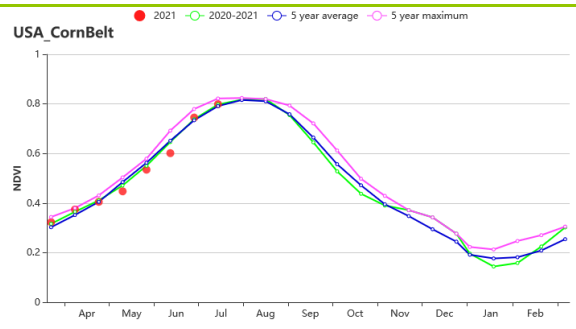




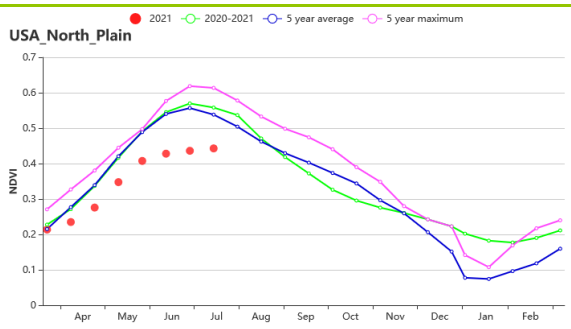
(d). Time series rainfall profile (e). Maximum VCI



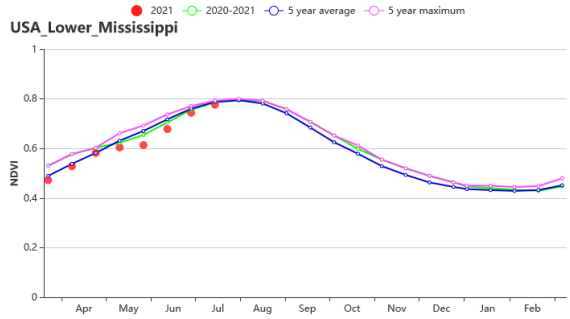
(f). Spatial distribution of NDVI profiles



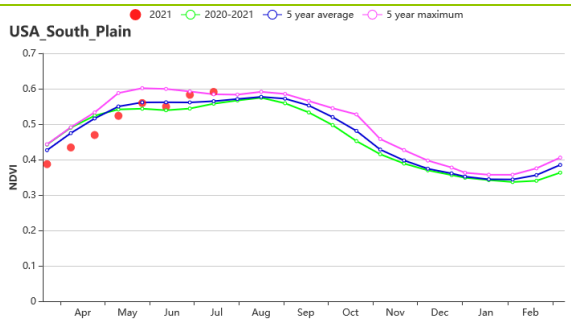
(g) Crop condition development graph in Corn Belt



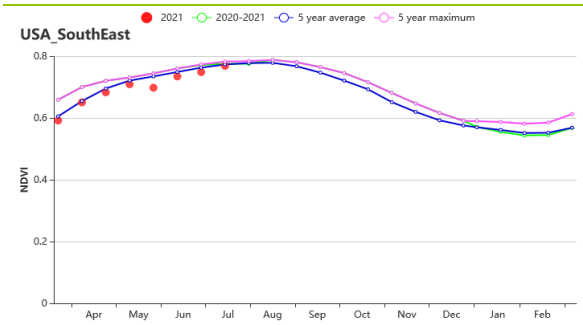
(h) Crop condition development graph in North Plain



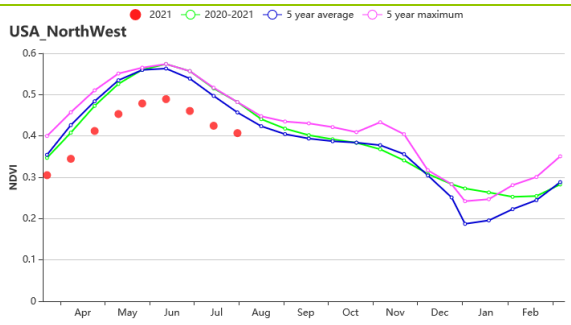
(i) Crop condition development graph in Lower Mississippi



(j) Crop condition development graph in South Plain



(i) Crop condition development graph in Southeast



(j) Crop condition development graph in Northwest

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

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure(°C)	Current (MJ/㎡)	Departure (%)	Current (gDM/m²)	Departure (%)
Corn Belt	428	4	16.9	0.0	1293	0	621	2
Northern Plains	321	-5	15.2	0.9	1416	2	632	10
Lower Mississippi	738	53	22.1	-1.4	1360	-2	797	-4
Southeast	660	33	22.1	-1.1	1413	1	828	0
Southern Plains	559	58	21.4	-1.4	1355	-5	766	-5
North-eastern areas	435	0	15.9	-0.2	1252	0	550	-1
Northwest	139	-45	13.7	1.5	1495	7	557	15
Southwest	253	33	18.5	0.6	1572	-1	674	12
Blue Grass region	428	-3	18.9	-1.2	1377	1	709	-2
California	33	-70	18.4	1.3	1694	4	491	2

Table 3.76 United States' agronomic indicators by sub-national regions, current season's values and departure from 5YA, April - July 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current
Corn Belt	100	0	0.95
Northern Plains	73	-17	0.69
Lower Mississippi	100	0	0.93
Southeast	100	0	0.95
Southern Plains	90	4	0.93
North-eastern areas	100	0	0.97
Northwest	72	-16	0.70
Southwest	37	-12	0.68
Blue Grass region	100	0	0.96
California	66	-16	0.63

[UZB] Uzbekistan

This monitoring period from April to July covers the sowing and main growth phase of maize. Wheat had reached maturity in June. Among the CropWatch agroclimatic indicators, RAIN was below average (-7%), while TEMP and RADPAR were above average (+0.9°C and +2%). The combination of these factors resulted in a decreased BIOMSS (-7%) compared to the fifteen-year average. The NDVI development graph shows that crop conditions were below the five-year average during the monitoring period. As shown in the NDVI cluster graph and profiles, only about 11% of the agriculture areas had above-average conditions in April and May. These areas are located mainly in the northern part of Kashkadarya province, the western part of Fergana province and Surkhandarya province. And in June and early July, 26% of the agriculture areas had above-average conditions, which are mainly distributed in Khorezm province and Bukhara province. By late July, in addition to the above two provinces, parts of the agriculture areas in Samarkand province and Jizzakh province also had above-average conditions. The national average VCIx was 0.73, and the cropped arable land fraction decreased by 13%.

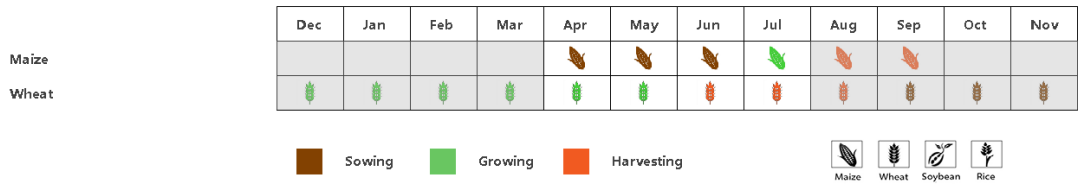
Overall, the conditions for crop production in Uzbekistan are unfavorable.

Regional analysis

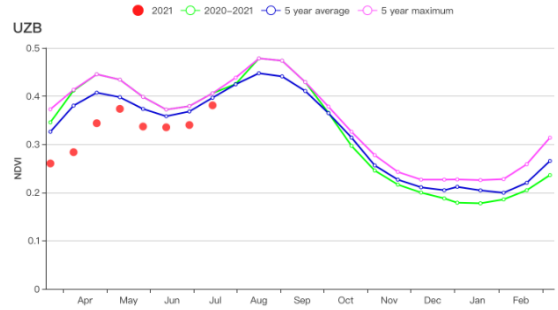
In **the Eastern hilly cereals zone**, NDVI was below the five-year average from April to July. The RAIN was below average (-6%), while TEMP and RADPAR were above the fifteen-year average (+0.7°C and +2%). The combination of these factors resulted in a decreased BIOMSS (-5%). The maximum VCI index was 0.71 and Cropped Arable Land Fraction decreased by 14%. Overall, crop conditions are expected to be below average.

In **the Aral Sea cotton zone**, crop condition was below the five-year average according to the NDVI development graph. The TEMP was much higher than average (+2.1°C), while RAIN was below average (-57%). RADPAR was slightly above average (+4%). Affected by these factors, BIOMSS decreased by 16% compared to the fifteen-year average. The maximum VCI index was 0.77 and Cropped Arable Land Fraction decreased by 7%. Overall crop prospects are unfavorable.

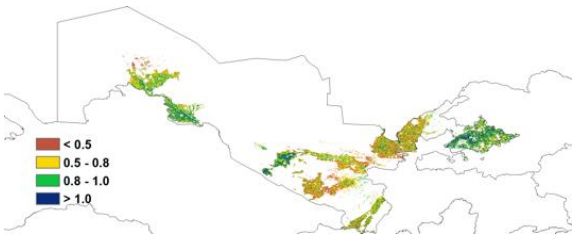
Figure 3.43 Uzbekistan crop condition, April - July 2021



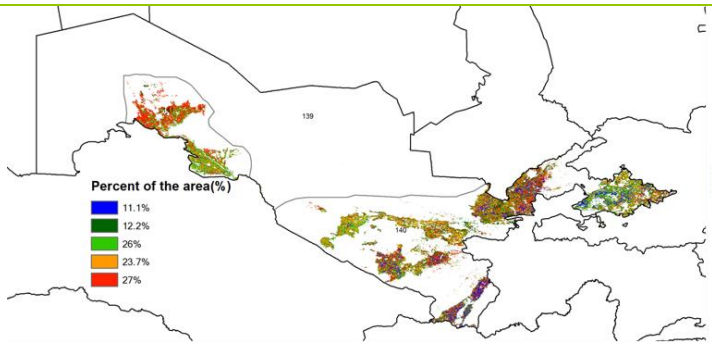
(a) Phenology of major crops



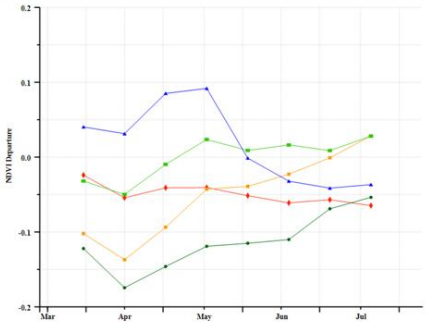
(b) Crop condition development graph based on NDVI



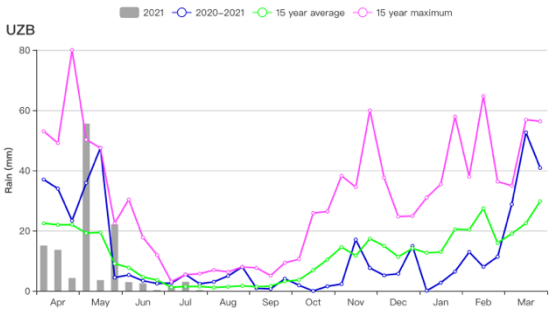
(c) Maximum VCI



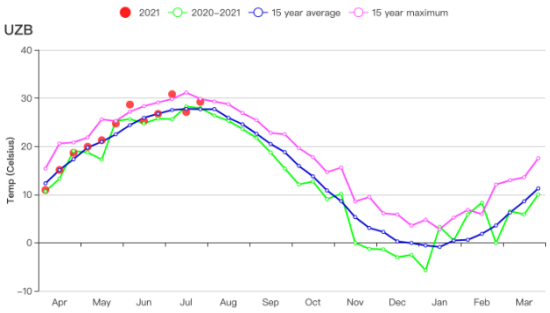
(d) Spatial NDVI patterns compared to 5YA



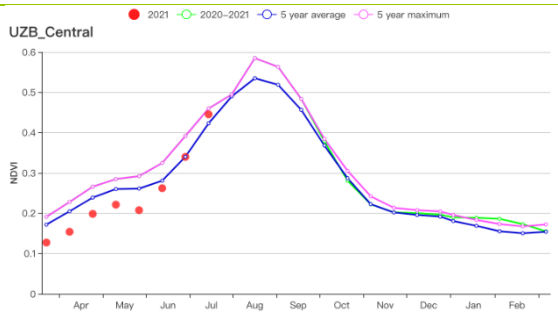
(e) NDVI profiles

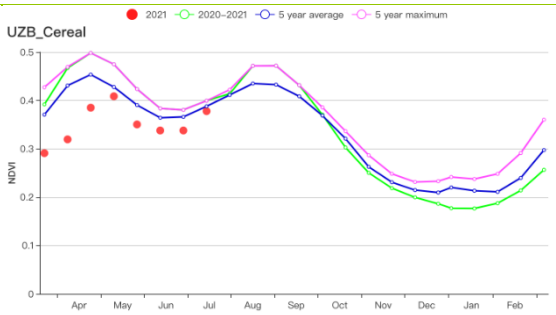


(f) Rainfall profiles

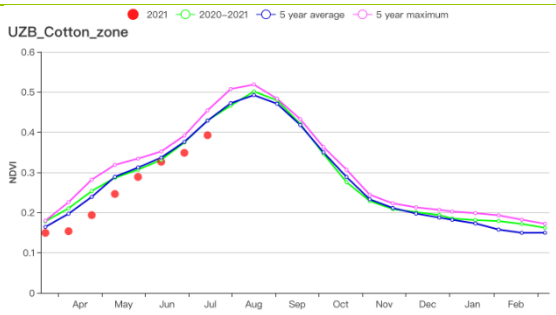


(g) Temperature profiles

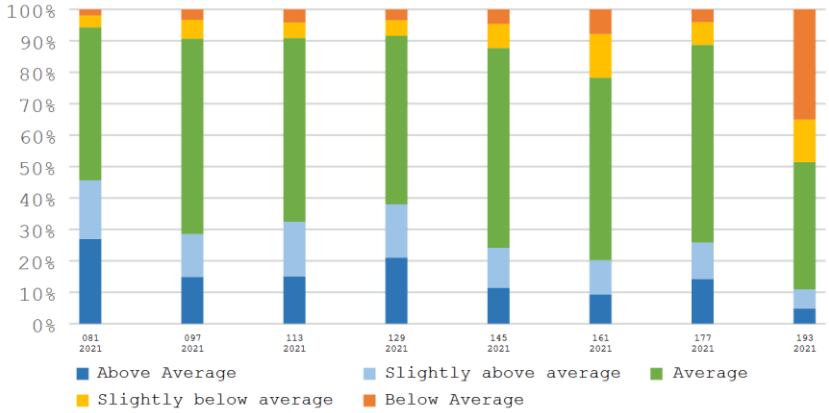




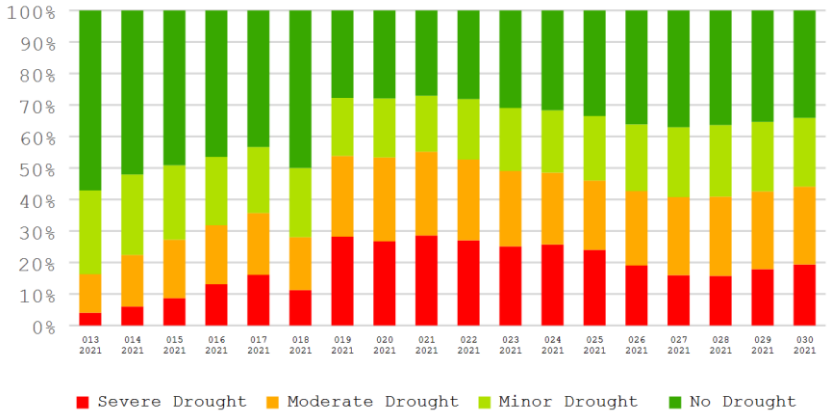
(h) Crop condition development graph based on NDVI Central region with sparse crops (left) Eastern hilly cereals region (right)



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



(j) Proportion of NDVI anomaly categories compared with 5YA in Uzbekistan



(k) Proportion of VHIn categories compared with 5YA in Uzbekistan

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

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m^2)	Departure (%)	Current (gDM/m^2)	Departure (%)
Aral Sea cotton zone	11	-57%	27.0	2.1	1592	4	519	-16
Eastern hilly cereals zone	137	-6	22.8	-0.7	1601	2	538	-5
Central region with sparse crops	29	-34	27.0	1.7	1596	3	**464**	-20

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure (%)	Current
Aral Sea cotton zone	61	-7	0.77
Eastern hilly cereals zone	64	-14	0.71
Central region with sparse crops	72	8	0.84

[VNM] Viet Nam

This monitoring period covers the entire period from the sowing to harvesting of summer rice in the Central part. In May, winter-spring rice in the north and summer-autumn rice in the Mekong Delta and the south-east had reached maturity. In July, the production of spring-winter rice started in the Mekong Delta and South-east region. The planting of rainy season rice in the north started as well. CropWatch agro-climatic indicators show average precipitation (1137 mm, +1%) and TEMP (25.1°C, +0.2°C), but with higher RADPAR (+7%), the BIOMSS (+8%) showed a marked increase compared to the 15YA. Both, VCIx (0.94) and CALF (96%) were high. Based on the NDVI development graph, the crop conditions were below the 5YA and the average of the same period last year, especially at the beginning of this monitoring period. The precipitation during this monitoring period showed an average level compared with the 15YA, while the temperature fluctuated near the 15YA. According to distribution of the VCIx, crop conditions in the North were favorable, while in the South Central Coast they showed an area with low values. As to the spatial distribution of NDVI profiles, crop conditions in about 40.1% were above average mainly in the central of Nghe An Province, Ninh Thuan Province and the South Central Coast region. About 18.3% were below average at the beginning of this monitoring period, mainly distributed in the Northeast of the country. Overall, crop conditions were favorable.

Regional analysis

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

In the **Central Highlands**, RAIN was below average (1080 mm, -9%) and TEMP was near average (23.8°C). While RADPAR increased significantly (1234 MJ/m^2, +8%), BIOMSS was also higher by 9%. CALF was 99% and VCIx was 0.91. The crop condition development graph based on NDVI indicated that the conditions had fallen from favorable levels to below the 5YA and last year's levels starting in May. Crop production is expected to be average at best.

In the **Mekong River Delta**, RAIN (1059 mm, 0%) and TEMP (27.9°C, -0.1°C) were close to the 15YA. The favorable radiation (RADPAR +6%) caused an increase of BIOMSS by 7%. CALF was also higher (86%, +3%) and VCIx was 0.93. According to the NDVI-based development graph, crop conditions were near the 5YA, except for early April and late July. Crop production is expected to be favorable.

In the **North Central Coast**, with average TEMP (25.1°C, +0.3°C), above average RAIN (1080 mm, +19%) and RADPAR (1300 MJ/m^2, +9%) were observed, resulting in an above-average BIOMSS (+11%). VCIx was 0.95 and CALF was 98%. According to the NDVI-based development graph, crop conditions were low in April but close to average from May to June, and finally surpassed the 5-year-maximum in July. Crop production in this area is expected to be above the average.

In the **North East**, TEMP (24.3°C, +0.5°C) and RAIN (1421 mm, 0%) were near the 15YA. RADPAR was above the 15YA (1211 MJ/m^2, +5%), which resulted in an increased BIOMASS (779 gDM/m^2, +7%). CALF was 100% and VCIx was 0.97. Overall, the crop output is expected to be favorable.

In the **North West**, with significantly increased RAIN (1322 mm, +18%) and RADPAR (1255 MJ/m^2, +6%) and normal TEMP (23.1°C, 0.2°C), BIOMSS increased by 8%. CALF was 100% and VCIx was 0.96. According to the NDVI-based development graph, crop conditions improved and exceeded the 5-year-maximum

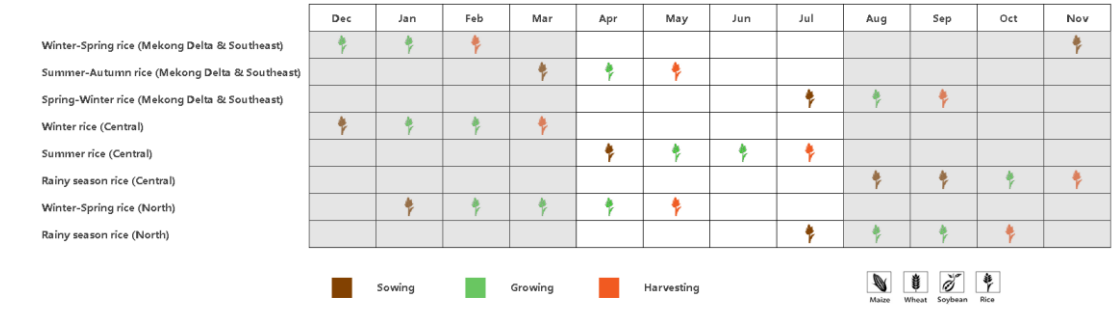
before May and then decreased below the 5YA. Crop conditions in this region were close to or above the average.

The situations of agro-climatic indicators in the **Red River Delta** were the same as in the **North West**. Increased RAIN (1186 mm, +12%) and RADPAR (1262 MJ/m^2, +6%) and average TEMP (27.2°C, 0.4°C) resulted in an increased BIOMSS (864 gDM/m^2, +8%). CALF was 96% and VCIx was 0.92. According to the crop condition development graph, the NDVI was below the 5YA during the whole monitoring period. Crop output is estimated to be below average.

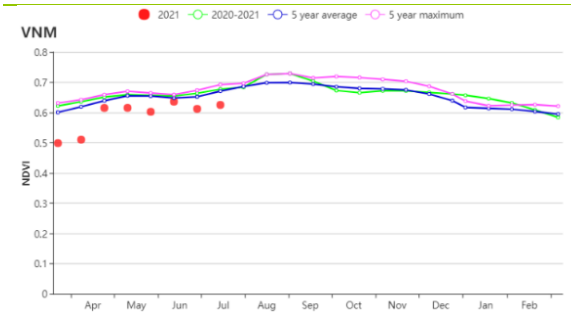
In the **South Central Coast**, RAIN greatly decreased (606 mm, -36%), together with average TEMP (24.6°C, +0.3°C) and increased RADPAR (1318 MJ/m^2, +10%) an increased BIOMSS (807 gDM/m^2, +6%) resulted. CALF was 96% and VCIx was 0.86. According to the crop condition development graph, the NDVI was below the 5YA during the whole monitoring period. Crop conditions were slightly unfavorable.

The situations of agro-climatic indicators in the **South East** were the same as those in the **South Central Coast**. Average TEMP (26.5°C, +0%), slightly decreased RAIN (1113 mm, -5%) and increased RADPAR (1301 MJ/m^2, +7%) resulted in an increased BIOMSS (870 gDM/m^2, +7%). CALF was 95% and VCIx was 0.92. According to the crop condition development graph, the NDVI was close to the 5YA in April but decreased below the 5YA after May. Crop conditions in this region were slightly unfavorable.

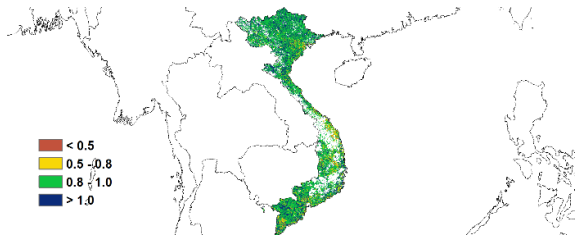
Figure 3.44 Vietnam's crop condition, April-July 2021



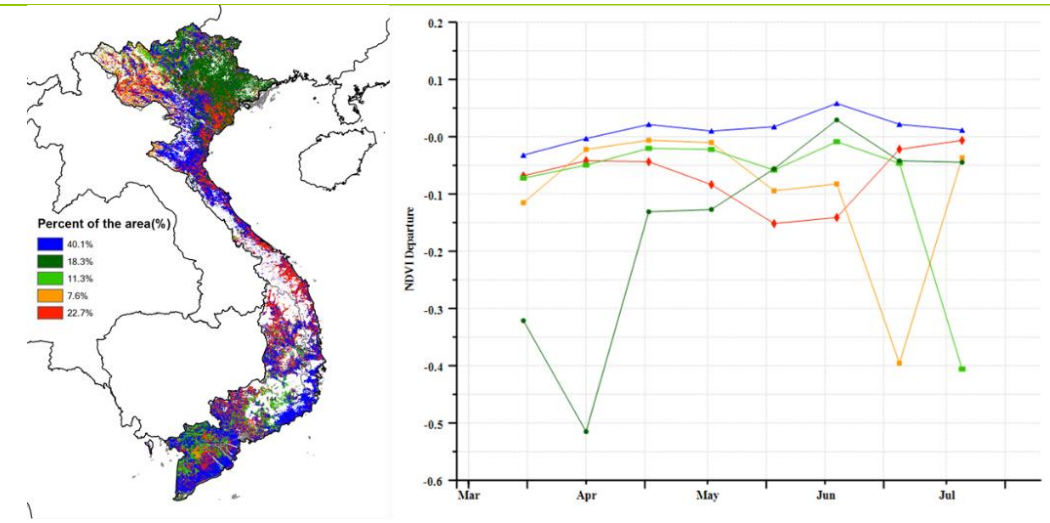
(a). Phenology of major crops



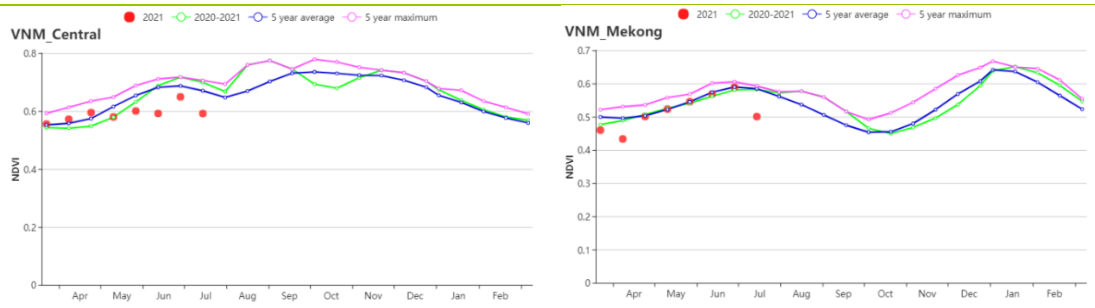
(b) Crop condition development graph based on NDVI



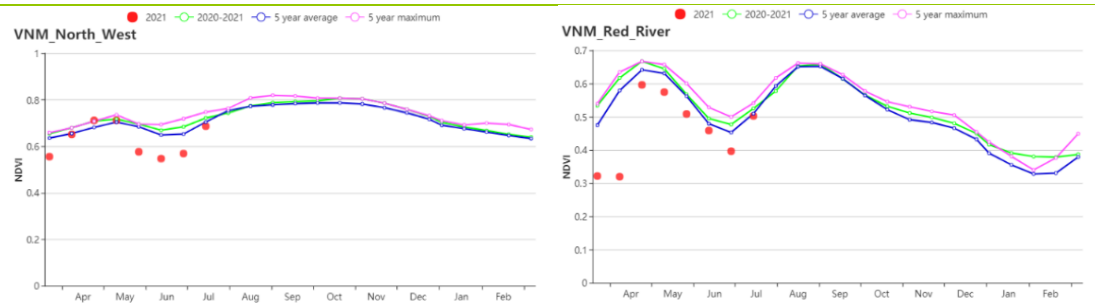
(c) Maximum VCI



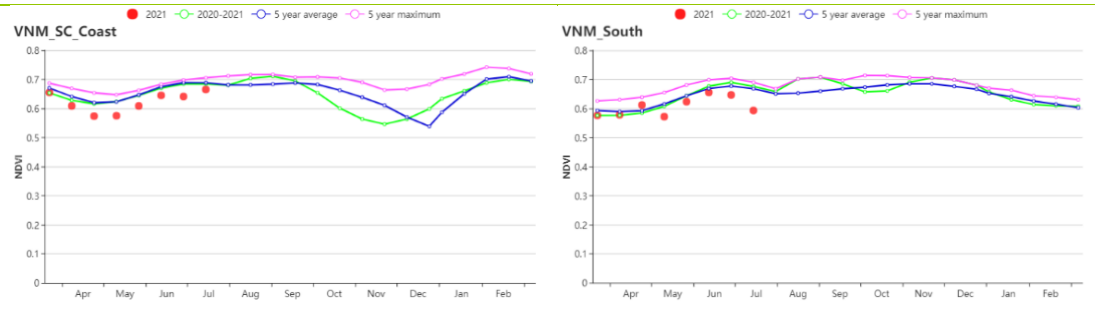
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



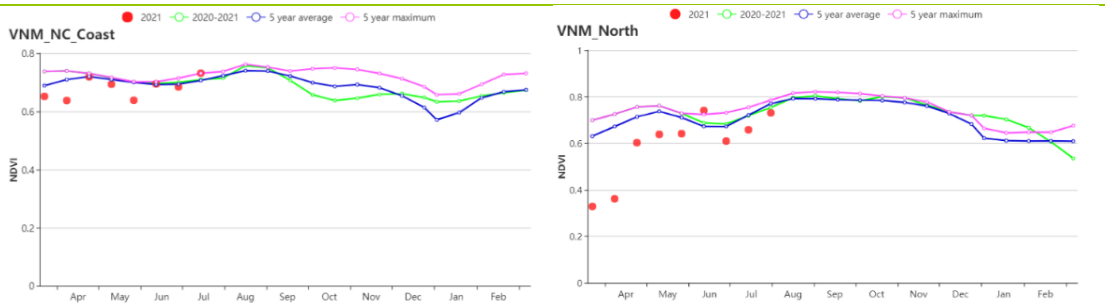
(f) Crop condition development graph based on NDVI Central Highlands Vietnam(left), and Mekong River Delta(right)



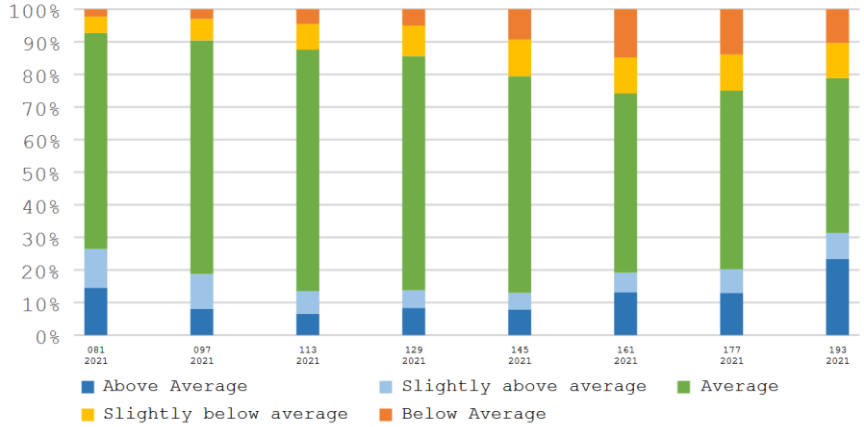
(g) Crop condition development graph based on NDVI North West Vietnam(left), and Red River Delta(right)



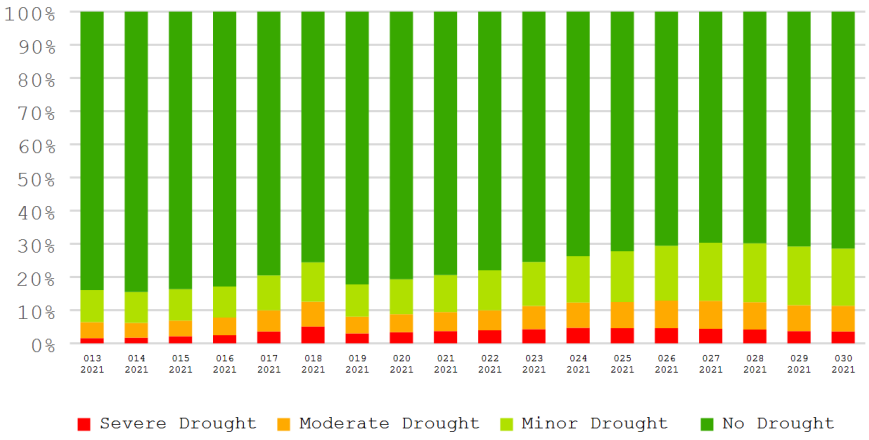
(h) Crop condition development graph based on NDVI South Central Coast Vietnam(left), and South East Vietnam(right)



(i) Crop condition development graph based on NDVI North Central Coast Vietnam(left), and North East Vietnam(right)



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



(k) Proportion of VHIm categories compared with 5YA

Table 3.79 Vietnam's agronomic indicators by sub-national regions, current season's values and departure from 15YA, April–July 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 (%)
Central Highlands	1080	-9	23.8	0.0	1234	8	780	9
Mekong River Delta	1059	0	27.9	-0.1	1333	6	917	7
North Central Coast	1080	19	25.1	0.3	1300	9	856	11
North East	1421	0	24.3	0.5	1211	5	779	7
North West	1322	18	23.1	0.2	1255	6	779	8
Red River Delta	1186	12	27.2	0.4	1262	6	864	8
South Central Coast	606	-36	24.6	0.3	1318	10	807	6
South East	1113	-5	26.5	0.0	1301	7	870	7

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current
Central Highlands	99	0	0.91
Mekong River Delta	86	3	0.93
North Central Coast	98	0	0.95
North East	100	0	0.97
North West	100	0	0.96
Red River Delta	96	-1	0.92
South Central Coast	96	0	0.86
South East	95	1	0.92

[ZAF] South Africa

In South Africa, soybean and maize are the main crops being produced during this monitoring period. In the east, maize harvest started in May, whereas in the west, it started one month later. Soybean harvest began in April and wheat planting in May.

Based on the NDVI development graph, the crop conditions were below the 5-year average in April and May and improved in June and July. It subsequently started to improve over the 5YA levels in June. At the national level, the CropWatch agroclimatic indicators showed that radiation was slightly above the 15-year average (RADPAR, +5%). With a significantly lower rainfall (RAIN, -36%) and a slightly lower temperature (TEMP, -0.3°C), the potential biomass decreased by 15% compared to the 15-year average. The maximum vegetation condition index (VCIx) was 0.84, and the cropped arable land fraction (CALF) increased by 1% compared with the last 5 years. According to the VCIx, conditions in the western region (such as Western Cape) were better than in the eastern region (like Gauteng, Mpumalanga). As to the spatial distribution of NDVI profiles, crop conditions on about 43.5% of the cropland were above average and about 56.5% 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 (like Gauteng, Mpumalanga province). Overall, crop conditions were slightly below average.

Regional analysis

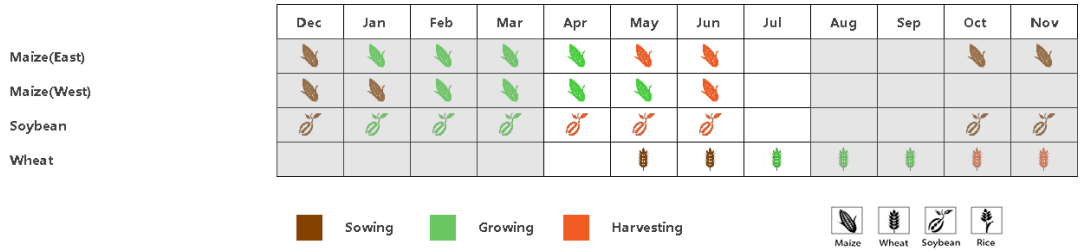
Rainfall in the Arid and desert zones was significantly below average (58 mm, -31%). whereas the average temperature (12.6°C, +0.2°C) and radiation (853 MJ/m2, +4%) were slightly above the average, potential biomass was reduced by 17% due to the insufficient precipitation. Cropped arable land fraction (CALF) decreased substantially (-14%) and VCIx was 0.78. The crop condition development graph based on NDVI indicates that the crop conditions were generally below the 5-year average, and only in June they started to become better than the average. Crop production is expected to be unfavorable.

In the Humid Cape Fold mountains, the temperature was near average (14.5°C, -0.1°C), and radiation (826 MJ/m2, +5%) was slightly above average. With significant below-average rainfall (93mm, -32%), potential biomass was below the 15-year average (-4%). CALF was 96% and VCIx was 0.85. The crop condition development graph based on NDVI also indicates normal conditions.

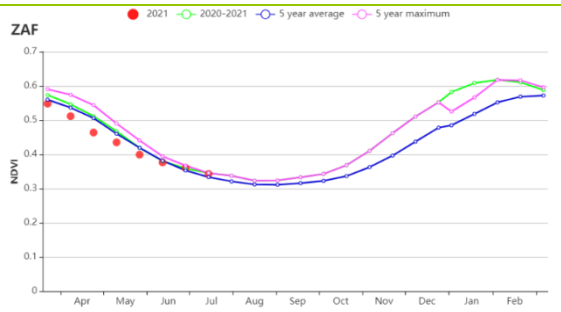
In the Mediterranean zone, the temperature was near average (13.3 °C, 0 °C), while rainfall witnessed a significant increase (316mm, +25%) and radiation was near average (689 MJ/m2, +1%). The estimated potential biomass was reduced by 5%. CALF increased substantially (87%, +6%) and VCIx was 0.93. According to the crop condition development graph, the NDVI was above the 5-year maximum for most of the period. Crop conditions were favorable.

In the Dry Highveld and Bushveld maize areas, most agroclimatic indicators were below the 15-year average: rainfall (31 mm, -54%), temperature (11.9 °C, -0.4°C) and radiation (196 MJ/m2, +5%). Potential biomass was reduced by 20%. CALF was above the 5YA (84%, +1%) and VCIx was 0.83. The crop condition development graph based on NDVI indicated similar conditions as in the Arid and desert zones, which became better than the average only at the end of June. Crop conditions were unfavorable.

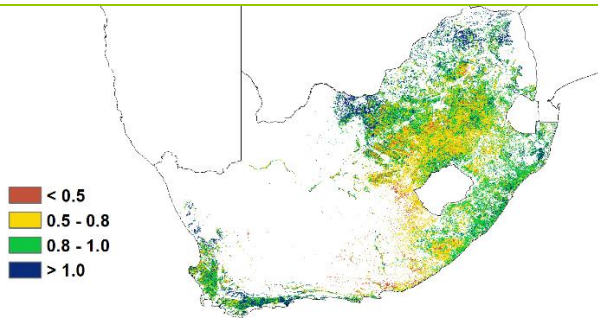
Figure 3.45 South Africa's crop condition, April - July 2021



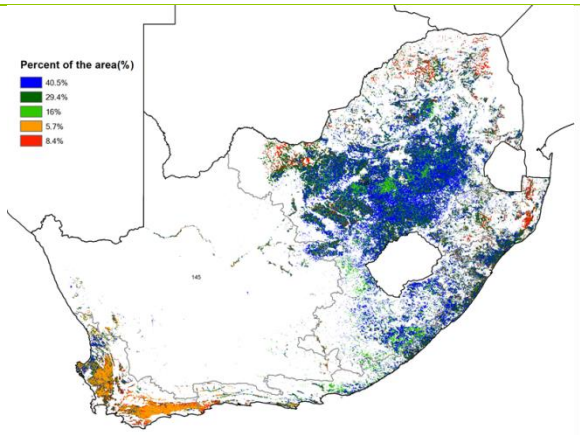
(a). Phenology of major crops



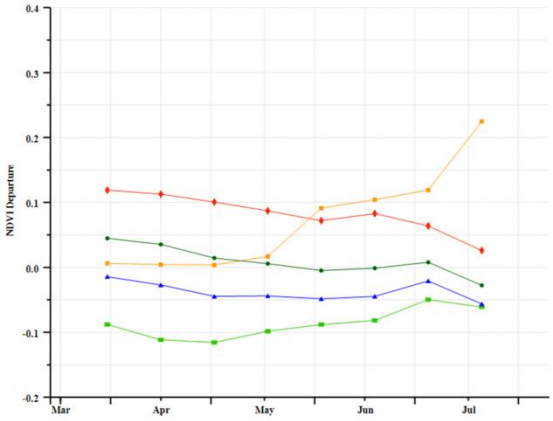
(b) Crop condition development graph based on NDVI



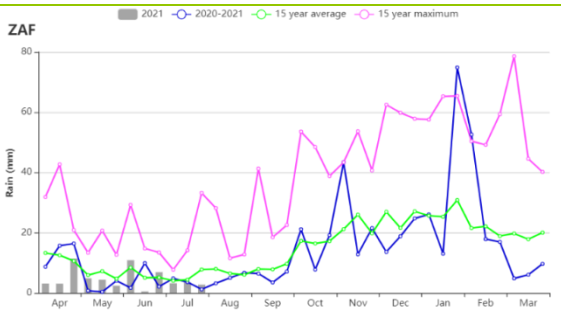
(c) Maximum VCI



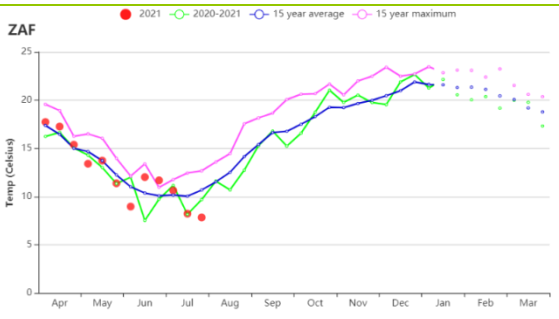
(d) Spatial NDVI patterns compared to 5YA



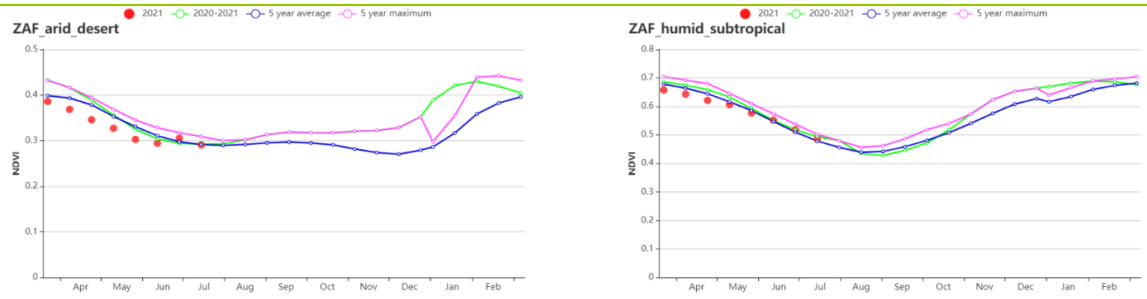
(e) NDVI profiles



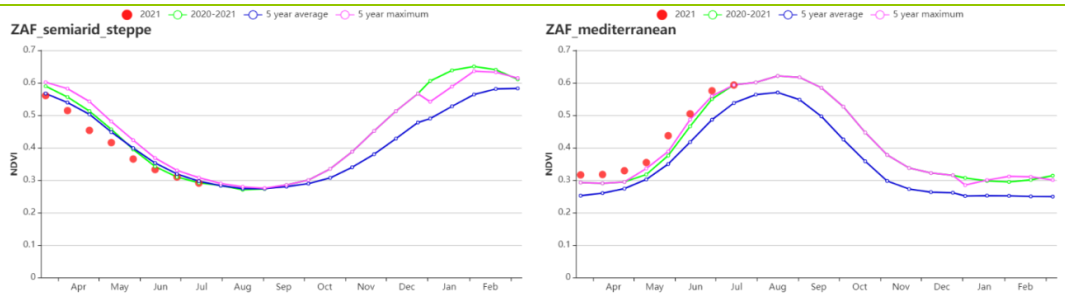
(f) Rainfall profiles



(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, April - July 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	58	-31	12.6	0.2	853	4	196	-17
Humid Cape Fold mountains	93	-32	14.5	-0.1	826	5	283	-4
Mediterranean zone	316	25	13.3	0.0	689	1	238	-5
Dry Highveld and Bushveld maize areas	31	-54	11.9	-0.4	967	5	196	-20

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

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current
Arid and desert zones	37	-14	0.78
Humid Cape Fold mountains	96	1	0.85
Mediterranean zone	87	6	0.93
Dry Highveld and Bushveld maize areas	84	1	0.83

[ZMB] Zambia

The report covers the harvest period for the rainfed crops and the sowing of irrigated winter wheat and horticultural crops. The 2021 rainfed cereal harvest was completed in July. Harvest of the minor winter wheat crop will take place in November. The total cereal production in the country is expected to be around 4 million tonnes for the 2020/2021 season. This includes the winter wheat crop, which is expected to be above average. The conducive rainfall throughout the season, favourable weather conditions in general and on-time provision of production inputs provided a favorable environment for the attainment of high crop yields. Minor and localized crop losses in parts of Southern and Western provinces occurred due to infestations of African Migratory Locust (AML). Regular control operations minimized the impact on agricultural output.

Rainfall showed a 54% negative departure from the 15YA. Temperature (TEMP) was also lower than the 15YA by 0.5°C, whereas radiation (RADPAR) showed a positive anomaly by 3% and potential biomass production (BIOMSS) showed a negative departure by 14%. The cropped arable land fraction (CALF) showed a 2% increase and maximum VCI value was 0.88. Based on the NDVI profiles, 12.2% of the cultivated area was above normal, 33.3% was close to normal, and 54.4% of the cultivated area had a negative departure attributed to the early ending of the rainy season. The observed rainfall deficit indicates drier conditions, which facilitated harvest. It had limited impact on the crops. Overall, crop conditions were fair.

Regional Analysis

CropWatch considers four main crop production zones in Zambia, namely the **Northern high rainfall zone**, **Central-eastern and southern plateau**, **Western semi-arid plain** and **Luangwa Zambezi rift valley**.

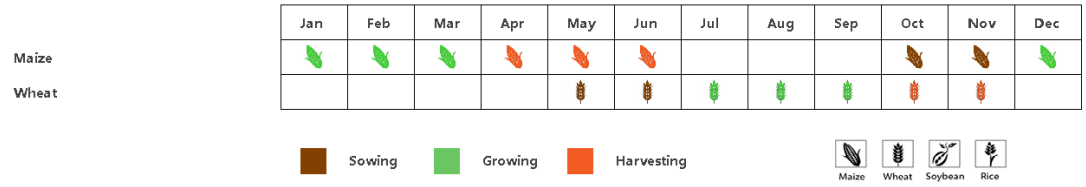
In the **Northern high rainfall zone**, precipitation decreased by 41%, temperature was near average (-0.4°C), while the radiation increased by 4%. In this zone the reduction in rainfall affected the estimated potential biomass by a 7% decrease over the 15YA, however the cropped arable land fraction (CALF) remained at 100% with no departure from the 5YA and VCIx was at 0.90.

In the **Central-eastern and southern plateau**, the precipitation decreased by 64% and temperatures by -0.5°C, while the radiation increased by 2%. VCIx was at 0.90. This region forms the main agriculture production of Zambia.

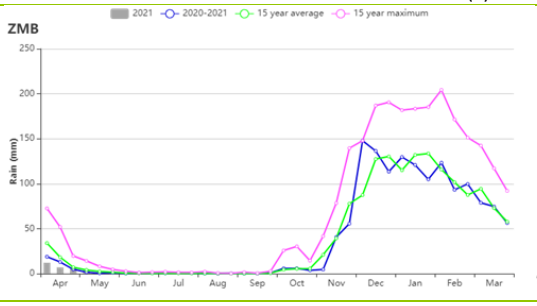
In the **Western semi-arid plain** the rainfall departed by -94% and temperatures by -0.3°C while radiation increased by 2%. These conditions affected biomass production with a reduction by 27% as a result of rainfall reduction and low water holding capacity of the predominant sandy soils in this region.

In the **Luangwa Zambezi rift valley**, the rainfall departed by -81%, temperatures were also below average (-0.5°C) and radiation increased by 2%. Estimated biomass was reduced by 17%. This region is associated with low rainfall and normally affected by drought and dry spells.

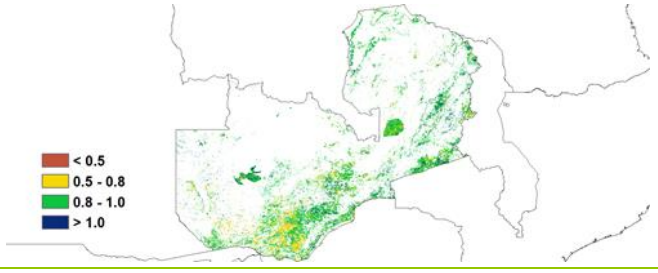
Figure 3.46 Zambia 's crop condition, April-July 2021



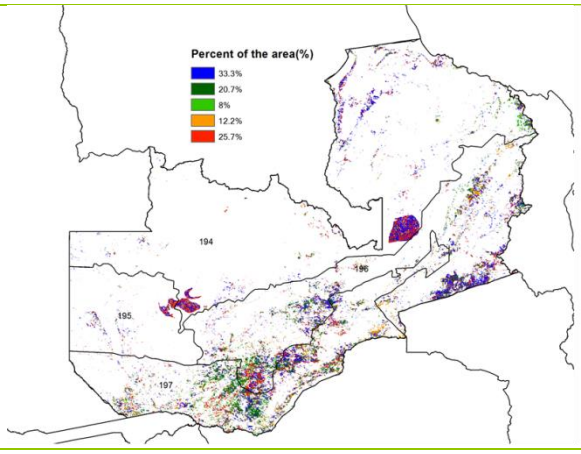
(a) Phenology of major crops



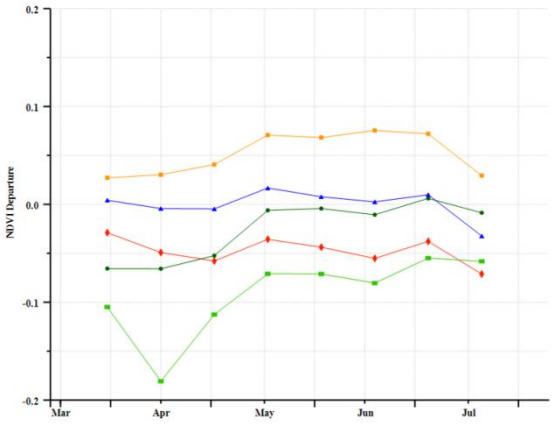
(b) Crop condition development graph based on NDVI



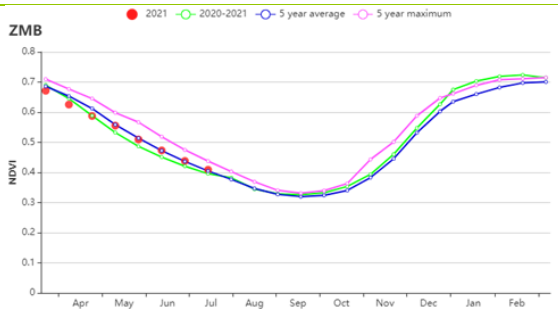
(c) Maximum VCI



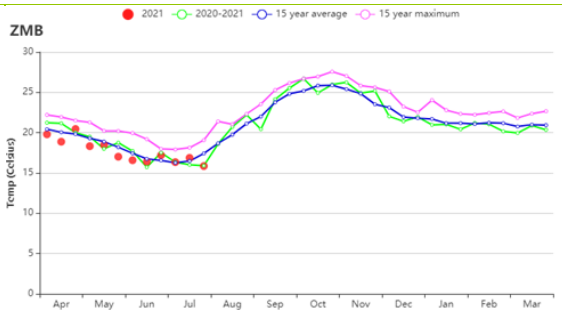
(d) Spatial NDVI patterns compared to 5YA



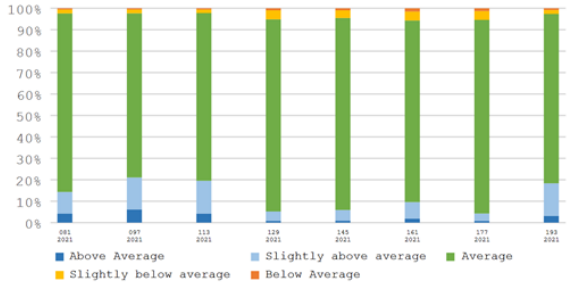
(e) NDVI profiles



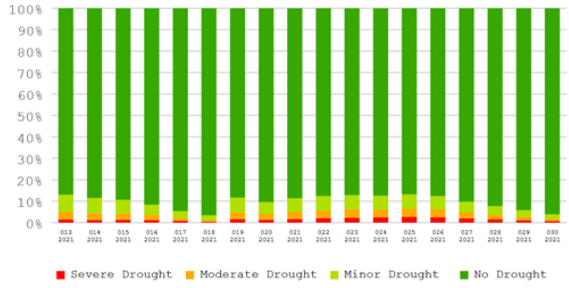
(f) Rainfall time series profile



(g) Time series temperature profile



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



(i) Proportion of VHIm categories compared with 5YA

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

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)	Current (gDM/m^2)	Departure from 15YA (%)
Northen high rainfall zone	62	-41	17.6	-0.4	1214	4	363	-7
Central-eastern and southern plateau	21	-64	17.5	-0.5	1116	2	361	-9
Western semi-arid plain	2	-94	18.3	-0.3	1194	1	150	-27
Luangwa Zambezi rift valley	7	-81	17.6	-0.5	1135	2	271	-17

Table 3.84 Zambia 's agronomic indicators by sub-national regions, current season's value and departure from 5YA, April-July 2021

Region	Cropped arable land fraction		Maximum VCI
	Current (%)	Departure from 5YA (%)	Current
Northen high rainfall zone	100	0	0.90
Central-eastern and southern plateau	100	2	0.89
Western semi-arid plain	99	0	0.85
Luangwa Zambezi rift valley	99	4	0.86